PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

A History of the Czech Lands

Pánek Jaroslav; Boubín, Jaroslav; Cibulka, Pavel; Gebhart, Jan; Ondo-Grečenková, Martina; Hájek, Jan; Harna, Josef; Hlavačka, Milan; Kučera, Martin; Mikulec, Jiří; Polívka, Miloslav; Semotanová, Eva; Třeštík, Dušan; Žemlička, Josef

Identifikátor: **RIV/67985963: /09:00332566**

Předkladatel výsledku do Pilíře II.:
Historický ústav AV ČR, v. v. i.

Podíl předkladatele na výsledku: **75 %**

Anotace dle RIV:

An original synthesis of the Czech history from the ancient times up to 1993.8910

Odůvodnění předkladatele:

The book transparently explains the history of the Czech lands from prehistory until the birth of the Czech Republic in 1993. The English, more extensive version of A History of the Czech Lands (it was published in Czech by the Karolinum Publishing House in 2008 under the title Dějiny českých zemí) is the first book, which introduces the history of the Czech lands to foreign readers in such an extent and quality. The history of the Czech lands is created with an emphasis on the progress of the Czech society, racial ethnics, culture, religion, economy and landscape within political transformations. It monitors development of the Czech state and nation, as well as the minorities living on the Czech territory, mainly the Jews, Germans, Poles and Slovaks. The main theme of the essay concerns transformations of the state (including territories belonging to it only temporarily) and societies living in it, but the culture, religion, development of the population and the thousand-year transformation of the landscape environment also receive balanced attention. It provides orientation in the history of Central Europe and is a significant conception for foreign students and specialists. Simultaneously, it represents current Czech historiography and reflects Czech history and culture within international circumstances. The publication A History of the Czech Lands is a collective work of all-societal reach, which the Institute of History, Academy of Sciences CR systematically studies (the other works include e.g. the Academic Encyclopaedia of the Czech Lands with three volumes published so far; the Academic Atlas of the of Czech History - was published in 2014; the Biographic Dictionary of the Czech Lands currently has sixteen volumes). It represents new methodological approaches, the latest findings of the historical science over the past two decades and constitutes one of the important international compendia on the national history.

Odůvodnění panelu:

První syntetické zpracování dějin českých zemí od neolitu až na práh současnosti, které zaplňuje řadu desetiletí trvající mezeru ve světové literatuře. Vyváženě propojuje dějiny politické, sociální, hospodářské, kulturní i náboženské. Metodicky se odlišuj

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Akademická gramatika spisovné češtiny

Štícha František, Hoffmannová Jana, Svobodová Ivana, Vondráček Miloslav

Identifikátor: **RIV/68378092:_____/13:00422609**

Předkladatel výsledku do Pilíře II.:
Ústav pro jazyk český AV ČR, v. v. i.

Podíl předkladatele na výsledku: **95 %**

Anotace dle RIV:

Gramatika je založena na analýzách textových dokladů obsažených v Českém národním korpusu. Přináší mnohé nové poznatky z oblasti formální morfologie, slovotvorby, syntaxe nelineární, slovosledu, souvětných struktur a výstavby textu.

Odůvodnění předkladatele:

The aim of the new Academic grammar of literary Czech is to present the Czech cultural public and mainly students and teachers of both high schools and universities, writers, newspaper authors and editors, translators and interpreters with information about rules and other phenomena of current, mostly written Czech. The ambition of the Academic grammar of literary Czech is mainly to become a practical handbook to be used by the broad cultural public; hence, theoretical considerations are limited to a reasonable minimum while the whole book is predominantly based on analyses of real, existing texts as occurring (for their most part) in the body of the Czech National Corpus.

Odůvodnění panelu:

Akademická gramatika spisovné češtiny je první velká mluvnice spisovného jazyka od konce osmdesátých let minulého století. Nejedná se však o dílo, které by pouze aktualizovalo poznatky, obsažené v dřívějších mluvnicích, ale je také novátorské, a to z toho

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Až k hořkému konci. Pražské německé divadlo 1845-1945

Jitka Ludvová

Identifikátor: **RIV/00023205:_____/12:#0000195**

Předkladatel výsledku do Pilíře II.:
Institut umění - Divadelní ústav

Podíl předkladatele na výsledku: **100 %**

Anotace dle RIV:

Kniha shrnuje dějiny pražského německého divadla v posledních stech letech jeho existence (1845-1945). Historie divadla je popsána na pozadí změn společenských, politických a sociologických. Jsou zachyceny dějiny opery i činohry, včetně hostování domácích a zahraničních německých souborů a jednotlivců. Součástí knihy jsou dobové texty týkající se divadla a kultury, zčásti od českých autorů zčásti přeloženy z němčiny. Přiložené CD obsahuje soupis členů divadla 1885-1939, soupis operního, operetního a činoherního repertoáru z této doby a lexikon osobností.

Odůvodnění předkladatele:

The monograph examines the history of Prague theatre from the mid-19th century, when two national groups – German and Czech – eventually separated in the Estates Theatre. It presents the story of the German-speaking theatre in the context of Czech-German relationships, i.e. in the close link with the Czech cultural life and in comparison with its Czech counterparts. Ludvová's comprehensive treatise is based on her own intense and long-standing material research. Her research situates theatre within the framework of social, political, national, economic, sociological, cultural-historic and individual conditions of existence, operation and impact of German-speaking theatre. Complex approach makes her arguments and conclusions convincing and brings new and ground-breaking discoveries. In Ludvová's monograph, theatre naturally emerges as a phenomenon, which intersects with all important historical events of the period; a phenomenon that mirrors and at the same time co-creates the history. Apart from all the particular and detailed findings regarding the history of theatre operation, Ludvová accomplished to capture the nature of theatre that functioned as a sensitive indicator of various tendencies and conflicts not only in the Czech lands, but in the whole of Central-European context. This is the most valuable contribution. Ludvová's book transgresses the discipline of theatre studies and provides valuable information and significant contributions to other academic disciplines, namely general history and, especially, to the particular field that focuses on the history of German-Czech relationships in the Czech lands from the mid-19th century to the World War II. The book excited considerable interest abroad: its author was nominated for the Artistic Award of Czech-German Understanding. Jitka Ludvová's monograph could be considered an extraordinary achievement and significant result of scholarly research from both academic and literary perspective.

Odůvodnění panelu:

Významný a neobyčejně rozsáhlý příspěvek k syntetickému poznání klíčového aspektu kultury českých zemí, který byl po dlouhou dobu tabuizován a doposud se mu nedostalo odborného zpracování. Publikace se synteticky věnuje vlivu německého divadla na kulturní

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Cyril a Metoděj mezi Konstantinopolí a Římem

Vavřínek Vladimír

Identifikátor: **RIV/68378017:_____/13:00424379**

Předkladatel výsledku do Pilíře II.:
Slovanský ústav AV ČR, v. v. i.

Podíl předkladatele na výsledku: **100 %**

Anotace dle RIV:

Publikace popisuje pozadí a průběh misie Cyrila a Metoděje na Velkou Moravu a prostředí byzantské říše, ze které oba bratři na Moravu přišli. Kromě toho autor vysvětluje, jak úspěch misie závisel na boji moravských vládců a nezávislost na franské říši. Tyto události jsou zasazeny do širšího historického rámce boje Konstantinopole a Říma o církevní jurisdikci nad Bulharskem. Kromě popisu osudů obou bratří autor vyzdvihuje jedinečnost jejich kulturního díla, zejména vytvoření slovanského písemnictví a zavedení slovanského jazyka do liturgie.

Odůvodnění předkladatele:

The book written by the renowned Byzantologist Vladimír Vavřínek evaluates complicated conditions of the origins of Cyril´s and Methodius´ work and its further progress from the complex point of view of several disciplines. The publication describes the background and circumstances of the Cyril and Methodius´mission to the Great Moravia and the situation in the Byzantine Empire those days. Besides this the author emphasizes the uniqueness of cultural achievements of both the brothers, in particular creating Slavic liturgy and introducing the Slavic language into liturgy. The whole topic is set into a wide context of cultural and political milieu in the 9th century Europe and into a historical frame of the controversy of Constantinople and Rome on the church jurisdiction over Bulgaria. The author presents well-found and often new scientific finding based on his lifelong knowledge and experience. The book was an immediate bestseller, favourably accepted by foreign scholars as well, and Vladimír Vavřínek was awarded an anniversary prize for the original and best selling publication of the Publishing House Vyšehrad in the year 2013. Access - National Library of the Czech Republic: http://aleph.nkp.cz/F/EFE1XQ9BHFBX1G8LA324TLUHJV14TK6G6L653T14I63FYI3FH8-05769?func=full-set-set&set_number=049208&set_entry=000007&format=999

Odůvodnění panelu:

Syntetická monografie o významu cyrilometodějské misie vyšla u příležitosti 1150. výročí jejího zahájení. Ve skutečnosti však byla nepřímo připravována celoživotním badatelským úsilím svého autora. Problém setkání, konkurence a vyznění východních a západn

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Czech law between europeanization and globalization : New phenomena in law at the beginning of 21st century

Karolina Adamová, Marek Antoš, Milan Bakeš, Vladimír Balaš, Miroslav Bělina, Karel Beran, Veronika Bílková, Radim Boháč, Stanislava Černá, Zuzana Císařová, Milan Damohorský, Tomáš Dobřichovský, Jan Dvořák, Ondřej Frinta, Dita Frintová, Aleš Gerloch, Tomá

Identifikátor: **RIV/00216208:11220/10:10002625**

Předkladatel výsledku do Pilíře II.:
Univerzita Karlova v Praze Právnická fakulta

Podíl předkladatele na výsledku: **90 %**

Anotace dle RIV:

The English version of monograph New phenomena in the law of the early 21st century, which contains a significant chapter in the development of Czech law from past to present, with emphasis on globalization and evropeanization of Czech legal environment.

Odůvodnění předkladatele:

The monograph results from a research project entitled “Quantitative and Qualitative Transformation of the Legal Order at the Beginning of the 3rd Millennium – Roots, Sources and Prospects” granted by the Ministry of Education, Youth and Sports of the Czech Republic. It represents an analysis of the main factors giving impetuses to Czech law from both inside and outside. External impulses subsist in the Europeanization and globalization of Czech law.

Odůvodnění panelu:

Vynikající, široce založená monografie o proměnách českého práva v evropském a mezinárodním kontextu. Pod vedením předního znalce evropského a asijského (čínského) práva M. Tomáška se na výzkumné práci podílel široký okruh řešitelů zejména z Právnické fak

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Dějiny nové moderny. Česká literatura v letech 1905-1923

Vladimír Papoušek, Michal Bauer, Veronika Broučková, Petr Bílek

Identifikátor: **RIV/60076658:12210/10:00011480**

Předkladatel výsledku do Pilíře II.:
Jihočeská univerzita v Českých Budějovicích Filozofická fakulta

Podíl předkladatele na výsledku: **67 %**

Anotace dle RIV:

Kniha analyzuje radikální proměny literárních diskurzů a kulturního paradigmatu, které vychází z nových modernistických a avantgardních směrů vznikajících v Evropě v prvních desetiletích 20. století. Představuje metodologicky nově pojaté dějiny české literatury tohoto období.

Odůvodnění předkladatele:

The monograph History of the New Modernism: Czech Literature in 1905 – 1923, Vladimír Papoušek et al., Prague: Academia, 2010, 628 pages, belongs amongst the important outputs of Czech cultural historiography of the last decade. Based on innovative methodology, it approaches literary texts and other works not as static containers of meaning; it interprets them spatially as mobile producers of discourses. Discursive practices have been analyzed as arriving into the public space and fighting for its position within the field of the culture of the era, combining with other types of discourses of the era but at the same time attempting to differentiate. The whole book has been based on four types of texts and approaches: 1. Models of continuous synchrony; each year of the era of 1905 – 1923 has been analyzed as a distinctive wholeness. 2. Assumption of transformations of literary discourses and imagination within the perspective of the era. 3. Spatial and chronological mapping of literary, cultural and social events and works that should produce the mental map of rich networking and dialogism of culture. 4. Methodology has been explained in a distinctive part of the book, taking the opportunity for a coherent argumentation. The years of 1905 and 1923 that frame the material claim the periodization that prefers inner dynamic development of literature to outer social and/or political factors. Next to the originality of methodology and analytical and synthetic expertise, the publication offers a distinguished visual material of book covers, photos, and paintings that connect works and events as well as verbal and visual discourses of the era covered. The book received the Academia Publishing House Award for the best non-fiction book of 2010, Magnesia Litera Award for non-fiction in 2011 and Union of Interpreters and Translators Award for encyclopaedia in 2011.

Odůvodnění panelu:

Kolektivní monografie je vysoce hodnocena za snahu autorů nahlížet literární terén počátku 20. století synchronně a nikoli jako školsky vypreparovanou dílčí etapu vývoje. Tento průlomový metodologický postup několika předním českým bohemistům umožnil komp

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

El bilingüismo paraguayo: Usos y actitudes hacia el guaraní y el castellano

Zajícová Lenka

Identifikátor: **RIV/61989592:15210/09:00008649**

Předkladatel výsledku do Pilíře II.:
Univerzita Palackého v Olomouci Filozofická fakulta

Podíl předkladatele na výsledku: **100 %**

Anotace dle RIV:

El libro trata sobre la situación lingüística actual en Paraguay. Se describen y analizan las tendencias existentes en el uso de las dos lenguas oficiales y las actitudes de los hablantes hacia ellas, hacia la educación bilingüe y hacia el guaraní estándar. El libro pasa revista a la historia lingüística de Paraguay, al papel del bilingüismo como símbolo nacional, a la compleja temática del yopará el conjunto de fenómenos lingüísticos característicos de la situación del contacto entre el guaraní y el castellano, al pasado y presente de la ense?anza del guaraní y de la educación bilingüe, a las políticas lingüísticas recientes, y al proceso inacabado de la estandarización del guaraní.

Odůvodnění předkladatele:

The book discusses the current linguistic situation in Paraguay. It describes and analyzes trends in the use of Guarani and Spanish and the speakers' attitudes towards them, bilingual education and the Guarani standard. The book looks at the linguistic history of Paraguay, the role of bilingualism as a national symbol, the complex issue of yopará (a linguistic phenomenon characteristic of the situation of contact between the Guarani and Spanish), past and present Guarani education and bilingual education, recent language policies, and the unfinished process of standardization of Guarani. It analyzes data from almost 2,600 Paraguayan speakers, collected through interviews (108 informants) and questionnaires (2,490 informants) during the fieldwork in 2001 and 2003. Thus, it worked with a larger sample than any other sociolinguistical studies on Paraguayan bilingualism. It is also the first sociolinguistic study that researched in depth the attitudes towards changes in language policies as well as bilingual education one decade after their introduction in Paraguay. It also identifies more precisely than other studies the contemporary tendencies in the use of both official languages and the social factors that influence it. One of the further merits of the monograph is a detailed overview of the history of Guarani education in Paraguay and of the process of Guarani standardization and codification. The book was published in the prestigious series Language and Society in the Hispanic World by Iberoamericana-Vervuert (Madrid-Frankfurt am Main), an internationally renowned publishing house in the areas of Latin American Studies, Spanish Studies, Portuguese Studies, etc. The book was reviewed in Great Britain, Spain and Costarica and until now has more than 30 international citations by authors from Germany, Spain, the United States, Argentina, Ecuador and Australia.

Odůvodnění panelu:

Kniha L. Zajícové se zabývá pozoruhodnou situací reálně uplatněného bilingvismu na příkladu Paraguaye, kde většina obyvatel vedle španělštiny užívá také indiánský jazyk guaraní. Kromě přehledu dosavadní literatury a dějin problematiky kniha obsahuje širok

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Emauzský cyklus. Ikonografie středověkých nástěnných maleb v ambitu kláštera Na Slovanech Kniha je evidována v Národní knihovně: http://aleph.nkp.cz/F/?func=direct&doc_number=002409862&local_base=NKC

Kubínová Kateřina

Identifikátor: **RIV/68378033:_____/12:00380321**

Předkladatel výsledku do Pilíře II.:
Ústav dějin umění AV ČR, v. v. i.

Podíl předkladatele na výsledku: **100 %**

Anotace dle RIV:

Kniha se zabývá vznikem, posláním a osudy souboru nástěnných maleb v pražském klášteře Na Slovanech zvaném též Emauzy. Malby vznikly přibližně mezi léty 1365 a 1372 za vlády císaře Karla IV. Těžiště knihy spočívá na ikonografické interpretaci obrazovéhocyklu.

Odůvodnění předkladatele:

This book presents a quite new insight into history, style and iconography of so called Emmaus cycle (set of medieval mural paintings which were painted in the cloister of Prague Benedictine monastery Na Slovanech known also as the Emmaus Abbey). These painted narratives are the most extensive cycle of medieval wall paintings north of the Alps. Last monograph about this monumental cycle was issued in 1897, and since this time the theme was treated only in some separate studies. In the last century many points of view have changed and also some new discoveries were published (for example: medieval description of whole cycle). Author of the book confronted the old views with some new aspects and brought different interpretations in many respects: for example datation, stylistical analysis and iconographical interpretation. The iconography of the cycle is thus reconstructed with the help of medieval description as a whole and also in every single scene. It is very important to read the scenes in their typological context for the understanding of the cycle. For the first time the book Speculum humanae salvationis (not only iluminations) and texts of the medieval theologians are used here for iconographical interpretation of the scenes. A Latin medieval description of cycle and also a new edition of medieval mural inscriptions (tituli) are published as a appendix A.

Odůvodnění panelu:

Nejen pro tuzemské, ale zejména pro zahraniční badatele objevná a novátorská monografie věnující se monumentálnímu nástěnnému zrcadlu lidské spásy z benediktinského Emauzského kláštera. Důkladný rozbor jednotlivých částí cyklu z doby Karla IV. přispěl k j

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Habsburgischer Adel und Aufklärung. Bildungsverhalten des Wiener Hofadels im 18. Jahrhundert

Ivo Cerman

Identifikátor: **RIV/60076658:12210/10:00011528**

Předkladatel výsledku do Pilíře II.:
Jihočeská univerzita v Českých Budějovicích Filozofická fakulta

Podíl předkladatele na výsledku: **100 %**

Anotace dle RIV:

Diese Monographie befasst sich mit den Auswirkungen der aufklärerischen Moralphilosophie und Wissenschaften auf die Ausbildung der Adeligen in der Habsburgermonarchie. Der Fokus liegt auf den adeligen Familien, die zur breit gefassten Hofgesellschaft inWien angehörten. Die These ist am Beispiel dreier Familien dargestellt, wobei jede von diesen Familien in unterschiedlicher Stellung zum Hof stand. Die Choteks waren Aufsteiger, die in dieses Milieu erst dank den Maria-Theresianischen Reformen kamen, dieDietrichstein ware eine seit langem etablierte Familie, die Windischgrätz dagegen, waren eine Familie, die aus der Hofgesellschaft freiwillig ausschied. Die Rekonstrunktion der Ausbildung dreier Generationen dieser Familien bildet den Kern dieser Arbeit.

Odůvodnění předkladatele:

This book is significant for our understanding of the ‘moral turn’ in human sciences. The renowned historian Derek Beales (Cambridge) compared its significance to Guy Chaussinand-Nogaret’s pioneering study in French aristocracy and evaluated it as ‘a major contribution to the nobility and Enlightenment across continental Europe’. Since its publication this book has become integral to standard accounts in current scholarship, as the review articles by Wolfgang Schmale or Franz L. Fillafer demonstrate. The book explores the impact of Enlightenment ethics on the Viennese Court aristocracy. However, this process is not depicted as a passive reception of Enlightenment ideas; it is interpreted as a quest for secular morality, and the moral education in aristocratic families is interpreted as a part of this project. This book focuses on moral education, because the belief in its power appeared to be a convenient solution to dilemmas of contemporary moral philosophy. However, the quest for secular morality arrived at crossroads when Claude Adrien Helvétius unintentionally revealed in his book De l’ esprit that the sensualist approach to morality is a dead-end and it cannot provide principles for any viable moral education. Rousseau’s natural pedagogy was in no small measure a response to this crisis, but it revealed a new dilemma between educating a citizen or a human being. The choice between common good and individual happiness was a topical problem in the Habsburg monarchy, and this book asks, how these dilemmas were solved by parents and tutors educating the new generation of Viennese Court aristocracy. It illustrates their approaches on three generations of the Dietrichstein, Chotek and Windischgraetz families, which all had a different social position at the court. The argument culminates in Count Windischgraetz’s polemic against Helvétius and his attempt to outline a new project of moral education for his children.

Odůvodnění panelu:

Monografie pojednává o vlivu osvícenství na kulturní a vzdělanostní vývoj vídeňského císařského dvora. Při znalosti mnoha dalších pramenů je založena přednostně na detailním prozkoumání velmi bohatých rodinných archivech české a moravské šlechty (Chotků,

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Jan Hus : život a dílo

Šmahel František

Identifikátor: **RIV/67985955:_____/13:00421855**

Předkladatel výsledku do Pilíře II.:
Filosofický ústav AV ČR, v. v. i.

Podíl předkladatele na výsledku: **100 %**

Anotace dle RIV:

Monografie o českém reformátorovi Janu Husovi (1416) vychází k blížícímu se 600. výročí jeho smrti. Autor v chronologické linii sleduje jak Husovy životní osudy a širší společenské i politické procesy, tak i vývoj jeho reformní nauky. Knihu doplňují věcné vysvětlivky, seznam pramenů a literatury, soupis vyobrazení a rejstříky.

Odůvodnění předkladatele:

The monograph on the life and works of Jan Hus († 1416) represents a culmination of life-long research of Františel Šmahel on this founding figure of Czech reformation. František Šmahel has devoted his whole professional life to the study of Czech Hussitism and he belongs to undisputed world-leading researchers in this field. His merits were repeatedly acknowledged by many scientific institutions in the Czech Republic as well as abroad, and in 2013 he was awarded, as a first scholar from the field of humanities, the National Prize of Czech government "Česká hlava". In this book, on the eve of the 600th anniversary of Jan Hus's death, František Šmahel tries to answer the crucial questions of older as well as recent scholarship on Jan Hus. In chronological order, the author follows the life story of Jan Hus set against the backdrop of broader social and political situation, and pays special attention to the development of Hus's reform teaching including its philosophical background. In order to reduce the references and thus facilitate the reading of the book, some controversial points and open questions of the existing research are treated separately. The book is furnished with indexes, comprehensive bibliography of sources and secondary literature and plates. It will definitely become a corner-stone of any further study on Jan Hus.

Odůvodnění panelu:

Vyzrálé syntetické dílo světově uznávaného medievisty a nejvýznamnějšího žijícího husitologa je literárně působivým souhrnem jeho celoživotních výzkumů. Význam této knihy není dán zdaleka jen tím, že uvozuje všechny další vědecké akce k 600. výročí upálen

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Kronika česká

Mgr. Jan Linka

Identifikátor: **RIV/68378068:_____/13:00426557**

Předkladatel výsledku do Pilíře II.:
Ústav pro českou literaturu AV ČR, v. v. i.

Podíl předkladatele na výsledku: **100 %**

Anotace dle RIV:

Kronika česká Václava Hájka z Libočan, poprvé vydaná v roce 1543, patřila až do 19. století k nejčtenějším a nejoblíbenějším česky psaným knihám, i přes tvrdou kritiku, které ji podrobil v druhé polovině 18. století historik Gelasius Dobner. Hlavně v 19.století Kronika poskytla látku mnoha novodobým českým autorům i výtvarným umělcům. Většina starých českých pověstí žije dodnes v obecném povědomí právě v podobě, kterou jim vtiskl Hájek. Práce Jana Linky je nejúplnější edicí Hájkovy kroniky (starší edice z 1. poloviny 20. století nebyla dokončena, v roce 1981 vyšel pouze výbor). Obsahuje kompletní transkripci textu a na připojeném CD rovněž jeho transliteraci, dále rejstříky (osob a míst), diferenční slovníček, ediční poznámku, doslov Petra Voita a těžLinkovu rozsáhlou studii Kronika česká jako obhajoba řádu. Ta přináší novou interpretaci Hájkova díla. V centru jeho pozornosti je dobový pojem "křesťanský řád", tedy "obecné dobré", z jehož hlediska si troufá soudit císaře i krále, šlec

Odůvodnění předkladatele:

PLEASE, SEE THE FILE KV04.DOC IN THE ATTACHEMENT.

Odůvodnění panelu:

Příkladně promyšlená edice mimořádně významného a objemného knižního pramene (1541), důležitého jak pro českou literaturu, tak pro starší české i středoevropské dějiny, pro historii dějepisectví a utváření národní tradice. Po desetiletém úsilí zde bylo ko

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

La storia della piastra d'argento di Urbano VIII (L'attivita della zecca romana sul finire del pontificato di Urbano VIII e il catalogo dettagliato delle piastre d'argento pontificie degli anni 1634-1644)

Vorel Petr

Identifikátor: **RIV/00216275:25210/13:39897584**

Předkladatel výsledku do Pilíře II.:
Univerzita Pardubice Fakulta filozofická

Podíl předkladatele na výsledku: **100 %**

Anotace dle RIV:

Il periodo del pontificato di Urbano VIII (1623-1644) rappresenta un decisivo momento di passaggio nella storia monetazione pontificia, soprattutto grazie all'introduzione della battitura meccanica nella nuova zecca papale di Roma a partire dal 1634. Inquel periodo con l'ausilio della tecnologia moderna (produzione delle monete con cilindri rotanti) venne avviata una regolare coniazione di monete pontificie d'argento di grande modulo, chiamate scudo d'argento o piastra. Questo libro riporta un nuovo eoriginale punto di vista sulle implicazioni tecniche di questo segmento di storia della monetazione romana ed e completato da un dettagliato catalogo delle piastre d'argento di Urbano VIII tra gli anni 1634-1644).

Odůvodnění předkladatele:

The submitted specialized monograph represents a major scientific outcome which is an evident asset contributing to the scientific branch development on a Pan-European level. The book is original both in the topic selection, resources and in the methodology of its processing. The presented outcomes are compared with the current Italian and other foreign studies in similar field. The publication contains original, so far unpublished facts and their interpretation has the strong potential to influence the future similar resources processing on an international level because the new findings concerning the historical coins production technologies and the newly used analytical procedures have a generic character. It is especially the interdisciplinary aspect characterized by the application of the exact analytical procedure, and also the undoubted international context of the early new age papal minting that list the book among the excellent outcomes of the Czech historical science.

Odůvodnění panelu:

Monografie zpracovává mimořádně obtížné téma z dějin papežských financí v období třicetileté války, kdy papežství získávalo obrovské zdroje ze španělských kolonií v Americe a spolufinancovalo (vedle vlastní politiky a monumentální barokní tvorby) také ha

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Národy nejsou dílem náhody: Příčiny a předpoklady utváření moderních evropských národů

Miroslav Hroch

Identifikátor: **RIV/00216208:11240/09:00013887**

Předkladatel výsledku do Pilíře II.:
Univerzita Karlova v Praze Fakulta humanitních studií

Podíl předkladatele na výsledku: **100 %**

Anotace dle RIV:

Kniha je syntetickým výkladem národotvorných procesů v Evropě 19. století. Snaží se zachovat rovnováhu mezi využíváním empirických poznatků a výsledky teoretických analýz moderních společenských věd.

Odůvodnění předkladatele:

Miroslav Hroch is an internationally respected expert on European nationalism. His works are widely cited in the scholarly literature and influential in a variety of contexts. The journal Nationalities Papers has recently published a special issue on Hroch's impact on nationalism studies (2010, Vol. 38, Issue 6). According to the Google Scholar, his earlier book, Social preconditions of national revival in Europe, has received 903 citations and all his works have been cited around 3000 times...

Odůvodnění panelu:

Publikace M. Hrocha shrnuje výsledky mnohaletého komparativního výzkumu evropské společnosti 19. století se širším zaměřením na novověk; na tomto základě se zrodila Hrochova teorie vzniku moderních národů a jejich typologie. Vzhledem k tomu, že autor již

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Ochrana zvířat v právu

Müllerová Hana

Identifikátor: **RIV/68378122:_____/13:00399295**

Předkladatel výsledku do Pilíře II.:
Ústav státu a práva AV ČR, v. v. i.

Podíl předkladatele na výsledku: **73 %**

Anotace dle RIV:

Kniha komplexním způsobem zpracovává téma vývoje a současného stavu právní úpravy týkající se zvířat. Výklad vzniku a formování novodobé ochrany zvířat prostředky práva je zasazen do širšího kontextu poznatků společenských a přírodních věd, zejména do souvislostí vývoje vztahu lidstva ke zvířatům vůbec. Těžištěm knihy je rozbor současného postavení zvířat v právu, od otázky jejich právního statusu, přes regulaci nakládání s nimi při různých lidských činnostech, až po zajištění jejich právní ochrany předtýráním a jejich správných životních podmínek (welfare). Kniha pojednává některá dílčí témata týkající se zvířat v českém jazyce vůbec poprvé (např. historické soudní procesy se zvířaty), a nevyhýbá se ani otázkám obtížným či kontroverzním, jako jsou regulace využívání zvířat pro pokusné účely, právní aspekty aplikace moderních biotechnologií na zvířata (klonování) nebo hnutí za práva zvířat. Podoba platné právní úpravy ochrany zvířat je zachycena ve sféře práva mezinárodního, evropských

Odůvodnění předkladatele:

The research in the area of animal welfare and animal law has dynamically developed in the last years worldwide; it is no more an “activist” topic only but it has become a subject of academic research and academic debate. The anti-cruelty laws and animal welfare legislation have entered all the spheres of international, European Union and domestic law, which is reflected by law faculties as well as veterinary and other faculties in their educational plans that more often cover animal law as a separate subject.The both authors of the book Protection of Animals in Law were carrying out a detailed research of the philosophical and social background of human-animal relationship and primarily of how the recent society changes in status of animals have impacted on law of all spheres. The book now presents the outcomes of their 5-years´ research to readers in the Czech Republic, where the branch of animal law has been still emerging. Protection of Animals in Law is thus the first complex composition of animal law written in Czech. It focuses on the current position of animals in law and society. It identifies the main weak points of a present use of animals in farming, food industry, science, and in entertainment and shows the ways how they are reflected in legislation. It introduces to Czech university students, academics, law practitioners and all interested persons including non-lawyers a full range of animal law issues, including difficult and controversial matters such as animal testing or cloning. The main features of animal rights movement, which is in general little known in central European countries, are presented as well. The description of the current animal law regulation covers the international law, the EU law and national laws, including the detailed analysis of the Czech animal welfare legislation and its practical application, compared with other eleven legislations of mostly European states.

Odůvodnění panelu:

Kniha je originální a z hlediska tématu ojedinělá; je výborným přehledem historie i současnosti postavení zvířat v právu. Zaměřuje se komplexně na zvíře a jeho právní ochranu, a to jak z hlediska základních teoretických východisek, tak i ve srovnávacím p

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Petrarca: homo politicus

Špička Jiří

Identifikátor: **RIV/61989592:15210/10:10215183**

Předkladatel výsledku do Pilíře II.:
Univerzita Palackého v Olomouci Filozofická fakulta

Podíl předkladatele na výsledku: **100 %**

Anotace dle RIV:

Monografie věnovaní politickým názorům a aktivitám F. Petrarky (italská politika, papežství, císařství, orient atd.)

Odůvodnění předkladatele:

Špička?s monograph deals with the political views and character of Francesco Petrarca. It is the most extensive and best-documented treatise on this topic and the only one to identify political themes in all of Petrarca?s writings, placing them into the context of biographical facts and historical background. Building upon the latest historical findings and on convincing argumentation, the author questions some stereotypical and traditional stories about the relationship between Petrarca and the Viscontis, the former?s republican attitude, and the alleged incoherence of his views, among others. The monograph succeeds in determining, in a very convincing way, how Petrarca?s personal ambitions, the political and propagandist interests of his protectors, the writer's participation in local politics and major themes such as empire, papacy, a unified Italy and Roman imperialism are linked together. Špička also shows, with a significant contribution to the sociology of literature and the culture history of the West, that Petrarca is a unique figure in terms of the relationship between him as an intellectual and political power to his ability to represent himself and to take advantage, in an exceptionally adroit way, of ethical and political ideology for social advancement. In 2011, this outstanding monograph received the Premio Flaiano Internazionale prize in the category of Italian studies, awarded by the Italian ministry of foreign affairs to the best foreign academic book on Italian culture. In the Czech Republic, the book is by far the largest and best documented study ever dedicated to an Italian writer. It constitutes a fundamental landmark in Italian studies in this country.

Odůvodnění panelu:

Pozoruhodná monografie z pera českého romanisty analyzuje politický význam, který Petrarca představoval ve své době nejen pro Itálii, ale například i pro Čechy. Tento pohled je zvláště cenný pro zahraniční badatele, kteří zaalpský vliv poněkud opomíjí. Kr

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Shakespeare a jeviště svět

Martin Hilský

Identifikátor: **RIV/00216208:11210/10:10057692**

Předkladatel výsledku do Pilíře II.:
Univerzita Karlova v Praze Filozofická fakulta

Podíl předkladatele na výsledku: **100 %**

Anotace dle RIV:

Kniha Shakespeare a jeviště svět je pokusem nahlédnout na Shakespearovo dílo jak v jeho úplnosti, tak v kontextech jeho vzniku, tedy anglické renesance. Chce být především pozváním do fascinujícího světa Shakespearovy imaginace, která je chápána v nejširším smyslu - patří do ní představy o světě, o řádu přírody a člověka, o vztahu mezi bytím a zdáním, skutečností a snem, realitou a iluzí. Chronologicky řazené studie a eseje nabízejí pohled na vývoj Shakespearovy komedie, tragédie, historické hry, romance i na všechna jeho básnická díla včetně Sonetů.

Odůvodnění předkladatele:

The monograph, which won the awards of the Česká učená společnost (Czech Learned Society) and Nakladatelství Academia (Academia Publishers) (both in 2011), discusses Shakespeare´s work in its entirety as well as in the context of the English Renaissance. It focuses on Shakespeare´s imagination understood in the widest sense as the notions of the world, order of nature and humanity, relation between appearance and being, dream, illusion and reality. Chronologically ordered studies offer insights into the development of Shakespeare´s comedies, tragedies, histories, dramatic romances and poems including The Sonnets.

Odůvodnění panelu:

Publikace z pera vynikajícího znalce anglické a americké literatury a dramatiky je hodnocena jako nejpodstatnější syntetický příspěvek k shakespearovskému tématu posledních desetiletí (její autor je ve Velké Británii pokládán za jednoho z nejlepších znalc

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Staročeská Bible drážďanská a olomoucká, V/1 Izaiáš – Daniel, V/2 Ozeáš – 2. Makabejská

Pečírková Jaroslava, Sobalíková Hana, Pytlíková Markéta, Homolková Milada

Identifikátor: **RIV/68378092:_____/09:00335890**

Předkladatel výsledku do Pilíře II.:
Ústav pro jazyk český AV ČR, v. v. i.

Podíl předkladatele na výsledku: **100 %**

Anotace dle RIV:

Pátý a závěrečný díl kritické edice Staročeská Bible drážďanská a olomoucká ve dvou svazcích. Obsahuje texty knih Izaiáš ? 2. Makabejská z rukopisů Bible drážďanské (kol. 1370) a Bible olomoucké (kol. 1417), textově kritický aparát, filologickou analýzutextů a obrazovou přílohu.

Odůvodnění předkladatele:

A critical scholarly edition of Staročeská Bible drážďanská a olomoucká (here: Old Czech Bible of Dresden and Olomouc, Part V concluding the long term editorial project, in two volumes), the oldest complete translation of the Bible into Czech language, is an achievement of fundamental scholarly and cultural significance. In its age and quality, the text of the Old Czech translation of the bible represents the most valuable and the most extensive source for recognizing the developmental course of the Czech language and literature; it is a unique record of learning and cultural maturation of the Czech language community (nation) of its time. Considering the fact that it is a translation which in its entirety belongs to the oldest in Europe and influenced the beginnings of translations into other European languages, the historical value of this literary treasure becomes even greater. The book has been prepared under the guidance of J. Pečírková by a team of scholars of the Institute of the Czech Language and was awarded the Prize of the President of the Academy of Sciences of the CR.

Odůvodnění panelu:

Synopticko-paleografická edice nejstarších záznamů biblického textu tzv. první redakce přeložené na evropské půdě do národního jazyka (Prof - 2Mac). Text Bible drážďanské se doposud prezentoval jen málo kvalitními fotografiemi, které představují to jediné

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

The Czech lands in medieval transformation

Jan Klápště

Identifikátor: **RIV/00216208:11210/12:10106206**

Předkladatel výsledku do Pilíře II.:
Univerzita Karlova v Praze Filozofická fakulta

Podíl předkladatele na výsledku: **100 %**

Anotace dle RIV:

Pátý a závěrečný díl kritické edice Staročeská Bible drážďanská a olomoucká ve dvou svazcích. Obsahuje texty knih Izaiáš ? 2. Makabejská z rukopisů Bible drážďanské (kol. 1370) a Bible olomoucké (kol. 1417), textově kritický aparát, filologickou analýzutextů a obrazovou přílohu.

Odůvodnění předkladatele:

A critical scholarly edition of Staročeská Bible drážďanská a olomoucká (here: Old Czech Bible of Dresden and Olomouc, Part V concluding the long term editorial project, in two volumes), the oldest complete translation of the Bible into Czech language, is an achievement of fundamental scholarly and cultural significance. In its age and quality, the text of the Old Czech translation of the bible represents the most valuable and the most extensive source for recognizing the developmental course of the Czech language and literature; it is a unique record of learning and cultural maturation of the Czech language community (nation) of its time. Considering the fact that it is a translation which in its entirety belongs to the oldest in Europe and influenced the beginnings of translations into other European languages, the historical value of this literary treasure becomes even greater. The book has been prepared under the guidance of J. Pečírková by a team of scholars of the Institute of the Czech Language and was awarded the Prize of the President of the Academy of Sciences of the CR.

Odůvodnění panelu:

Synopticko-paleografická edice nejstarších záznamů biblického textu tzv. první redakce přeložené na evropské půdě do národního jazyka (Prof - 2Mac). Text Bible drážďanské se doposud prezentoval jen málo kvalitními fotografiemi, které představují to jediné

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Znárodněné Československo. Od znárodnění k privatizaci - státní zásahy do vlastnických a dalších majetkových práv v Československu a jinde v Evropě

Jan Kuklík

Identifikátor: **RIV/00216208:11220/10:10051700**

Předkladatel výsledku do Pilíře II.:
Univerzita Karlova v Praze Právnická fakulta

Podíl předkladatele na výsledku: **100 %**

Anotace dle RIV:

Kniha se zabývá změnami v pojetí soukromého vlastnictví, stejně jako s různými vyvlastňování, pozemkové reformy, konfiskací a restitucí po celou historii Československa, tj. mezi roky 1918-1992.

Odůvodnění předkladatele:

Jan Kuklík, Znárodněné Československo, Praha: Auditorium 2010, 444 s. ISBN 978-80-87284-12-4 Nationalized Czechoslovakia The book deals with the changes in the concept of private ownership as well as with various expropriations, land reforms, confiscations and restitutions during the whole history of Czechoslovakia, i.e. between 1918 and 1992.

Odůvodnění panelu:

Nejvýznamnější český odborník v oblasti moderních právních dějin se ve své obsáhlé monografii věnuje problematice vyvlastnění, konfiskace a znárodnění v československé a české historii (1918-1992). Jasně definuje obsah těchto pojmů a osvětluje rovněž poje

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Abusir XIX. Tomb of Hetepi (AS 20), Tombs AS 33–35, and 50–53

Miroslav Bárta, Filip Coppens, Hana Vymazalová

Identifikátor: **RIV/00216208:11210/10:10062265**

Předkladatel výsledku do Pilíře II.:
Univerzita Karlova v Praze Filozofická fakulta

Podíl předkladatele na výsledku: **100 %**

Anotace dle RIV:

Kniha se zabývá změnami v pojetí soukromého vlastnictví, stejně jako s různými vyvlastňování, pozemkové reformy, konfiskací a restitucí po celou historii Československa, tj. mezi roky 1918-1992.

Odůvodnění předkladatele:

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PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Commentary on the Gospel of Thomas from interpretations to the interpreted

Petr Pokorný

Identifikátor: **RIV/00216208:11270/09:00203039**

Předkladatel výsledku do Pilíře II.:
Univerzita Karlova v Praze Evangelická teologická fakulta

Podíl předkladatele na výsledku: **100 %**

Anotace dle RIV:

The discovery and the description , the Gospel of Thomas as literature, the testimony of Jesus and history, the genesis and theology of the Gospel of Thomas, Commentary on sayings

Odůvodnění předkladatele:

The publication presents a synthesis of one of the most important parts of the research that the author has carried out in the last few decades in the field of the non-canonical writings of early Christianity, especially gnostic ones. The monograph is devoted to one of the most significant texts in the field, known as the "Gospel of Thomas" (Nag Hammadi Codex II,2). This early Christian writing (dating from the 2nd century) is a collection of the sayings of Jesus (logia), which are presented as the secret teaching of Jesus, which was recorded in writing by his brother Judah (the twin, in Greek Didymos). The monograph is written in the form of a standard scholarly commentary. The first part of the work contains a general introduction into the issues related to the writing (its discovery, textual proofs of a secondary Coptic translation and Greek fragments, its literary form, genre, and composition, the ideas connecting it to the wisdom and prophetic traditions, and to the canonical gospels and other New Testament writings). The second part consists of a translation of the text (from the Coptic version, in some places with a critical evaluation of the Greek fragments), and an analysis of and commentary on all 114 sayings (logia). The author provides an ongoing evaluation of the research so far into the issues examined and in this way offers a considered survey of the current state of the research into this subject. The publication has been reviewed in leading international scholarly journals (such as Catholic Biblical Quarterly. 2010, 72/1, 158-159, reviewed by Marvin W. MEYER). It is regarded as a significant synthetic compendium on the Gospel of Thomas and its profile in the context of early Christian literature. The response to the work led to the author being immediately invited to participate in an international conference on this subject.

Odůvodnění panelu:

Významné dílo mezinárodní úrovně přinášející autorovu originální interpretaci textu apokryfního Tomášova evangelia, vydané v prestižním nakladatelství.

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Dějiny českého venkova v příběhu Ouběnic

Josef Petráň

Identifikátor: **RIV/00216208:11610/11:10111291**

Předkladatel výsledku do Pilíře II.:
Univerzita Karlova v Praze Ústav dějin Univerzity Karlovy a archiv Univerzity Karlovy

Podíl předkladatele na výsledku: **50 %**

Anotace dle RIV:

Kniha se řadí k dějepisu sociálně kulturnímu. Prolíná se v ní obecný typizující postup při charakteristice struktur s mikroanalýzou příběhu - konkrétních životních osudů. V lokálním prostoru středočeské vesnice Ouběnic se pokouší objevit horizont, kterýby umožnil poznat společenství vesnice a posoudit úlohu skupiny či individua v dobových souvislostech. Předmětem je každodennosti, ale rovněž obecné hospodářské a politické procesy a události, jež během staletí ovlivňovaly život venkovanů.

Odůvodnění předkladatele:

Dějiny českého venkova v příběhu Ouběnic [History of the Bohemian Countryside in the Story of Ouběnice] is a unique undertaking. In this extensive book, the author, Josef Petráň, draws on his vast scientific erudition to approach a topic that is close to his heart. In collaboration with his wife, the historian and ethnologist Lydia Petráňová, he uses the 'story' of the village of Ouběnice to describe the history of Bohemian countryside from the 12th century until the present day. This work is not just a micro-historical probe. Using a relatively small region, the author opens a macro-historical perspective, combines analytical and synthetic methods, and demonstrates his mastery of historical hermeneutics, familiarity with the most recent trends in historical studies and modern methodologies. Josef Petráň is very well acquainted with historical sources – and one ought to note that these sources cover almost one thousand years. He masterfully interprets them based on a thorough evaluation and manages to set local events into broader contexts. And thanks to his close collaborator, the historical research is enriched also by ethnological sources. In this book, the history of Bohemian countryside from the Middle Ages until our days vividly comes to life. Petráň manages to enter the households and the daily lives of country dwellers, he follows their daily work, cares, and leisure, and discusses village politics, but also social relations and structures. He depicts the history of the countryside and the villagers through the thick and thin, whereby it seems it was the period after 1948 that witnessed the most tragic degradation of Bohemian countryside whose consequences are clearly visible even now.

Odůvodnění panelu:

Vynikající text, který je skutečně zásadní publikací svého oboru. Navíc je srozumitelný a je založen na interdisciplinárním přístupu.

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Descartes and the Doubting Mind

James Hill

Identifikátor: **RIV/00216208:11210/12:10125828**

Předkladatel výsledku do Pilíře II.:
Univerzita Karlova v Praze Filozofická fakulta

Podíl předkladatele na výsledku: **50 %**

Anotace dle RIV:

Kniha se řadí k dějepisu sociálně kulturnímu. Prolíná se v ní obecný typizující postup při charakteristice struktur s mikroanalýzou příběhu - konkrétních životních osudů. V lokálním prostoru středočeské vesnice Ouběnic se pokouší objevit horizont, kterýby umožnil poznat společenství vesnice a posoudit úlohu skupiny či individua v dobových souvislostech. Předmětem je každodennosti, ale rovněž obecné hospodářské a politické procesy a události, jež během staletí ovlivňovaly život venkovanů.

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Dějiny českého venkova v příběhu Ouběnic [History of the Bohemian Countryside in the Story of Ouběnice] is a unique undertaking. In this extensive book, the author, Josef Petráň, draws on his vast scientific erudition to approach a topic that is close to his heart. In collaboration with his wife, the historian and ethnologist Lydia Petráňová, he uses the 'story' of the village of Ouběnice to describe the history of Bohemian countryside from the 12th century until the present day. This work is not just a micro-historical probe. Using a relatively small region, the author opens a macro-historical perspective, combines analytical and synthetic methods, and demonstrates his mastery of historical hermeneutics, familiarity with the most recent trends in historical studies and modern methodologies. Josef Petráň is very well acquainted with historical sources – and one ought to note that these sources cover almost one thousand years. He masterfully interprets them based on a thorough evaluation and manages to set local events into broader contexts. And thanks to his close collaborator, the historical research is enriched also by ethnological sources. In this book, the history of Bohemian countryside from the Middle Ages until our days vividly comes to life. Petráň manages to enter the households and the daily lives of country dwellers, he follows their daily work, cares, and leisure, and discusses village politics, but also social relations and structures. He depicts the history of the countryside and the villagers through the thick and thin, whereby it seems it was the period after 1948 that witnessed the most tragic degradation of Bohemian countryside whose consequences are clearly visible even now.

Odůvodnění panelu:

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PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Energy use, climate change and folk psychology: Does sustainability have a chance? Results from a qualitative study in five European countries.

PhDr. Jan Vávra, Ph.D.

Identifikátor: **RIV/60076658:12510/11:43879308**

Předkladatel výsledku do Pilíře II.:
Jihočeská univerzita v Českých Budějovicích Ekonomická fakulta

Podíl předkladatele na výsledku: **20 %**

Anotace dle RIV:

Citizens support for policies that aim to curb carbon emissions and energy use is often seen as informed by their values, attitudes and perceptions of the environmental problem in question. We argue that we also need to understand how people conceptualise policies and the governance approaches underpinning them to be able to judge the likely acceptance of policy change. In this study, we draw on qualitative interviews (n = 202) from five European countries to explore citizens views on governance approaches to stimulate behavioural change in the field of resource use, including regulations, price changes, collective action, technological change and education. We found that many of our interviewees referred to generalised characteristics of humankind andcontemporary society to back up their arguments for or against specific governance approaches. In particular, many interviewees concurred that people in general were so self-centred, driven by habit and money- and consumption-oriented th

Odůvodnění předkladatele:

Citizens' support for climate mitigation policies (decrease of energy demand) is often seen as informed by their values, attitudes and perceptions of the environmental problem. We argued that we also need to understand how people conceptualise policies, governance approaches underpinning them, and perception of other people. We found that many of our interviewees referred to generalised characteristics of humankind and contemporary society to back up their arguments for or against specific governance approaches. Such "folk psychologies" (one's ideas of how and why others think and act) can have substantial impact not only on public acceptance, but also on the success of policy measures that aim to reduce citizens' energy use. Most of the interviewees perceived other people in negative manner, as self-centred, driven by habit and consumption-oriented. Thus even a very pro-environmental person can become passive, due to the belief that other will not participate in climate mitigation actions. The study was based on 202 qualitative interviews from five European countries: UK, the Netherlands, Germany, the Czech Republic and Hungary. Such large and international qualitative sample of respondents is rather rare in social sciences. The paper offered new interpretations of so called "value-action gap" and opened new topics for further research in sociology, psychology and sustainability-oriented branches of social science. The findings are important also for the policymakers. Surprisingly negative picture of "the others" was paralleled by the relative support for strict top-down measures, like regulations or price changes. This highlights the role of institutions in energy-relevant behaviour and importance of fine governance for successful implementation of sustainability policies. With IF2011=6,868 (IF2012=5,236), the journal was ranked 1st in both ENVIRONMENTAL STUDIES and GEOGRAPHY. The paper has been cited 4x by WoS and 1x by Scopus listed journal.

Odůvodnění panelu:

Původní vědecký článek, založený na sběru dat, publikovaný v prestižním mezinárodním časopise (impakt faktor 8,00)

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Grace and the Will according to Augustine

Karfíková Lenka

Identifikátor: **RIV/61989592:15260/12:33140885**

Předkladatel výsledku do Pilíře II.:
Univerzita Palackého v Olomouci Cyrilometodějská teologická fakulta

Podíl předkladatele na výsledku: **100 %**

Anotace dle RIV:

Tracing the gradual crystallisation of Augustine's doctrine on grace in the individual periods of his thinking, the book also shows the unacceptable consequences of Augustine's teaching as criticised by his Pelagian opponents.

Odůvodnění předkladatele:

The book analyses Augustine's doctrine on grace throughout his life's work. It traces the gradual crystallisation of this teaching and shows also its unacceptable consequences criticised by his Pelagian opponents. The aim is to follow and understand Augustine's development from the reader of Cicero and "the books of the Platonists" to an enthusiastic proponent of the ideas that appear in his polemic against Julian (and which remind one of Freud rather than the Stoics or Plotinus). A thorough analysis of the whole Augustine's work brings many new insights, both in the field of theology (divine grace) and philosophy (free will). This is why the book is submitted for expert review. The book also proves a successful integration of the Czech research in the international scientific community, as confirmed by warm reception among academics (to mention just two leading experts in Augustinian scholarship: Josef Lossl, review in Theologische Literaturzeitung 138/10, 2013, 1105-1107; John Rist, review in Augustinianum 53, 2013, 547-548).

Odůvodnění panelu:

Originálně zpracovaná monografie, předkládající novou filosofickou interpretaci klasického tématu, vydaná v prestižním nakladatelství.

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Inferentializing Semantics

Peregrin Jaroslav

Identifikátor: **RIV/67985955:_____/10:00343030**

Předkladatel výsledku do Pilíře II.:
Filosofický ústav AV ČR, v. v. i.

Podíl předkladatele na výsledku: **100 %**

Anotace dle RIV:

The entire development of modern logic is characterized by various forms of confrontation of what has come to be called proof theory with what has earned the label of model theory. The aim of this paper is to sort out the cluster of problems besetting logical inferentialism by disentangling and clarifying one of them, namely determining the power of various inferential frameworks as measured by that of explicitly semantic ones.

Odůvodnění předkladatele:

This paper is what we consider the most significant result of the work of the team of our department of logic, though the members of the team produced also a number of other papers in prestigious international journals and books. We are convinced that the Journal of Philosophical Logic is the most significant international journal in the field of philosophical logic. It is 11th in the category Philosophy according to the Scopus ranking. (We do not take the ranking as reflecting the importance of the journal quite faithfully. – In fact we have also a paper, by the same author, in Logica Universalis, which is 5th in the same category; but we take this latter journal to be by far not so important as Journal of Philosophical Logic). The paper is the culmination of the author's effort at an elaboration of certain technical aspects of the doctrine of inferentialism, founded by Robert Brandom and developed by several authors including Peregrin. The paper studies the relationship between logical systems as determined by rules and those determined by truth-valuations. In particular, the author shows that given a certain generalization of the concept of rule, every system that can be determined in terms of truth-valuations can be determined by such generalized rules, and he studies the hierarchy of systems that can be determined by rules in various stricter senses. This paper is a truly pioneering study of these problems and it is a true milestone of the development of the technical aspect of inferentialism. It is important to stress how difficult it is to publish in the top international journals like Journal of Philosophical Logic. The acceptance rate of the journals are usually minuscule, hence any publication of this kind is a significant achievement. It is also a rare proof of the fact that Czech humanities keep up with the international developments.

Odůvodnění panelu:

Originální a argumenty podložená koncepce nabízející novou filosofickou interpretaci sémantiky z pohledu inferencionalizmu. Významný příspěvek do oboru.

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Modeling Neolithic Dispersal in Central Europe: Demographic Implications

Patrik Galeta, Vladimír Sládek, Jaroslav Brůžek

Identifikátor: **RIV/00216208:11310/11:10105331**

Předkladatel výsledku do Pilíře II.:
Univerzita Karlova v Praze Přírodovědecká fakulta

Podíl předkladatele na výsledku: **38 %**

Anotace dle RIV:

On the basis of new examination of ancienit DNA and craniometric analyses, Neolithic dispersal in Central Europe has been recently explained as reflecting colonization or at least a major influx of near eastern farmers. Given the fact that Neolithic dispersal in Central Europe was very rapid and extended into a large area, colonization would have to be associated with high population growth and fertility rates of an expanding Neolithic population. We built three demographic models to test whether the growth and fertility rates of Neolithic farmers were high enough to allow them to colonize Central Europe without admixture with foragers. The principle of the models is based on stochastic population projections. Our results demonstrate that colonizationis an unlikely explanation for the Neolithic dispersal in Central Europe, as the majority of fertility and growth rate estimates obtained in all three models are higher than levels expected in the early Neolithic population. On the basis

Odůvodnění předkladatele:

The study brings the new inside into spread of Neolithic populations through European continent by modeling demographic expansion of first Neolithic group in Europe. The approach was developed by cooperation between mathematics, statistics, ethnology, and biological anthropology. Only such an approach can correct cultural and biological concepts by setting limits by estimating the size of the migrant population and its demographic potential. Given the fact that Neolithic dispersal in Central Europe was very rapid and extended into a large area, colonization would have to be associated with high population growth and fertility rates of an expanding Neolithic population. On the basis of new examination of ancient DNA and craniometric analyses, Neolithic dispersal in Central Europe has been recently explained as reflecting colonization or at least a major influx of near eastern farmers. Authors built three demographic models to test whether the growth and fertility rates of Neolithic farmers were high enough to allow them to colonize Central Europe without admixture with foragers. The principle of the models is based on stochastic population projections. The results demonstrate that colonization is an unlikely explanation for the Neolithic dispersal in Central Europe, as the majority of fertility and growth rate estimates obtained in all three models are higher than levels expected in the early Neolithic population. On the basis of our models, we derived that colonization would be possible only if more than 37% of women survived to mean age at childbearing. Second, that Neolithic expansion in Central Europe lasted more than 150 years, and the last condition - the population of farmers grew in the entire settled area. These settings, however, represent very favorable demographic conditions that seem unlikely given current archaeological and demographic evidence.

Odůvodnění panelu:

Vlastní výzkum špičkové úrovně založený na datech o populační migraci v neolitu publikován v prestižním americkém nakladatelství.

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Motorická výkonnost dětí s lehkým intelektovým postižením

Alena Lejčarová

Identifikátor: **RIV/00216208:11510/11:10108919**

Předkladatel výsledku do Pilíře II.:
Univerzita Karlova v Praze Fakulta tělesné výchovy a sportu

Podíl předkladatele na výsledku: **100 %**

Anotace dle RIV:

Práce se věnuje motorické výkonnosti a dynamice jejích změn za jeden rok u žáků základních škol praktických mladšího školního věku s ohledem na etiologii a stupeň jejich intelektového postižení. Hodnocení vybraných motorických schopností kondičního i koordinačního charakteru je pro autorku pouze východiskem, neboť jejich rozvoj sleduje v závislosti na individuálním intelektovém postižení dětí a zamýšlí se také nad sociálními determinantami rozvoje pohybových schopností této části školní populace.

Odůvodnění předkladatele:

The monograph is completely original and unique, even compared with a reputable publications dealing with motor competence of children and young people with various disabilities. The results of this study may have an immediate practical importance in diagnostic activities in physical education and extracurricular physical activities of pupils in practical elementary schools. They can also contribute to the content and didactic-methodical creation of physical education in these special school facilities, stimulate physical education teachers and other professionals engaged in leisure physical and sports activities in this population to improve the detected state, to expand their offerings, etc. Condition utilization of research results is the inclusion of relevant issues in the curriculum of pedagogical and sport faculties and various forms of trainings and seminars for teachers of special schools, in the case of integrated physical education for elementary school teachers, physical education staff, instructors, trainers,etc.

Odůvodnění panelu:

Publikace založena na rozsáhlém empirickém výzkumu, přesvědčivá interpretace dat, významná pro praxi výchovy, vzdělání a uplatnění žáků s lehkým intelektovým postižením.

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Out of Arabia : The Settlement of Island Soqotra as Revealed by Mitochondrial and Y Chromosome Genetic Diversity

Viktor Černý, Martina Kujanová, Alžběta Vašíková, Martin Hájek

Identifikátor: **RIV/00216208:11310/09:10001404**

Předkladatel výsledku do Pilíře II.:
Univerzita Karlova v Praze Přírodovědecká fakulta

Podíl předkladatele na výsledku: **18 %**

Anotace dle RIV:

The Soqotra archipelago is one of the most isolated landmasses in the world, situated at the mouth of the Gulf of Aden between the Horn of Africa and southern Arabia.We collected samples throughout the island Soqotra and analyzed mitochondrial DNA and Y-chromosomal variation.

Odůvodnění předkladatele:

This study presents the first attempt to estimate the age of initial human settlement of the Soqotra Island from molecular genetics point of view. The island show high degree of endemism (several hundred of endemic species) suggesting long time of isolation form the continental (African) gene pools. The Soqotri people speak their own language, which is one of six, pre-literate tongues called the 'Modern South Arabian' (MSA) languages, spoken only in south-eastern tip of Arabian Peninsula. They live traditionally by fishing, date-palm cultivation and animal husbandry but virtually nothing was known on the origin of their ancestors; still insufficient archaeological excavations revealed intermittent visits of various sailors. Therefore, Viktor Cerny decided to undertake a first comprehensive archaeogenetic investigation of the island. He has undertaken the sampling of the buccal swabs of the present inhabitants with the help of Miranda Morris, linguists from Scotland knowing the autochthonous peoples for years. All laboratory analyses were carried out by other Czech scientists from Department of Anthropology and Human Genetics, Faculty of Sciences, Charles University, Prague.

Odůvodnění panelu:

Založeno na empirickém genetickém výzkumu, článek přináší originální interdisciplinární syntézu poznatků o původu obyvatel ostrova Soquotra.

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Philosophy and Probability

Childers Timothy

Identifikátor: **RIV/67985955:_____/13:00395575**

Předkladatel výsledku do Pilíře II.:
Filosofický ústav AV ČR, v. v. i.

Podíl předkladatele na výsledku: **100 %**

Anotace dle RIV:

An introduction to the foundations of probability. Frequentist, propensity, classical, Bayesian, and objective Bayesian interpretations are covered in detail, engaging in current literature.

Odůvodnění předkladatele:

Philosophy and Probability is the only up to date comprehensive survey of philosophical aspects of probability. Only very few, if any, results of philosophical enquiry originating from the Czech territory in last decades have been published by Oxford University Press, perhaps the most prestigious publishing house for philosophy at all. The acceptance for publication by such a prestigious publisher only confirms the originality and importance of this book and also guarantees its world-wide distribution and critical appraisal. Philosophy and Probability engages with the main interpretations of the probability calculus. Varieties of objective probability, i.e., frequentist and propensity interpretations, are discussed in detail, including both von Mises's and Kolmogorov's interpretations. An extensive range of propensity views, including those of Popper and Mellor, is classified, offering a much needed overview. The degree to which these interpretations are viable and independent of frequentism is covered. Epistemic interpretations, namely, the classical, Bayesian, and objective Bayesian interpretations are expounded in detail. The main arguments for and against each interpretation are explored, as well as the further philosophical implications of each view: in particular problems of language dependence and of subjectivity take centre stage. This goes together with an exploration of which views are compatible, and which necessarily conflict. In particular, Principles of Direct Inference, which aim to provide an objective grounding to parts of Bayesian inference, are explored. Each of the interpretations is also confronted with the Problem of Induction. All areas are placed in the context of ongoing debates in current literature, making the book a starting point for much future research.

Odůvodnění panelu:

Vědecká monografie o základech teorie pravděpodobnosti představuje excelentní výstup publikovaný v prestižním nakladatelství.

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Proclus : An Introduction

Radek Chlup

Identifikátor: **RIV/00216208:11210/12:10103509**

Předkladatel výsledku do Pilíře II.:
Univerzita Karlova v Praze Filozofická fakulta

Podíl předkladatele na výsledku: **100 %**

Anotace dle RIV:

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Odůvodnění předkladatele:

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PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

The EU Council enlarged: North-South-East or core-periphery?

Běla Plechanovová

Identifikátor: **RIV/00216208:11230/11:10088995**

Předkladatel výsledku do Pilíře II.:
Univerzita Karlova v Praze Fakulta sociálních věd

Podíl předkladatele na výsledku: **100 %**

Anotace dle RIV:

This article aims to evaluate the emerging patterns of decision-making in the European Union after the first Eastern enlargement through an analysis of voting positions in the Council of Ministers.

Odůvodnění předkladatele:

This article aims to evaluate the emerging patterns of decision-making in the European Union after the first Eastern enlargement through an analysis of voting positions in the Council of Ministers. By applying three methods (cluster analysis, factor analysis and Bayesian item-response modelling), it assesses the new spatial dimensions of EU policy-making. The results show that the level of open contestation at the Council meetings has risen following enlargement, but the general coalition-building patterns remain similar to the ones in the old EU. The analysis also indicates that it is possible to identify a winning coalition that constitutes the critical mass of the qualified majority of weighted votes for the periods before and after the Eastern enlargement. Furthermore, the size of the largest coalition in relation to the qualified majority threshold becomes smaller in the EU of 25 member states, which may herald a new era of increased policy stability.

Odůvodnění panelu:

Velmi podstatný příspěvek, publikovaný v prestižním časopisu věnovaném politické vědě. V článku zřetelná metodologie a jasná interpretace výsledků.

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

The Rise of Medieval Towns and States in East Central Europe : Early Medieval Centres as Social and Economic Systems

MACHÁČEK, Jiří

Identifikátor: **RIV/00216224:14210/10:00043428**

Předkladatel výsledku do Pilíře II.:
Masarykova univerzita Filozofická fakulta

Podíl předkladatele na výsledku: **100 %**

Anotace dle RIV:

This book is a contribution to efforts to understand the transformation that took place across the European continent, and in particular East Central Europe, during the second half of the first millennium. Its goal is to draw conclusions primarily on thebasis of the archaeological evidence from important early medieval centres. A special emphasis is given to Pohansko near Břeclav (Czech Republic), perhaps the best studied centre of its kind in the entire region. In terms of methodology the book marks anew attempt to interlink a number of proven methodological tools used in western archaeology from the 1970s, to new questions related to a cognitive approach to archaeology and the positivist tradition of Central European archaeology.

Odůvodnění předkladatele:

This book is a contribution to efforts to understand the transformation that took place across the European continent, and in particular East Central Europe, during the second half of the first millennium. Its goal is to draw conclusions primarily on the basis of the archaeological evidence from important early medieval centres. A special emphasis is given to Pohansko near Břeclav (Czech Republic), perhaps the best studied centre of its kind in the entire region. In terms of methodology the book marks a new attempt to interlink a number of proven methodological tools used in western archaeology from the 1970's, to new questions related to a cognitive approach to archaeology and the positivist tradition of Central European archaeology. http://www.brill.nl/rise-medieval-towns-and-states-east-central-europe

Odůvodnění panelu:

Velmi kvalitní vědecká publikace založená na archeologickém výzkumu, do hloubky analyzující konkrétní archeologickou lokalitu. Zasazeno do souvislostí, prestižní nakladatelství.

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Attitudes and action: public opinion and the occurrence of international terrorism

Malečková Jitka

Identifikátor: **RIV/67985998:_____/09:00330668**

Předkladatel výsledku do Pilíře II.:
Národohospodářský ústav AV ČR, v. v. i.

Podíl předkladatele na výsledku: **100 %**

Anotace dle RIV:

The predictors of terrorism are unclear. This paper examines the effect of public opinion in one country toward another country on the number of terrorist attacks perpetrated by people or groups from the former country against targets in the latter country. Public opinion was measured by the percentage of people in Middle Eastern and North African countries who disapprove of the leadership of nine world powers.

Odůvodnění předkladatele:

The article studies the relationship between public attitudes towards other countries and the occurrence of terrorism. Specifically, the article examines whether the public attitudes in country "i" toward the leadership of country "j" are related to the likelihood that people or groups from country i perpetrate terrorism against people or property from country j. The results indicate that if people of country i disapprove of the leadership of country j, the probability of a terrorist act against country j increases. This reveals a potentially important mechanism suggesting that one might be able to affect the occurrence of international terrorism by influencing public opinion. The article was published in the Science journal, one of the most prestigious science journals. Its impact factor is 29.75, an order of magnitude higher than any economic journal. Publishing in Science is a unique scientific achievement at the Economics Institute of the Academy of Sciences.

Odůvodnění panelu:

The article, published in Science, one of the most prestigious science journals, uses data on pairs of countries to study the relationship between public attitudes towards other countries and the occurrence of terrorism. Public opinion on target country l

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Behavioral foundations of microcredit: experimental and survey evidence from rural India

Bauer Michal

Identifikátor: **RIV/67985998:_____/12:00377131**

Předkladatel výsledku do Pilíře II.:
Národohospodářský ústav AV ČR, v. v. i.

Podíl předkladatele na výsledku: **50 %**

Anotace dle RIV:

We use experimental measures of time discounting and risk aversion for villagers in south India to highlight behavioral features of microcredit, a financial tool designed to reduce poverty and fix credit market imperfections. The evidence suggests that microcredit contracts may do more than reduce moral hazard and adverse selection by imposing new forms of discipline on borrowers. We find that, conditional on borrowing from any source, women with present-biased preferences are more likely than others toborrow through microcredit institutions. Another particular contribution of microcredit may thus be to provide helpful structure for borrowers seeking self-discipline.

Odůvodnění předkladatele:

The paper studies the problem of microcredit, that is, small size loans provided to impoverished borrowers. The loans often use innovative contracts that reduce moral hazard and adverse selection. The goal of this paper is to analyze the role of time discounting and risk aversion in the provision of microcredit. The article shows that women with present-biased preferences are more likely than others to borrow through microcredit institutions. One particular contribution of microcredit may thus be to provide helpful structure for borrowers seeking self-discipline. Microcredit is one of the most important forms of investment financing in developing countries. Its key role in the economic development of those countries has been evidenced many times. Nevertheless, the reasons why microcredit is often more successful than regular credit are still being debated from a theoretical standpoint. This article is an essential contribution to this subject. The article was published in the American Economic Review, one of the top-5 journals, which are clearly distinct (see Card and DellaVigna, Journal of Economic Literature, 2013, vol. 51, issue 1, pp. 144-61). Publications in the top-5 journals have a powerful influence on the direction of research in economics and on the career paths of young researchers. Since 1989, there were only 9 publications in the top-5 journals by authors affiliated in the Czech Republic, all of them with one exception are from CERGE-EI (a joint workplace of CERGE of Charles University and the Economics Institute of the Academy of Sciences). The article currently has 12 citations in the Web of Science and 108 citations in Google Scholar. Among others, it has been cited in one of the top-5 journal, the Review of Economic Studies, and in the Journal of Development Economics.

Odůvodnění panelu:

The article studies the use of microcredit in developing countries, i.e., the provision of small loans to impoverished borrowers, where loan contracts are often set up so as to reduce moral hazard and adverse selection. The article shows that women with p

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Business environment, exports, ownership, and firm performance

Jan Švejnar

Identifikátor: **RIV/00216208:11640/11:00358764**

Předkladatel výsledku do Pilíře II.:
Univerzita Karlova v Praze Centrum pro ekonomický výzkum a doktorská studia

Podíl předkladatele na výsledku: **67 %**

Anotace dle RIV:

We use two large samples of firms to assess the effects of business environment constraints, competition, export orientation, and ownership on firm performance. We deal with omitted variables, errors in variables, and endogeneity, and find that few business constraints affect performance. Replicating the analysis with Doing Business and Heritage Foundation indicators of the business environment yields similar results. In fact, country fixed effects, reflecting time-invariant differences in the businessenvironment as well as other factors such as health care and education, matter more for firm performance than differences in the business environment across firms within countries.

Odůvodnění předkladatele:

The article studies the role of competition, ownership structure, export orientation and other factors in determining firms' competitiveness. It uses several large firm-level data sets collected by the European Bank for Reconstruction and Development and The World Bank. Thanks to the new data the authors are able to can use more explanatory variables and adopt more advanved estimation techniques compared to previous studies. The article shows, among other findings, that foreign ownership and business environment in a given country are essential determinants of firm performance. The article enhances our understanding of how economic environment shapes the efficiency of economies, especially transition economies. The authors show the importance of controlling for country-level effects and that excluding them can lead to misleading conclusions. The article has been cited 5 times in the Web of Science and 26 times in Google Scholar, including the Review of Economics and Statistics.

Odůvodnění panelu:

The article uses newly available European data to study the role of competition, ownership structure, and export orientation in determining firms' competitiveness, an important issue from the policy perspective. The findings highlight the importance of a

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Czech society in the 2000s: a report on socio-economic policies and structures

Večerník Jiří

Identifikátor: **RIV/68378025:_____/09:00326470**

Předkladatel výsledku do Pilíře II.:
Sociologický ústav AV ČR, v. v. i.

Podíl předkladatele na výsledku: **100 %**

Anotace dle RIV:

Social report which informs about the development during the two decades in the fields of employment and social policies, earnings and income inequalities, social structures with attention to the situation of the middle class, pensioners and the poor, and socio-economic values with regard to work and consumer values. The aim is to provide a documented picture of Czech society using statistical and sociological surveys and other sources, seeking also systemic changes behind quantitative shifts.

Odůvodnění předkladatele:

See KV14 file

Odůvodnění panelu:

The empirically-grounded sociology report deals with all key aspects of socio-economic development of Czech Republic in the last decades. Drawing on the statistical analysis of several national and European data sets it describes dynamics in the labor mar

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Digital Youth: The Role of Media in Development

David ŠMAHEL

Identifikátor: **RIV/00216224:14230/10:00045332**

Předkladatel výsledku do Pilíře II.:
Masarykova univerzita Fakulta sociálních studií

Podíl předkladatele na výsledku: **50 %**

Anotace dle RIV:

Digital Youth: The Role of Media in Development recognizes the important role of digital tools in the lives of teenagers and presents both the risks and benefits of these new interactive technologies. From social networking to instant messaging to text messaging, the authors create an informative and relevant guidebook that goes beyond description to include developmental theory and implications. Also woven throughout the book is an international sensitivity and understanding that clarifies how, despitethe widespread popularity of digital communication, technology use varies between groups globally. Other specific topics addressed include: Sexuality on the Internet. Online identity and self-presentation. Morality, ethics, and civic engagement. Technology and health. Violence, cyberbullying, and victimization. Excessive Internet use and addictive behavior.

Odůvodnění předkladatele:

The book, Digital Youth by Kaveri Subrahmanyam and David Smahel, is a monograph representing comprehensive review of the significance of new technology in the development of today's youth. Based on wide empirical evidence, as well as existing theoretical frameworks, the authors argue that online and offline worlds are interconnected, which poses an alternative perspective to previous assumptions that youths' online identity is separate from their 'real' life. The book focuses on various topics relevant to adolescents' development, such as their social relationships, identity, intimacy, and sexuality. With each chapter focused on specific topics, the book shows how adolescents can benefit from internet use in these different layers of development, and it also discusses possible risks current youth deal with, such as addictive behavior or cyberbullying. Each chapter is concluded with comprehensive summaries as well as practical implications for those working with children. This makes the book interesting not only for academics, but also for parents, teachers and other professionals. The authors illustrate their arguments with data from other researchers, utilizing most of their data from the World Internet Project, whose Czech data collection was organized under the leadership of David Smahel in the Faculty of Social Sciences.

Odůvodnění panelu:

The book provides a comprehensive review of the significance of new technology in the development of today's youth based on the World Internet Project survey. It is published by a prestigious publisher and is likely to form the starting point of much futu

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Immutable Mobiles Derailed: STS, Geopolitics, and Research Assessment

Stöckelová Tereza

Identifikátor: **RIV/68378025:_____/12:00368632**

Předkladatel výsledku do Pilíře II.:
Sociologický ústav AV ČR, v. v. i.

Podíl předkladatele na výsledku: **100 %**

Anotace dle RIV:

Science policies and science studies largely share an understanding of scientific knowledge and objects as immutable mobiles. This article shows how the analysis of research assessment in a non-Anglophone country and its effects on social sciences can shed new light on this shared notion. The preference for immutable mobiles in assessment regimes pushes social scientists to publish in specialized, usually Anglophone journals, which can result in the attenuation of local relevance of the knowledge they produce and contribute to the performance of globally converging societies. The author argues that the observed consequences for the social sciences in non-Anglophone countries underscore a larger problem with both the policy ideal and the science and technology studies (STS) idea of immutable mobiles on two counts: the relation of the social and natural sciences to society and the engagement of sciences with the multiplicity of societies as well as natures.

Odůvodnění předkladatele:

See KV14 file

Odůvodnění panelu:

The paper is a case study of Czech R&D funding reform of 2009, its practical enactment in the social sciences and humanities, and the effect on these disciplines. The author employed the concept of immutable mobiles, taken from ‘science and technology stu

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Perceived Aggressiveness Predicts Fighting Performance in Mixed-Martial-Arts Fighters

Vít Třebický, Jan Havlíček, Karel Kleisner

Identifikátor: **RIV/00216208:11310/13:10191098**

Předkladatel výsledku do Pilíře II.:
Univerzita Karlova v Praze Přírodovědecká fakulta

Podíl předkladatele na výsledku: **60 %**

Anotace dle RIV:

Accurate assessment of competitive ability is a critical component of contest behavior in animals, and it could be just as important in human competition, particularly in human ancestral populations. Here, we tested the role that facial perception playsin this assessment by investigating the association between both perceived aggressiveness and perceived fighting ability in fighters' faces and their actual fighting success. Perceived aggressiveness was positively associated with the proportion of fights won, after we controlled for the effect of weight, which also independently predicted perceived aggression. In contrast, perception of fighting ability was confounded by weight, and an association between perceived fighting ability and actual fightingsuccess was restricted to heavyweight fighters. Shape regressions revealed that aggressive-looking faces are generally wider and have a broader chin, more prominent eyebrows, and a larger nose than less aggressive-looking faces. Our resul

Odůvodnění předkladatele:

Accurate assessment of competitive ability is a critical component of contest behavior in various animal species, and it could be just as important in human competition, particularly in human ancestral populations. Here, we tested the role that facial perception plays in this assessment by investigating the association between both perceived aggressiveness and perceived fighting ability in fighters' faces and their actual fighting success. Perceived aggressiveness was positively associated with the proportion of fights won, after we controlled for the effect of weight, which also independently predicted perceived aggression. In contrast, perception of fighting ability was confounded by weight, and an association between perceived fighting ability and actual fighting success was restricted to heavyweight fighters. Shape regressions revealed that aggressive-looking faces are generally wider and have a broader chin, more prominent eyebrows, and a larger nose than less aggressive-looking faces. Our results indicate that perception of aggressiveness and fighting ability might cue different aspects of success in male-male physical confrontation. The paper significantly contributes to our understanding of social perception and specifically to the first impression formation. It brings first direct evidence that facial appearance might provide cues to the formidability assessments by using outcomes of actual combats. Further, to test these hypothesis we employed sophisticated multivariate statistical methods and modelling techniques based on geometrics morphometrics which allow more complex insights into the relation between perception and morphology. The study was possible only thanks to the expertise in geometric morphometric approach available in our institution.

Odůvodnění panelu:

The article uses an innovative research design based on outcomes of actual combats to empirically study assessment of competitive ability based on facial perception. It is rooted in evolutionary psychology and combines experimental psychology empirical me

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

The effects of privatization and ownership in transition economies

Evžen Kočenda

Identifikátor: **RIV/00216208:11640/09:00339582**

Předkladatel výsledku do Pilíře II.:
Univerzita Karlova v Praze Centrum pro ekonomický výzkum a doktorská studia

Podíl předkladatele na výsledku: **33 %**

Anotace dle RIV:

In this paper, we evaluate what we have learned to date about the effects of privatization from the experiences during the last fifteen to twenty years in the postcommunist (transition) economies and, where relevant, China. We distinguish separately theimpact of privatization on efficiency, profitability, revenues, and other indicators and distinguish between studies on the basis of their econometric methodology in order to focus attention on more credible results.

Odůvodnění předkladatele:

The article studies the effect of privatization of state-owned enterprises in transition economies on firms' effectiveness, profitability, and other indicators. It is a survey study that aggregates and analyzes the existing literature to which the authors themselves have significantly contributed. The Journal of Economic Literature is the most important economics journal that focuses on survey studies and ranks among the top-10 economics journals. The article is an essential contribution to the field of the economics of transition. It is the most authoritative study to date that summarizes the results of about twenty years of global research on the topic. Thanks to that the article has been widely cited (58 citations in the Web of Science and 221 citations in Google Scholar), including citations in prestigious journals such as the Review of Financial Studies and the Review of Economics and Statistics.

Odůvodnění panelu:

The article comprehensively surveys the empirical literature on the effect of privatization of state-owned enterprises in transition economies on firms' effectiveness and profitability. This was one of the most lively research areas and one of the key pol

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Who matters in coordination problems?

Steiner Jakub

Identifikátor: **RIV/67985998:_____/12:00384730**

Předkladatel výsledku do Pilíře II.:
Národohospodářský ústav AV ČR, v. v. i.

Podíl předkladatele na výsledku: **67 %**

Anotace dle RIV:

Agents face a coordination problem akin to the adoption of a network technology. A principal announces investment subsidies that, at minimal cost, attain a given likelihood of successful coordination. Optimal subsidies target agents who impose high externalities on others and on whom others impose low externalities. Based on the analysis of the role of strategic uncertainty in coordination processes, we provide a methodology that can be used to find the optimal targets for a variety of interventions ina large class of coordination problems with heterogeneous agents.

Odůvodnění předkladatele:

KV04 v příloze.

Odůvodnění panelu:

The article provides an original contribution to the study of coordination, which in economics helps explain for example bank runs, technology adoption, or business cycles. The analysis opens a new potential for economic policy to affect coordination by p

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

A dynamic programming algorithm for identification of triplex-forming sequences

Tomáš Martínek, Ivana Burgetová

Identifikátor: **RIV/00216305:26230/11:PU96166**

Předkladatel výsledku do Pilíře II.:
Vysoké učení technické v Brně Fakulta informačních technologií

Podíl předkladatele na výsledku: **40 %**

Anotace dle RIV:

Current methods for identification of potential triplex-forming sequences in genomes and similar sequence sets rely primarily on detecting homopurine and homopyrimidine tracts. Procedures capable of detecting sequences supporting imperfect, but structurally feasible intramolecular triplex structures are needed for better sequence analysis. We modified an algorithm for detection of approximate palindromes, so as to account for the special nature of triplex DNA structures. From available literature we conclude that approximate triplexes tolerate two classes of errors. One, analogical to mismatches in duplex DNA, involves nucleotides in triplets that do not readily form Hoogsteen bonds. The other class involves geometrically incompatible neighboring triplets hindering proper alignment of strands for optimal hydrogen bonding and stacking. We tested the statistical properties of the algorithm, as well as its correctness when confronted with known triplex sequences. The proposed algorithm satisf

Odůvodnění předkladatele:

This work was focused on design and implementation of a novel method for detection of DNA sequences potentially capable to form triplex structure. Detection of such sequences is significant for biologists as they can help to understand gene expression and other processes affected by these triplex structures. The main result of this work is publication in Bioinformatics journal (IF=4.926).

Odůvodnění panelu:

Excellent paper, published in a prestigious journal. Not so many yet excellent citations by influential authors.

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

AC Drive Observability Analysis

Václavek Pavel, Blaha Petr, Herman Ivo

Identifikátor: **RIV/00216305:26220/13:PU103263**

Předkladatel výsledku do Pilíře II.:
Vysoké učení technické v Brně Fakulta elektrotechniky a komunikačních technologií

Podíl předkladatele na výsledku: **100 %**

Anotace dle RIV:

AC induction motors and permanent magnet synchronous drives became very popular for motion control applications due to their simple and reliable construction. Sensorless drive control is required in many applications to reduce drive production costs. While many approaches to magnetic flux, rotor speed, or other quantities needed to control electrical machine were proposed, conditions under which these quantities can be estimated are not often sufficiently investigated. In this paper, induction machine and permanent-magnet-synchronous-machine drive state observability analysis is presented, together with conditions allowing reliable rotor speed and position estimation. A method based on the nonlinear dynamical system state observability theory is proposed, resulting in a unified approach to the ac drive observability analysis.

Odůvodnění předkladatele:

The published article presents new theoretical results in the field of observability of AC drives as non-linear dynamical systems. The analyzed property is very important for design of so-called sensorless control of drives which is very important for current industrial applications. While many authors are trying to investigate conditions for reliable operation of sensorless control, this published article can be considered to be the first systematical approach based on unified non-linear systems observability theory. This publication can be considered to be significant achievement as the journal IEEE Transaction on Industrial Electronics is the best journal in the field with ranking Q1 1/59, 1/57, 4/243 (IF(2012)=5.165). Importance of the article is documented by the fact that while it was published recently (in August 2013) there is already significant (and increasing) number of citations of this article indexed by Web of Science.

Odůvodnění panelu:

Outstanding theoretical result, good international impact proven by many citations.

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Adaptive Multi-Agent System for Network Traffic Monitoring

Rehák Martin, Pěchouček Michal, Grill Martin, Stiborek Jan, Bartoš Karel

Identifikátor: **RIV/68407700:21230/09:00158346**

Předkladatel výsledku do Pilíře II.:
České vysoké učení technické v Praze Fakulta elektrotechnická

Podíl předkladatele na výsledku: **55 %**

Anotace dle RIV:

We present an application of agent-based data mining for a near-real time detection of attacks against the computer networks and connected hosts. The presented system processes the statistics of network traffic provided by high-speed network monitoring cards and uses a set of known anomaly detection techniques to identify the anomalous behavior. The individual anomaly detection methods have relatively high error rates that make them unfit for most practical deployments. Based on the agent-based trust modeling technique, our system fuses the data provided by snímaly detection methods and progressively builds a better classification, with an acceptable error rate. The system uses agent-based self-adaptation techniques to dynamically align its structure with the changes in network traffic structure and attacks.

Odůvodnění předkladatele:

The paper describes the basic principles behind the design of an innovative Intrusion Detection System (ID) based on the anomaly detection paradigm. Our team was able to fulfill a sequence of connected research and technology products. The paper in te impacted journal completes the first phase of the innovation cycle. Post its publication, we have developed the technology into product, spun-it off as a separate company and sold the company - Cognitive Security to Cisco in 2013. The acquisition enabled creation of Cisco Cognitive Research team in Prague.

Odůvodnění panelu:

Excellent idea leading to an original technology developed in a start-up company with an exceptional commercial success. Purchased by a huge international corporation to be applied in its mass products marketed worldwide.

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Affine Moment Invariants Generated by Graph Method

Suk Tomáš, Flusser Jan

Identifikátor: **RIV/67985556:_____/11:00359752**

Předkladatel výsledku do Pilíře II.:
Ústav teorie informace a automatizace AV ČR, v. v. i.

Podíl předkladatele na výsledku: **100 %**

Anotace dle RIV:

The paper presents a general method of an automatic deriving affine moment invariants of any weights and orders. The method is based on representation of the invariants by graphs. We propose an algorithm for eliminating reducible and dependent invariants. This method represents a systematic approach to the generation of all relevant moment features for recognition of affinely distorted objects. We also show the difference between pseudoinvariants and true invariants.

Odůvodnění předkladatele:

The result presents a general method of an automatic deriving affine moment invariants of any weights and orders. The method is based on representation of the invariants by graphs. We propose an algorithm for eliminating reducible and dependent invariants. This method represents a systematic approach to the generation of all relevant moment features for recognition of affinely distorted objects. We also show the difference between pseudoinvariants and true invariants. The significance of this result follows from the fact that the consistent theory of affine invariants was presented here for the first time. It was published in a prestigeous journal and has received numerous citations.

Odůvodnění panelu:

Excellent paper in a top journal, both theoretical and applied results, a good impact apparent from many citations.

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Anisotropic elastic moduli and internal friction of graphene nanoplatelets/silicon nitride composites

Seiner Hanuš, Sedlák Petr, Landa Michal

Identifikátor: **RIV/61388998:_____/13:00386699**

Předkladatel výsledku do Pilíře II.:
Ústav termomechaniky AV ČR, v. v. i.

Podíl předkladatele na výsledku: **75 %**

Anotace dle RIV:

Elasticity and internal friction of graphene nanoplatelets (3 wt.%)/Si3N4 composite is analyzed by ultrasonic methods. It is shown that the composite exhibits a degenerate (elliptic) form of transversal isotropy with the graphene nanoplatelets acting effectively as spheroidal voids and inducing significant softening in all directions.

Odůvodnění předkladatele:

Ceramic-matrix composites with small amounts of graphene-type fillers (in particular with exfoliated graphene nanoplatelets, GNPs) are a novel class of materials exhibiting unique strongly anisotropic thermal and electrical conductivity, enhanced fracture toughness and superior machinability. Within collaboration between the Institute of Thermomechanics AS CR and the Institute of Ceramics and Glass CSIC (Madrid, Spain), a research focused on the mechanical properties of these composites was carried out. The contact-less resonant ultrasound spectroscopy (RUS) device developed at IT ASCR was used to determine the elastic constants and internal friction parameters of a composite consisting of a silicon nitride matrix filled with 3 wt.% of GNPs. It was shown that the anisotropic spatial arrangement of the GNPs results in strong anisotropization of both the elasticity and the internal friction of the composite. The results enabled also an insight into the micromechanics of the composite to be achieved, using the Sevostianov-Kachanov theoretical model of effective elasticity of materials with oriented arrays of defects. This analysis confirmed that although the presence of the fillers leads to overall elastic softening and deterioration of the matrix, the GNPs are not acting as micro-cracks in the composite structure, and cannot, thus, be responsible for initiation or growth of macroscopic fracture of the composite. The results of the study were published in the journal Composites Science and Technology that has according to ISI Web of Knowledge the highest impact factor in the respective category (Materials Science – Composites).

Odůvodnění panelu:

A novel piece of research in a topic of considerable interest and importance, reasonable impact, relatively well cited.

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Bidirectional Texture Function Modeling: State of the Art Survey

Filip Jiří , Haindl Michal

Identifikátor: **RIV/67985556:_____/09:00329827**

Předkladatel výsledku do Pilíře II.:
Ústav teorie informace a automatizace AV ČR, v. v. i.

Podíl předkladatele na výsledku: **70 %**

Anotace dle RIV:

An ever-growing number of real world computer vision applications require classification, segmentation, retrieval, or realistic rendering of genuine materials. However, the appearance of real materials dramatically changes with illumination and viewing variations. Thus, the only reliable representation of material visual properties requires capturing of its reflectance in as wide range of light and camera position combinations as possible. This is a principle of the recent most advanced texture representation, the Bidirectional Texture Function (BTF). Multispectral BTF is a seven-dimensional function that depends on view and illumination directions as well as on planar texture coordinates. BTF is typically obtained by measurement of thousands of imagescovering many combinations of illumination and viewing angles. However, the large size of such measurements has prohibited their practical exploitation in any sensible application until recently.

Odůvodnění předkladatele:

An ever-growing number of real world computer vision applications require classification, segmentation, retrieval, or realistic rendering of genuine materials. However, the appearance of real materials dramatically changes with illumination and viewing variations. Thus, the only reliable representation of material visual properties requires capturing of its reflectance in as wide range of light and camera position combinations as possible. This is a principle of the recent most advanced texture representation, the Bidirectional Texture Function (BTF). Multispectral BTF is a seven-dimensional function that depends on view and illumination directions as well as on planar texture coordinates. BTF is typically obtained by measurement of thousands of images covering many combinations of illumination and viewing angles. However, the large size of such measurements has prohibited their practical exploitation in any sensible application until recently.

Odůvodnění panelu:

Excellent review paper with a large citation response worldwide proving its strong impact on the research community.

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Bootstrap Resampling for Image Registration Uncertainty Estimation without Ground Truth

Kybic Jan

Identifikátor: **RIV/68407700:21230/10:00175493**

Předkladatel výsledku do Pilíře II.:
České vysoké učení technické v Praze Fakulta elektrotechnická

Podíl předkladatele na výsledku: **100 %**

Anotace dle RIV:

We address the problem of estimating the uncertainty of pixel based image registration algorithms, given just the two images to be registered, for cases when no ground truth data is available. Our novel method uses bootstrap resampling. It is very general, applicable to almost any registration method based on minimizing a pixel-based similarity criterion; we demonstrate it using the SSD, SAD, correlation, and mutual information criteria. We show experimentally that the bootstrap method provides better estimates of the registration accuracy than the state-of-the-art Cramer-Rao bound method. Additionally, we evaluate also a fast registration accuracy estimation (FRAE) method which is based on quadratic sensitivity analysis ideas and has a negligible computational overhead. FRAE mostly works better than the Cramer-Rao bound method but is outperformed by the bootstrap method.

Odůvodnění předkladatele:

Image registration attemts to find a geometrical transformation between corresponding objects or parts of objects in two images. It is one of the most important tasks in medical image processing, where it is used for intrasubject, intersubject, and intermodality analysis, registration with atlases, quantification and qualification of feature shapes and sizes, elastography, distortion compensation, and motion detection and compensation. Image registration is also used for motion analysis, video compression and coding, object tracking, image stabilization, segmentation, stereo-reconstruction and super-resolution. There are hundreds of image registration algorithms available. However, most of them return a single, deterministic answer, a point-wise estimate. We would like to know the error of this estimate, the associate uncertainty. We present a method of estimating this uncertainty given only the method and the two images being registered, with very week assumptions about the registration process. We need no ground truth, no explicit model for the transformation, the image, or the measurement noise. This is a significant step ahead from the previous work. The standard approach is to run the algorithm on a large set of training images with known transformation and evaluate the error. This measures only the average performance of the algorithm, not an expected result on a particular pair of previously unseen input images. Another direction of previous research analyzes the theoretically limits of registration algorithms. While interesting, the analysis needs to make rather unrealistic assumptions about the transformation, the noise and the image, and it does not take into account the particularities of a specific algorithm. The key component of our approach is bootstrap resampling - we use samples from the images themselves to artificially create different instances of the input images and evaluate the behaviour of the algorithm on this set of bootstrap instances.

Odůvodnění panelu:

Excellent result published in a top journal. Significant impact on the research community worldwide confirmed by a large number of citations.

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

CAVER 3.0

CHOVANCOVÁ, Eva, Antonín PAVELKA, Jan BREZOVSKÝ, Barbora KOZLÍKOVÁ, Artur Wiktor GORA, Vilém ŠUSTR, Lada BIEDERMANNOVÁ, Jiří DAMBORSKÝ

Identifikátor: **RIV/00216224:14310/11:00050643**

Předkladatel výsledku do Pilíře II.:
Masarykova univerzita Přírodovědecká fakulta

Podíl předkladatele na výsledku: **100 %**

Anotace dle RIV:

Tunnels and channels facilitate the transport of small molecules, ions and water solvent in a large variety of proteins. Characteristics of individual transport pathways, including their geometry, physico-chemical properties and dynamics are instrumentalfor understanding of structure-function relationships of these proteins, for the design of new inhibitors and construction of improved biocatalysts. CAVER is a software tool widely used for the identification and characterization of transport pathways in static macromolecular structures. Herein we present a new version of CAVER enabling automatic analysis of tunnels and channels in large ensembles of protein conformations from molecular dynamics simulations. CAVER 3.0 implements new algorithms for calculation and clustering of pathways. Trajectories from molecular dynamic simulations serve as the inputs, while detailed characteristics and summary statistics of the time evolution of individual pathways are provided in the outputs.

Odůvodnění předkladatele:

CAVER 3.0 (www.caver.cz) is a software tool for biochemist research, developed at Masaryk University. The tool enables analysis of tunnels and channels in large ensembles of protein conformations from molecular dynamics simulations. CAVER 3.0 implements new algorithms for calculation and clustering of pathways. Trajectories from molecular dynamic simulations serve as the inputs, while detailed characteristics and summary statistics of the time evolution of individual pathways are provided in the outputs. CAVER 3.0 safely identified and reliably estimated the importance of all previously published DhaA pathways, including the pathways closed in DhaA crystal structures. Obtained results clearly demonstrate that the analysis of molecular dynamics simulation is essential for estimating pathway characteristics and the elucidation of the structural basis of the tunnel gating. CAVER 3.0 paves the way for the study of important biochemical phenomena in the area of molecular transport, molecular recognition and enzymatic catalysis. The software is freely available as a command-line application at http://www.caver.cz. All versions of CAVER were cited 274 times. The latest publication describing the CAVER 3.0 version, which was published in PLoS Computational Biology (IF 4.867) in September 2012, was cited 25 times according to WoS (44 times according to Google Scholar). The majority of manuscripts citing CAVER include this tool into their research workflow. The tunnels detected by CAVER were utilized for analysis and improvement of diverse molecular structures and their functions. In [1] the earlier version of CAVER tool was utilized for the detection and choice of the most appropriate tunnels for unbinding and escape of Tamiflu from the active site of A/H5N1 (avian flu) and its mutation A/H1N1 (swine flu).

Odůvodnění panelu:

An excellent and original freeware tool, used worldwide and referred to in many top journal papers in various fields. Also presented in an influent journal paper with many citations.

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Compact and low-cost biosensor based on novel approach to spectroscopy of surface plasmons

M.Piliarik, M. Vala, I. Tichý, J. Homola

Identifikátor: **RIV/67985882:_____/09:00341078**

Předkladatel výsledku do Pilíře II.:
Ústav fotoniky a elektroniky AV ČR, v. v. i.

Podíl předkladatele na výsledku: **100 %**

Anotace dle RIV:

A compact 4-channel surface plasmon resonance (SPR) sensor based on a novel approach to spectroscopy of surface plasmons is reported. The sensor employs a special diffraction grating structure, which simultaneously couples light into a surface plasmon and disperses light for spectral readout of SPR signal. The sensor is demonstrated to measure refractive index changes as small as 3107 and to detect short oligonucleotides down to 200 pM.

Odůvodnění předkladatele:

This paper presents a new compact multichannel surface plasmon resonance (SPR) sensor based on a novel approach to spectroscopy of surface plasmons. The sensor employs a special diffraction grating structure, which simultaneously couples light into a surface plasmon and disperses light for spectral readout of SPR signal. The sensor is demonstrated to measure refractive index changes as small as 3E-7 and to detect short oligonucleotides down to 200 pM.The original approach to spectroscopy of surface plasmons has been granted a total of 6 patents (including 2 US patents). The paper has been published in Biosensors and Bioelectronics, one of the leading journals in the field of analytical chemistry (ranked 4 of 75 in analytical chemistry according to WOS). To date the paper has generated 40 citations.

Odůvodnění panelu:

Original idea presented in a highly cited paper published in a top journal. Substantial impact to R&D of optical biosensors. Follow-up technology with a strong industrial potential covered by several patents including two US.

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Computing the lattice of all fixpoints of a fuzzy closure operator

Bělohlávek Radim, Outrata Jan, Vychodil Vilém

Identifikátor: **RIV/61989592:15310/10:10216427**

Předkladatel výsledku do Pilíře II.:
Univerzita Palackého v Olomouci Přírodovědecká fakulta

Podíl předkladatele na výsledku: **86 %**

Anotace dle RIV:

We present a fast bottom-up algorithm for computing all fixpoints of a fuzzy closure operator in a finite set over a finite chain of truth degrees, along with the partial order on the set of all fixpoints. Fuzzy closure operators appear in several areasof fuzzy logic and its applications, including formal concept analysis which we use as a reference area of application in this paper. Several problems in formal concept analysis, such as computing all formal concepts from data with graded attributes or computing non-redundant bases of all attribute dependencies, can be reduced to the problem of computing fixpoints of particular fuzzy closure operators associated with the input data. The development of a general algorithm applicable in particular to these problems is the ultimate purpose of this paper. We present the algorithm, its theoretical foundations, and experimental evaluation.

Odůvodnění předkladatele:

This paper analyzes the problem of computing the lattice of fixpoints of fuzzy closure operators. Since fuzzy closure operators are present in many areas, including ordinal data analysis, factor analysis of discrete data, entailment in fuzzy logics, and approximate reasoning, the problem has broad ramifications. The paper greatly improves the available approaches, mainly by a proper analysis of the problem and a new algorithm based on the analysis that is able to compute with a polynomial time delay all fixpoints of a fuzzy closure operator. The paper was published in a leading journal on fuzzy logic which is ranked among the top journals in computer sciences overall (last IF 5.484). So far, the paper has ca 30 citations.

Odůvodnění panelu:

Excellent theoretical result that improves existing approaches and provides a new algorithm. Published in a leading journal on fuzzy logic which is ranked among the top journals in computer sciences. Significant impact on the research community worldwide

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Coupling Effect between Mechanical Loading and Chemical Reactions

Klika Václav, Maršík František

Identifikátor: **RIV/61388998:_____/09:00331443**

Předkladatel výsledku do Pilíře II.:
Ústav termomechaniky AV ČR, v. v. i.

Podíl předkladatele na výsledku: **75 %**

Anotace dle RIV:

This paper offers a theoretical explanation of the coupling effect phenomenon between mechanical loading and chemical reactions based on linear non-equilibrium thermodynamics and also discusses the classical method of obtaining restrictions on the phenomenological coefficients. The question whether static or dynamic loading influences biochemical processes is addressed. Further, the presented paper suggests that chemical and mechanical processes do not only facilitate or support one another but they mayalso play a triggering role for the other coupled process. As an example, a detailed analysis of a model for controlled autocatalytic reproduction is presented, where the coupling effect is demonstrated.

Odůvodnění předkladatele:

A theoretical explanation and comparison with clinical data of the coupling effect phenomenon between mechanical loading and chemical reactions based on linear nonequilibrium thermodynamics is provided. The question whether static or dynamic loading influences biochemical processes is addressed – the necessity of dynamic (time varying) loading as a stimulatory mechanism is shown. Further, the presented study suggests that chemical and mechanical processes do not only facilitate or support one another but they may also play a triggering role for the other coupled process – some biochemical processes may need mechanical stimulation to run and vice versa as well – chemical reactions may provide energy for some mechanical processes. As an example, a detailed analysis of a model for controlled autocatalytic reproduction is presented, where the coupling effect, i.e. the influence of dynamic loading on reaction kinetics, is demonstrated. Additionally, it served as a starting point for further research on this topic by the authors (3 directly connected papers that further advance the understanding are currently available: Klika (2010) J Phys Chem B, Klika Grmela (2013) Phys Rev E, Klika Grmela (2014) J Chem Phys), has been recognized by the community (17 citations in WoS) including direct application in cancer research with stimulating results (Laila Ziko, Asma Amleh: Triple trouble: examining the effect of combining mechanical stress, PBMCs and cisplatin on hepG2 cell death http://dar.aucegypt.edu/handle/10526/3232).

Odůvodnění panelu:

Remarkable result published in a leading journal, good citation response and potential for application in cancer research with stimulating results.

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Deciding first-order properties for sparse graphs

Zdeněk Dvořák, Daniel Kráľ

Identifikátor: **RIV/00216208:11320/10:10052094**

Předkladatel výsledku do Pilíře II.:
Univerzita Karlova v Praze Matematicko-fyzikální fakulta

Podíl předkladatele na výsledku: **80 %**

Anotace dle RIV:

We show that every FOL property can be tested in linear time for graphs with bounded expansion.

Odůvodnění předkladatele:

The paper shows that every property definable in first order logic can be tested in linear time for graphs with bounded expansion. The result gives an algorithm for a wide class of combinatorial problems using methods on the boundary of logic and theoretical computer science. This belongs to so-called algorithmic meta theorems, an important area of current theoretical computer science. Published at a top conference (CORE A* rating), a journal version appeared in J. ACM, the top journal in the area. Widely cited (59 in Google scholar, 18 in Scopus), also by an important monograph (http://goo.gl/76Nk1F) by Bruno Courcelle, an architect of the area who proved one of the most famous algorithmic meta theorems, and by several tutorials (http://goo.gl/RYjelw, http://goo.gl/xYPXWe).

Odůvodnění panelu:

An excellent result presented at a flagship (A*) conference, later published in a top journal, significant impact on the international research community evidenced by numerous citations.

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Derivative-Free Estimation Methods: New Results and Performance Analysis

Šimandl Miroslav, Duník Jindřich

Identifikátor: **RIV/49777513:23520/09:00501611**

Předkladatel výsledku do Pilíře II.:
Západočeská univerzita v Plzni Fakulta aplikovaných věd

Podíl předkladatele na výsledku: **100 %**

Anotace dle RIV:

The derivative-free nonlinear estimation methods exploiting the Stirling's interpolation and the unscented transformation for discrete-time nonlinear stochastic systems are treated. The divided difference and unscented filters, smoothers, and predictorsbased on the methods are introduced in the unified framework. The new relations among the first order Stirling's interpolation, the second order Stirling's interpolation, and the unscented transformation are derived and their impact on the covariance matrices of the state estimates of the corresponding filters is analysed. The theoretical results are illustrated and used for the explanation of the unexpected behaviour of the sigma point Gaussian sum filters given as a mixture of the derivative-free filters.

Odůvodnění předkladatele:

The article has been published in the journal Automatica of the International Federation of Automatic Control, which is together with the journal IEEE TAC (Transactions on Automatic Control) considered to be the most prestigious journals in the area of the automatic control (group of journals Automation and Control Systems, five year impact factor 3,9). So far, the article has been cited 22 times and 39 times according to the WoS and Scopus databases, respectively. The article is devoted to a substantial theoretical extension of local nonlinear filters unifying synthesis of the algorithms of the nonlinear filters for the state estimation of nonlinear dynamic stochastic systems. Also, an in-depth analysis and comparison of the conceptually different nonlinear filters with the stress on the estimation quality has been given. The proposed unified approach to the synthesis of the nonlinear filters is important not only from the theoretical perspective but also it significantly facilitates application of these nonlinear estimators in the areas of the decision making and automatic control in various technical and non-technical fields.

Odůvodnění panelu:

Excellent result published in the best journal of the field, expressive international impact evidenced by a considerable amount of citations.

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Effects of Global Illumination Approximations on Material Appearance

Jaroslav Křivánek

Identifikátor: **RIV/00216208:11320/10:10022137**

Předkladatel výsledku do Pilíře II.:
Univerzita Karlova v Praze Matematicko-fyzikální fakulta

Podíl předkladatele na výsledku: **50 %**

Anotace dle RIV:

Rendering applications in design, manufacturing, ecommerce and other fields are used to simulate the appearance of objects and scenes. Fidelity with respect to appearance is often critical, and calculating global illumination (GI) is an important contributor to image fidelity; but it is expensive to compute. GI approximation methods, such as virtual point light (VPL) algorithms, are efficient, but they can induce image artifacts and distortions of object appearance. In this paper we systematically studythe perceptual effects on image quality and material appearance of global illumination approximations made by VPL algorithms. In a series of psychophysical experiments we investigate the relationships between rendering parameters, object properties andimage fidelity in a VPL renderer. ...

Odůvodnění předkladatele:

This work deals with the perception of rendered images generated by a class of algorithms based on so called virtual point lights. It identifies classes of parameters for which these algorithms are not capable of rendering the glossiness of objects and therefore generate misleading, incorrect renderings. The paper gave an impulse for a series of follow-up works, which deal with efficient rendering of glossy objects.

Odůvodnění panelu:

Excellent work, sound theory and great application, very high impact obvious from many citations worldwide.

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Evaluating Stability and Comparing Output of Feature Selectors that Optimize Feature Subset Cardinality

Somol Petr, Novovičová Jana

Identifikátor: **RIV/67985556:_____/10:00348726**

Předkladatel výsledku do Pilíře II.:
Ústav teorie informace a automatizace AV ČR, v. v. i.

Podíl předkladatele na výsledku: **80 %**

Anotace dle RIV:

Stability (robustness) of feature selection methods is a topic of recent interest, yet often neglected importance, with direct impact on the reliability of machine learning systems. We investigate the problem of evaluating the stability of feature selection processes yielding subsets of varying size. We introduce several novel feature selection stability measures and adjust some existing measures in a unifying framework that offers broad insight into the stability problem. We study in detail the properties of considered measures and demonstrate on various examples what information about the feature selection process can be gained. We also introduce an alternative approach to feature selection evaluation in the form of measures that enable comparing thesimilarity of two feature selection processes. These measures enable comparing, e.g., the output of two feature selection methods or two runs of one method with different parameters.

Odůvodnění předkladatele:

Stability (robustness) of feature selection methods is a topic of recent interest, yet often neglected importance, with direct impact on the reliability of machine learning systems. We investigate the problem of evaluating the stability of feature selection processes yielding subsets of varying size. We introduce several novel feature selection stability measures and adjust some existing measures in a unifying framework that offers broad insight into the stability problem. We study in detail the properties of considered measures and demonstrate on various examples what information about the feature selection process can be gained. We also introduce an alternative approach to feature selection evaluation in the form of measures that enable comparing the similarity of two feature selection processes. These measures enable comparing, e.g., the output of two feature selection methods or two runs of one method with different parameters.

Odůvodnění panelu:

Good result published in a top journal. Strong international impact proven by many citations.

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Fluid Turbine

Sedláček Miroslav, Beran Václav, Novák Jiří

Identifikátor: **RIV/68407700:21110/11:00179945**

Předkladatel výsledku do Pilíře II.:
České vysoké učení technické v Praze Fakulta stavební

Podíl předkladatele na výsledku: **100 %**

Anotace dle RIV:

Rolling fluid turbine comprising a stator, fitted with at least one inlet hole and at least one outlet hole, where a rolling rotor is arranged in the stator using a shaft and a clamping mechanism, the rotor comprising a body of a rotational shape, whoseessence consists in the principle that a power generator is installed inside the rotor and the shaft, on whose one end the rotor is arranged, is seated with its other end fixed firmly in the clamp of the clamping mechanism. The clamping mechanism makes sure that the shaft can longitudinally deflect from its axis in all directions and perform a precessional movement, but cannot rotate around its longitudinal axis.

Odůvodnění předkladatele:

The result brings significant technical and economic benefits. It is based on a new and so far unknown, undescribed hydrodynamic principle. This principle has never been used in practice or in theory before this invention. European patent titled Fluid Turbine No. EP 2171260 (validation in progress in GB, F, I and DE) is based on the Czech national patent titled Fluid turbine No. 302396. The essence of its meaning lies in completely original way of solving the mechanical connection of electrical power with bladeless turbine. This turbine is based on an original Czech patent based on yet unknown hydrodynamic phenomena which body axially symmetrical shape circulates in the outlet cylinder. (For more on this principle, see for example patent Czech Rolling Fluid machine, number 284483 or European patent titled Rolling Fluid Machine, number EP 1015760 B1 or Czech patent entitled Precession liquid turbine number 302361). At the present time when it is necessary to strengthen the sustainable development also by the means of finding new and environmentally clean energy sources the Fluid Turbine is an important patent solution for the use of very low gradients of water (water head). Water turbine according to this patent can be installed on a gradient from 0.5 to 1.5 meters and can be operated with a flow rate of several tens or several hundred liters per second. It is also possible to use this machine in horizontal position, to generate electricity from marine or river currents, when the rate of water flow is not greater than 3 m/sec. The machine structure is extremely simple and does not require any special technology for its production. This is an important prerequisite for the widespread use at extremely low gradients water (up to 1 meter drop), ie where it is not possible to install conventional water turbine.

Odůvodnění panelu:

An excellent example of patented applied research that implements a new hydrodynamic principle for construction of a fluid turbine. The result was also described in a high-impacted journal.

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Hard nanocomposite coatings: Thermal stability, oxidation resistance and toughness

Musil Jindřich

Identifikátor: **RIV/49777513:23520/12:43915536**

Předkladatel výsledku do Pilíře II.:
Západočeská univerzita v Plzni Fakulta aplikovaných věd

Podíl předkladatele na výsledku: **100 %**

Anotace dle RIV:

The article reports on the enhanced hardness of nanocomposite coatings, their thermal stability, protection of the substrate against oxidation at temperatures above one thousand degree of Celsius, X-ray amorphous coatings thermally stable above one thousand degree of Celsius and new advanced hard nanocomposite coatings with enhanced toughness which exhibit (i) low values of the effective Young's modulus satisfying the condition of high hardness to effective Young's modulus ratio, (ii) high elastic recovery, (iii) strongly improved tribological properties, and (iv) enhanced resistance to cracking. At the end trends of next development of hard nanocomposite coatings are briefly outlined.

Odůvodnění předkladatele:

The article, published in the international journal Surface and Coatings Technology (2012 Elsevier B.V.), reports on the enhanced hardness of nanocomposite coatings, their thermal stability, protection of the substrate against oxidation at temperatures above 1000 C, X-ray amorphous coatings thermally stable above 1000 C and new advanced hard nanocomposite coatings with enhanced toughness which exhibit (i) low values of the effective Young´s modulus satisfying the condition of high hardness-to-effective Young's modulus ratio, (ii) high elastic recovery, (iii) strongly improved tribological properties, and (iv) enhanced resistance to cracking. These materials were prepared in our laboratories at the University of West Bohemia. At the end of the article, trends of next development of hard nanocomposite coatings are briefly outlined. The article already has 30 citations in international journal with IF.

Odůvodnění panelu:

Influential review paper with a strong international impact proven by numerous citations. The paper presents the cutting edge of science in the field of highly loaded and resistant coatings with fundamental contribution of the Czech research team.

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

HotSpot Wizard: a Web Server for Identification of Hot Spots in Protein Engineering

PAVELKA, Antonín, Eva CHOVANCOVÁ a Jiří DAMBORSKÝ

Identifikátor: **RIV/00216224:14310/09:00028562**

Předkladatel výsledku do Pilíře II.:
Masarykova univerzita Přírodovědecká fakulta

Podíl předkladatele na výsledku: **100 %**

Anotace dle RIV:

HotSpot Wizard is a web server for automatic identification of "hot spots" for engineering of substrate specificity, activity or enantioselectivity of enzymes and for annotation of protein structures. The web server implements the protein engineering protocol, which targets evolutionarily variable amino acid positions located in the active site or lining the access tunnels. The "hot spots" for mutagenesis are selected through the integration of structural, functional and evolutionary information obtained from: (i) the databases RCSB PDB, UniProt, PDBSWS, Catalytic Site Atlas and nr NCBI and (ii) the tools CASTp, CAVER, BLAST, CD-HIT, MUSCLE and Rate4Site. The protein structure and e-mail address are the only obligatory inputs for the calculation. In the output, HotSpot Wizard lists annotated residues ordered by estimated mutability. The results of the analysis are mapped on the enzyme structure and visualized in the web browser using Jmol.

Odůvodnění předkladatele:

This article describes a web server for automatic identification of ‘hot spots’ for engineering of substrate specificity, activity or enantioselectivity of enzymes and for annotation of protein structures. The web server implements the protein engineering protocol, which targets evolutionarily variable amino acid positions located in the active site or lining the access tunnels. The ‘hot spots’ for mutagenesis are selected through the integration of structural, functional and evolutionary information obtained from: (i) the databases RCSB PDB, UniProt, PDBSWS, Catalytic Site Atlas and nr NCBI and (ii) the tools CASTp, CAVER, BLAST, CD-HIT, MUSCLE and Rate4Site. The results of the analysis are mapped on the enzyme structure and visualized in the web browser using Jmol. HotSpot Wizard is freely available at http://loschmidt.chemi.muni.cz/hotspotwizard/. This tool finds its use in academic community, but also among companies, which naturally leads to lower number citations in the scientific literature. Analysis of the jobs submitted to HotSpot Wizard revealed that there has been in total 3686 jobs submitted to the server from October 2009 to March 2014, with clearly increasing number of jobs as well as returning users, reaching almost 30% during the first quarter of 2014. We are currently working on the version 2.0, which will implement homology modelling for proteins of unknown structure, increasing utility of the tool by an order of magnitude. See the list of reviews and bibliometrics indicators in the attachement!

Odůvodnění panelu:

Excellent idea, numerous users from various communities, published in a really high impact journal, impressive impact on the biochemistry as well as informatics community, a remarkable amount of citations.

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Hydroprocessed rapeseed oil as a source of hydrocarbon-based biodiesel

Šimáček P., Šebor G., Pospíšil M.

Identifikátor: **RIV/62243136:_____/09:#0000064**

Předkladatel výsledku do Pilíře II.:
Výzkumný ústav anorganické chemie, a.s.

Podíl předkladatele na výsledku: **80 %**

Anotace dle RIV:

his paper deals with the hydroprocessing of rapeseed oil representing a perspective technological way for production of biocomponents in diesel fuel range. Rapeseed oil was hydroprocessed at various temperatures (260?340 _C) under a pressure of 7 MPa ina laboratory flow reactor. Three Ni?Mo/alumina hydrorefining catalysts were used. Reaction products were analyzed using several gas-chromatographic methods. Reaction products contained water, hydrogen-rich gas and organic liquid product (OLP). The main components of OLP were identified as C17 and C18 n-alkanes and i-alkanes. At a low reaction temperature, OLP contained also free fatty acids and triglycerides. At reaction temperatures higher than 310 _C, OLP contained only hydrocarbons of the same natureas hydrocarbons present in diesel fuel. Influence of reaction temperature and catalyst on the composition of reaction products is discussed.

Odůvodnění předkladatele:

The article is focused on a highly topical issue of the next generation of biofuels. Hydroprocessing of vegetable oils alone or in a blend with suitable petroleum fractions using existing refinery facilities represents a prospective method for producing high quality diesel fuel biocomponents. Relevance of the topic and quality of the results obtained is documented by citation of the article (80 citations until May 2014). The article is included in the list of most cited articles published in the journal Fuel since 2009 (see www.journals.elsevier.com / fuel / most-cited articles-)

Odůvodnění panelu:

Good paper in a top journal, extends a number of materials and processes for biofuel fabrication, outstanding impact on the research community worldwide obvious from an extraordinary amount of citations.

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Characterization of the local crystallinity via reflectance of very slow electrons

Pokorná Zuzana, Mikmeková Šárka, Müllerová Ilona, Frank Luděk

Identifikátor: **RIV/68081731:_____/12:00384097**

Předkladatel výsledku do Pilíře II.:
Ústav přístrojové techniky AV ČR, v. v. i.

Podíl předkladatele na výsledku: **100 %**

Anotace dle RIV:

The reflectance of very slow electrons from solids and its electron energy dependence are shown as characteristic for the crystal system and its spatial orientation so they can serve, e. g., to fingerprinting the orientation of grains in polycrystals. Measurements on single crystals and polycrystals are validated via electron backscatter diffraction analyses. Sensitivity of the method to fine details of crystallinity is demonstrated.

Odůvodnění předkladatele:

The acquisition of surface crystallographic information is a task of continually increasing importance for the materials science. The electron backscatter diffraction (EBSD) method as an attachment to the scanning electron microscope (SEM) has become traditional. For every pixel, a side-attached camera provides a structure of lines revealing the local symmetry that is determined off-line via image processing. The sample has to be tilted to about 70 , the lateral resolution remains at tens of nm and decoding of the data slows the experiment down. The authors invented fully new method (Attachment 1) based on an innovative SEM mode immersing the sample in a strong electric field enabling one to retard incident electrons to an arbitrarily low energy without losing image resolution. This success led to a “Czech Minds” award for the team leader (Attachment 2). They have also designed and built an instrument (Attachment 3) for obtaining atomically clean crystalline surfaces and for their observation with very slow electrons. Pilot experiments have shown the crystallographic information enhanced by the decreased energy of electrons. In the range below around 40 eV (not available in commercial SEMs) the dependence of the reflectivity of electrons on their energy was found to be specific to the local crystallographic orientation. This is a result unparalleled anywhere in the world, a fact acknowledged by two awards (Attachments 4 and 5). In comparison with EBSD, the lateral resolution is not deteriorated by the sample tilt, data acquisition is much faster, and the very low energy assures supreme surface sensitivity. The result opens the way to an innovative and extremely promising method of establishing the surface crystallinity. Electronic properties of solids and their examination with electrons constitute the core of the electronics and optoelectronics branch so this result and the very low energy electron microscopy in general are crucial contributions to this discipline.

Odůvodnění panelu:

Outstanding original measurement methodology, published in a top journal, developed into a unique surface analysis device subsequently used in number of projects, awarded the “Czech Minds” Award.

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Image search method and device using affine-invariant regions

Chum Ondřej, Matas Jiří

Identifikátor: **RIV/68407700:21230/12:00198463**

Předkladatel výsledku do Pilíře II.:
České vysoké učení technické v Praze Fakulta elektrotechnická

Podíl předkladatele na výsledku: **80 %**

Anotace dle RIV:

An image search method that is robust and fast (with computational complexity of logarithmic order relative to the number of models). The image search method including: extracting a plurality of specific regions possessing such a property that a shape can be normalized regardless of an affine transformation thereof, as affine-invariant regions from one or more learning images; calculating, with respect to a reference affine-invariant region, other neighboring affine-invariant regions as a set; deformingthe neighboring affine-invariant regions by a transformation to normalize the shape of the reference affine-invariant region; and outputting the deformed shapes of the neighboring affine-invariant regions, together with combination of the reference affine-invariant region and the neighboring affine-invariant region

Odůvodnění předkladatele:

• The patent has helped CVUT to maintain a long-term collaboration with Toyota, who co-own the patent. Since its start in 2003, the collaboration brought approximately 30 million CZK to CTU. • The patent covers the results published in a paper O. Chum and J. Matas. Geometric hashing with local affine frame, Computer Vision and Pattern Recognition (CVPR), volume 1, pages 879-884 . The paper, published at the top conference in the field , has been cited 37 times in Google Scholar.

Odůvodnění panelu:

Excellent original idea covered by a joint US patent with Toyota. Successful application by Toyota also resulted in a 30 million contract with ČVUT. Also presented at an excellent conference with many citations.

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Large Scale Discovery of Spatilly Related Images

Chum Ondřej, Matas Jiří

Identifikátor: **RIV/68407700:21230/10:00168992**

Předkladatel výsledku do Pilíře II.:
České vysoké učení technické v Praze Fakulta elektrotechnická

Podíl předkladatele na výsledku: **100 %**

Anotace dle RIV:

We propose a randomized data mining method that finds clusters of spatially overlapping images. The core of the method relies on the min-Hash algorithm for fast detection of pairs of images with spatial overlap, the so-called cluster seeds. The seeds arethen used as visual queries to obtain clusters which are formed as transitive closures of sets of partially overlapping images that include the seed. We show that the probability of finding a seed for an image cluster rapidly increases with the size ofthe cluster.

Odůvodnění předkladatele:

(1) Published in the journal with the highest impact factor in the field of computer vision (IF=4.3). IEEE T. PAMI is consistently ranked in the top five journals in the Thomson-Reuters Journal Citation Reports in the Computer Science – Artificial Intelligence subject category. (2) It has 55 citation according to Google Scholar and 16 citations according WoS. (3) Implenetation of the method was licenced (non-exlusively) to Samsung within a $80 000 licensing agreement.

Odůvodnění panelu:

Original method beating its predecessors. Excellent theoretical result with immediate practical application. Published in the journal with the highest impact factor in the field. Expressive impact on the international research community obvious from nume

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Mapping Based Algorithm for Large-Scale Computation of Quasi-Polynomial Zeros

Vyhlídal Tomáš, Zítek Pavel

Identifikátor: **RIV/68407700:21220/09:00151840**

Předkladatel výsledku do Pilíře II.:
České vysoké učení technické v Praze Fakulta strojní

Podíl předkladatele na výsledku: **100 %**

Anotace dle RIV:

A method for computing all zeros of a retarded quasi-polynomial that are located in a large region of the complex plane is presented. The method is based on mapping the quasi-polynomial and on utilizing asymptotic properties of the chains of zeros. First, the asymptotic exponentials of the chains are determined based on the distribution diagram of the quasi-polynomial. Secondly, large regions free of zeros are defined. Finally, the zeros are located as the intersection points of the zero-level curves ofthe real and imaginary parts of the quasi-polynomial, which are evaluated over the areas of the region outside those free of zeros.

Odůvodnění předkladatele:

The article presents an original method for computing arbitrarily large set of zeros of a retarded quasi-polynomial located in a given region of complex plane. The method is based on mapping the quasi-polynomial and on utilizing asymptotic properties of the chains of zeros. The uniqueness of the algorithm is in the ability to compute effectively a large number of roots (hundreds and even thousands) of a time delay system. The presented algorithm is one of very few algorithms that can perform the given computationally demanding task. The algorithm is particularly important for analysis of dominant dynamical modes and the stability analysis of time delay systems, which are infinite dimensional. The design and implementation of the algorithm enabled the authors to achieve a number of subsequent research results in the spectral analysis and synthesis of time delay systems and resulted in a rich international collaboration (e.g. with Prof. W. Michiels, K.U. Leuven, Belgium, Prof. N. Olgac, University of Connecticut, US and Prof. D. Henrion, LAAS CNRS Toulouse - with 7 joint journal publications indexed at WOS where the algorithm was directly involved). The article and the algorithm have also achieved high impact and recognition in time delay system community (27 citation records in WOS and 41 in Scopus). The research results presented in the article have fully been performed in the research group of Prof. Pavel Zítek at CTU in Prague. Based on the distinguished results achieved by the group in the spectral analysis of time delay systems, the group was entrusted to organise the prestigious 9th IFAC Workshop on Time Delay Systems, June 7 - 9, 2010, at CTU in Prague. The research results were also acknowledged by CTU in Prague Rector's Award for distinguished research results in 2009.

Odůvodnění panelu:

Excellent theoretical result with good application potential, published in a leading journal, good international impact apparent from many citations worldwide.

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Material and structural characterization of alkali activated low-calcium brown coal fly ash

Kopecký Lubomír, Šmilauer Vít, Bittnar Zdeněk

Identifikátor: **RIV/68407700:21110/09:00156617**

Předkladatel výsledku do Pilíře II.:
České vysoké učení technické v Praze Fakulta stavební

Podíl předkladatele na výsledku: **75 %**

Anotace dle RIV:

The heterogeneous microstucture of the geopolymer Mn [-(Si-O)z -Al-O]n.wH2 O, that forms during the alkaline activation, was examined by means of microcalorimetry, XRD, TGA, DSC, MIP, FTIR, NMR MAS (29 Si, 27 Al, 23 Na), ESEM, EDS, and EBSD. Based on these techniques, the properties of synthetized geopolymer are discussed.

Odůvodnění předkladatele:

The article presents state-of-the-art of an aluminosilicate inorganic binder synthesized from alkali-activated fly ash. Although this material has been known for decades, long-term evolution of strength and isothermal calorimetry were presented the first time. Excellent chemical resistance in aggressive environment and immobilization of heavy metals open further ways for various applications. A weakly bound alkalies in N-A-S-H gels lead to efflorescence. This article paved the way for further research, resulting in micromechanical and chemical model of alkali activation in Journal of Materials Science, 2011 and related articles in Ceramics – Silikáty, 2012 and Journal of Environmental Science and Engineering, 2011.

Odůvodnění panelu:

Highly credible research result related to complex material, published in a good journal, high citation response from all over the world.

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

METHOD AND APPARATUS FOR RETRIEVING IMAGE

Obdržálek Štěpán, Matas Jiří

Identifikátor: **RIV/68407700:21230/11:00180535**

Předkladatel výsledku do Pilíře II.:
České vysoké učení technické v Praze Fakulta elektrotechnická

Podíl předkladatele na výsledku: **80 %**

Anotace dle RIV:

PROBLEM TO BE SOLVED: To provide a robust and high-speed (calculation quantity of logarithmic order to the number of models) image retrieving method. SOLUTION: The image retrieving method includes: a normalization process for extracting a plurality of areas from one or more model images and normalizing the extracted areas as routine areas; a classification process for setting specific areas in respective normalized routine areas and classifying the plurality of routine areas into some partial sets on the basis of the features of the specific areas; a recursive classification process for repeatedly performing the setting of other specific areas on positions different from the specific areas in respective routine areas classified in each partial set.

Odůvodnění předkladatele:

• The patent, is related to an award winning paper Stepán Obdrzálek, Jiri Matas: Sub-linear Indexing for Large Scale Object Recognition. BMVC 2005 (best science paper award). • The quality of the research protected by the patent was acknowledged when S. Obdrzalek was awarded the Doctorandus prize of the Czech Mind („Česká hlava“) for the most innovative PhD work in the Czech Republic (in 2006, the year of the filling of the patent) • The patent has helped CVUT to maintain a long-term collaboration with Toyota, who co-own the patent. In the last ten years, the collaboration brought approximately 25 million CZK to CTU.

Odůvodnění panelu:

Excellent result, US patented, employed in NASA and ESA satellites, applied in CERN and for medical irradiation. Commercial license sold to industry to manufacture an educative version that is purchased and used by many universities and schools worldwide.

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Model predictive control of a building heating system: The first experience

Prívara Samuel, Ferkl Lukáš, Cigler Jiří

Identifikátor: **RIV/68407700:21230/11:00171368**

Předkladatel výsledku do Pilíře II.:
České vysoké učení technické v Praze Fakulta elektrotechnická

Podíl předkladatele na výsledku: **90 %**

Anotace dle RIV:

This paper presents model predictive controller (MPC) applied to the temperature control of real building. Conventional control strategies of a building heating system cannot make use of the energy supplied to a building. Moreover dropout of outside temperature can lead to underheating of a building. Presented predictive controller uses both weather forecast and thermal model of a building to inside temperature control. By this, it can utilize thermal capacity of a building and minimize energy consumption. It can also maintain inside temperature at desired level independent of outside weather conditions. The models of multiple input multiple output systems (MIMO) can be identified by means of subspace methods. Oftentimes, the measured data used for identification are not satisfactory and need special treatment. During the 2009/10 heating season, the controller was tested on a large university building and achieved savings of 17-24% compared to the present controller.

Odůvodnění předkladatele:

The paper presents the process of implementation of a model predictive controller (MPC) on a real building and the evaluation of the controller performance. At that time, it used to be one of the first successful MPC implementation on a real building (a similar achievement was concurrently presented by group of prof. Borrelli from UC Berkeley). The performance of the MPC was superior to the state-of-the-art control strategies – energy savings thanks to better control were higher than 17%.

Odůvodnění panelu:

Excellent implementation of the new predictive control strategy on a real building. One of the first two successful applications of the strategy worldwide (the other done by the UC Berkeley). Superior performance to state-of-the-art strategies leading to

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Multi-wall carbon nanotube networks as potential resistive gas sensors for organic vapor detection

Slobodian Petr ; Riha Pavel ; Lengálová Anežka ; Svoboda Petr ; Sáha Petr

Identifikátor: **RIV/70883521:28150/11:10018844**

Předkladatel výsledku do Pilíře II.:
Univerzita Tomáše Bati ve Zlíně Fakulta humanitních studií

Podíl předkladatele na výsledku: **95 %**

Anotace dle RIV:

The sensitivity of multi-wall carbon nanotube (MWCNT) networks of randomly entangled pure nanotubes and those oxidized with acidic KMnO4 to various organic solvent vapors (iso-pentane, diethyl ether, acetone and methanol) has been investigated by resistance measurements. The solvents had different polarities given by Hansen solubility parameters and different volume fractions of saturated vapors defined by the vapor pressure. The results show that the network electrical resistance increases when exposedto organic solvent vapors, and a reversible reaction is observed when the network is removed from the vapors. The reaction with KMnO4 increases oxygen content on the nanotube surface and causes lower porosity of MWCNT network as well as higher electrical resistance, which improves the network selectivity to polar solvents. The investigated MWCNT networks could be potentially used as sensing elements for sensitive and selective organic vapor switches.

Odůvodnění předkladatele:

Recent technology progress relies heavily on the use of materials that allow for achieving advanced structural and functional capabilities. In this respect carbon nanotubes (CNT) have the potential for becoming advanced novel multifunctional materials. In above mentioned paper multiwall carbon nanotubes were used in form of entangled networks as cheap and easy to prepare micro-sized detector for organic solvent vapors. The experimental results show that the prepared materials are capable to detect vapors in the air sensitively, reversibly and reproducibly. Further chemical treatment leads to selectivity of responses to different groups of solvents. These novel selective materials are really promising in area of expected development of new analytical tools so called electronic noses. In this regard, the paper brings breakthrough strategy into technology of sensors.

Odůvodnění panelu:

Distinguished result published in a top journal, numerous citations worldwide.

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

On Nonmetric Similarity Search Problems in Complex Domains

Tomáš Skopal

Identifikátor: **RIV/00216208:11320/11:10045849**

Předkladatel výsledku do Pilíře II.:
Univerzita Karlova v Praze Matematicko-fyzikální fakulta

Podíl předkladatele na výsledku: **67 %**

Anotace dle RIV:

The task of similarity search is widely used in various areas of computing, including multimedia databases, data mining, bioinformatics, social networks, etc. In fact, retrieval of semantically unstructured data entities requires a form of aggregated qualification that selects entities relevant to a query. A popular type of such a mechanism is similarity querying. For a long time, the database-oriented applications of similarity search employed the definition of similarity restricted to metric distances. Due to its topological properties, metric similarity can be effectively used to index a database which can be then queried efficiently by so-called metric access methods. However, together with the increasing complexity of data entities across variousdomains, in recent years there appeared many similarities that were not metrics -- we call them nonmetric similarity functions. In this paper we survey domains employing nonmetric functions for effective similarity search, and methods for

Odůvodnění předkladatele:

The paper surveys the phenomenon of similarity search accross different domains, ranging from theoretical to applied. It has uncovered many domains where the similarity search is the essential task, though the terminology, formalisms and use cases vary. For the first time, the survey justifies the very task of similarity search as serious, inevitable and omnipresent part of managing unstructured data. As of June 2014, the paper has cca 1100 downloads from the ACM digital library. The journal is in the long term ranked as the first in a WoS category with IF-2011=4.53. Based on the paper the authors presented tutorial at the IEEE ICDE 2011 conf., that is among 3 top database conferences (ranked A* in CORE).

Odůvodnění panelu:

Influential original survey, published in a top journal and presented at a flagship conference (A*), frequently cited.

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Preparation and characterization of ZnS nanoparticles deposited on montmorillonite

Kozak, O.; Praus, P. ; Koci, K.

Identifikátor: **RIV/61989100:27360/10:86076855**

Předkladatel výsledku do Pilíře II.:
Vysoká škola báňská - Technická univerzita Ostrava Fakulta metalurgie a materiálového inženýrství

Podíl předkladatele na výsledku: **75 %**

Anotace dle RIV:

ZnS nanoparticles were prepared and deposited on montmorillonite (MMT) in the presence of cetyltrimethylammonium (CTA). UV spectrometry and transmission electron microscopy (TEM) proved the formation of nanoparticles with diameters ranging from 3 nm to 5nm. Selected-area electron diffraction (SAED) patterns revealed the presence of romboedric ZnS. The band gap energy of nanosize ZnS was estimated at 3.89 +- 0.03 eV. Photoluminescence spectra exhibited a strong emission band between 300 nm and 600 nm explained by the vacant ZnS nanostructure. The prepared ZnS-montmorillonite nanocomposite (ZnS-MMT) was used for the photocatalytic reduction of CO2 providing a considerably high efficiency that exceeded 5-6-fold the results of commercial TiO2 Degussa P25.The main reaction products were hydrogen and methane. Methanol and carbon oxide were also observed in about 7-fold lower amounts. The stability of ZnS against oxidation was confirmed by the determination of sulphate using capillary isota

Odůvodnění předkladatele:

ZnS nanoparticles were precipitated by reactions of zinc and sulphide ions in the presence of the stabilizing cationic surfactant cetyltrimehylammoniu bromide and deposited on the clay mineral montmorillonite (MMT) forming the stable ZnS-MMT nanocomposite. Formation of the ZnS-MMT nanocomposite is the original procedure for long-term stabilization and easy handling with the nanoparticles. In addition, the photocatalytic activity of ZnS nanoparticles is not affected by their immobilization in MMT pores. The nanocomposite exhibits several times higher photoctalytic activity for the reduction of carbon dioxide than commonly used TiO2 in spite of the low content ZnS (5-7 wt. %). The paper was published in the prestigious Journal of Colloid and Interface Science (Elsevier) having IF = 3.172. Sums of citations and citations without self-citations were 35 and 20, respectively, at WoS and 46 and 23 at Google Schoolar. Recently, the ZnS-MMT nanocomposite has been also sufficiently applied for the photocatalytic decomposition of organic compounds and nitrous oxide and, therefore, is potential for other applications, especially, for decomposition of various polluting compounds in the environment. Quartile in Category: CHEMISTRY, PHYSICAL - Q2

Odůvodnění panelu:

Excellent paper in a good journal, good application potential in photocatalysis. Significant impact on the research community worldwide as also proven by many citations.

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Revisiting the Linear Programming Relaxation Approach to Gibbs Energy Minimization and Weighted Constraint Satisfaction

Werner Tomáš

Identifikátor: **RIV/68407700:21230/10:00170728**

Předkladatel výsledku do Pilíře II.:
České vysoké učení technické v Praze Fakulta elektrotechnická

Podíl předkladatele na výsledku: **100 %**

Anotace dle RIV:

We present a number of contributions to the LP relaxation approach to weighted constraint satisfaction (Gibbs energy minimization). We generalize it to n-ary constraints in a simple and natural way. This includes a simple algorithm to minimize the LP-based upper bound, n-ary max-sum diffusion, we consider using other bound-optimizing algorithms as well. The diffusion iteration is tractable for a certain class of high-arity constraints represented as a black-box, which is analogical to propagators for global constraints CSP. Diffusion exactly solves permuted n-ary supermodular problems. A hierarchy of gradually tighter LP relaxations is obtained simply by adding various zero constraints and coupling them in various ways to existing constraints. Zero constraints can be added incrementally, which leads to a cutting plane algorithm. The separation problem is formulated as finding an unsatisfiable subproblem of a CSP.

Odůvodnění předkladatele:

The topic of the article is the following problem: given a set of discrete variables and a set of functions each depending on a subset of variables, minimize the sum of the functions over all variables. This difficult problem finds many applications in computer vision, machine learning, pattern recognition, artificial intelligence, bioinformatics, and elsewhere. One of very succesful approaches to this problem is linear programming (LP) relaxation, which in turn allows to construct and justify convergent message-passing algorithms to approximately solve the problem. Previously, this relaxation was defined for cases in which each function depends at most on two variables. My article generalizes the relaxation and one of the message-passing algorithms (max-sum diffusionn) to the general case. The formulation is very simple and clean. Thanks to this, I easily obtained several other results: (1) a hierarchy of progressively tighter relaxations of the problem, (2) a cutting plane algorithm, (3) elegant handling of global constraint (functions depending on large number or all variables), (4) a proof that generalized max-sum diffusion is exact for the class of problems in which all the functions are supermodular. Since publishing the article, a number of researchers have used the proposed formulation and generalized max-sum diffusion has become a well-known algorithm in pattern recognition and machine learning. I believe that due multidisciplary nature of the topic and to simplicity and generality of the algorithm, the article will in the future become well-known also in other scientific fields, such as mathematical optimisation and theoretical computer science. The paper was preceded by its conference version [T.Werner. High-arity Interactions, Polyhedral Relaxations, and Cutting Plane Algorithm for Soft Constraint Optimisation (MAP-MRF). Comp. Vision and Pattern Recognition Conf., Anchorage, USA, June 2008]. The two papers together have 32 citations in WoS.

Odůvodnění panelu:

Excellent theoretical result with strong application potential presented at a prestigious conference and published in a leading journal, significant impact on the research community worldwide as also evidenced by a considerable amount of citations.

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

SPICE Model of Memristor with Nonlinear Dopant Drif

BIOLEK Dalibor

Identifikátor: **RIV/60162694:G43__/09:#0003121**

Předkladatel výsledku do Pilíře II.:
Ministerstvo obrany Univerzita obrany - Fakulta vojenských technologií Brno

Podíl předkladatele na výsledku: **90 %**

Anotace dle RIV:

A mathematical model of the prototype of memristor, manufactured in 2008 in Hewlett-Packard Labs, is described in the paper. It is shown that the hitherto published approaches to the modeling of boundary conditions need not conform with the requirementsfor the behavior of a practical circuit element. The described SPICE model of the memristor is thus constructed as an open model, enabling additional modifications of nonlinear boundary conditions. Its functionality is illustrated on computer simulations.

Odůvodnění předkladatele:

Currently, this paper is considered to be a fundamental work from the area of memristor modelling, serving as a starting point of the worldwide progress in the SPICE modelling and computer simulation of this revolutionary component of contemporary electronics. According to Google Scholar, it is the 7th most frequently cited paper on memristive systems worldwide, and the most cited paper on memristor SPICE modelling. (Available at http://scholar.google.com.au/citations?user=Yc4TtpUAAAAJ&hl=en). The number of citations in WoS, SCOPUS, and Scholar Google is 154, 205, and 303, respectively (the data are valid on June 24, 2014).

Odůvodnění panelu:

Excellent result with a good timing. Although published in a low-impact-factor journal, it achieved an impressive impact on the international research community evident from an extraordinary number of citations.

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Surface plasmon resonance (SPR) sensors: approaching their limits?

M. Piliarik, J. Homola

Identifikátor: **RIV/67985882:_____/09:00341041**

Předkladatel výsledku do Pilíře II.:
Ústav fotoniky a elektroniky AV ČR, v. v. i.

Podíl předkladatele na výsledku: **100 %**

Anotace dle RIV:

We report on a unified theoretical model of the resolution of SPR sensors which makes it possible to predict the ultimate performance of all major configurations of SPR sensors. The theory indicates that the performance of SPR sensors is independent of the method of excitation of surface plasmons or the method of modulation and depends dominantly on the noise properties of the light source and detector.

Odůvodnění předkladatele:

This paper reports on a unified theoretical model of the resolution of surface plasmon resonance (SPR) sensors which makes it possible to predict the ultimate performance of all major configurations of SPR sensors. The theory indicates that the performance of SPR sensors is independent of the method of excitation of surface plasmons or the method of modulation and depends dominantly on the noise properties of the light source and detector. Results of the theoretical analysis are compared with the performance reported for several SPR sensors to illustrate that the best state-of-art SPR sensors are approaching their theoretical limits. The paper has been published in Optics Express, one of the leading journals in the field of optics (ranked 5 of 80 in optics according to WOS). To date the paper has generated 115 citations.

Odůvodnění panelu:

Excellent theoretical result providing a general model that is proved on several real sensors. Published in one of the leading journals in the field. Impressive impact on the international research community apparent from an extraordinary number of citati

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Surface plasmon resonance biosensor for rapid label-free detection of microribonucleic acid at subfemtomole level

H. Šípová, J. Homola

Identifikátor: **RIV/67985882:_____/10:00358219**

Předkladatel výsledku do Pilíře II.:
Ústav fotoniky a elektroniky AV ČR, v. v. i.

Podíl předkladatele na výsledku: **70 %**

Anotace dle RIV:

MicroRNAs (miRNAs) present an important target for medical diagnostics of various serious diseases. We report a novel method for rapid and sensitive miRNA detection and quantization using high-performance portable surface plasmon resonance (SPR) sensor combined with a DNA*RNA antibody-based assay. The new approach allows detecting miRNA at levels down to high attomoles in less than 30 minutes. The methodology is found to yield results which agree well with established methods for miRNA detection.

Odůvodnění předkladatele:

This paper presents a novel method for rapid and sensitive detection of microribonucleic acids (miRNAs) using surface plasmon resonance (SPR) sensor technology and a DNA(star)RNA antibody-based assay. The approach takes advantage of a novel high-performance portable SPR sensor instrument for spectroscopy of surface plasmons based on a special diffraction grating called a surface plasmon coupler and disperser (SPRCD) developed at the Institute of Photonics and Electronics in Prague. This approach allows detection of miRNA in less than 30 min at concentrations down to 2 pM with an absolute amount at high attomoles. The methodology was evaluated for analysis of miRNA from mouse liver tissues and was found to yield results which agree well with those provided by the quantitative polymerase chain reaction (qPCR). The paper has been published in Analytical Chemistry, one of the leading journals in the field of analytical chemistry (ranked 3 of 75 in analytical chemistry according to WOS). To date the paper has generated 53 citations.

Odůvodnění panelu:

Excellent paper in a top journal, huge citation impact, good application potential in biosensing.

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Systém pro automatické vyvažování klikových hřídelí během obrábění

Schlegel Miloš, Balda Pavel, Štětina Milan, Sobota Jaroslav, Severa Ondřej, Ježek Ondřej

Identifikátor: **RIV/49777513:23520/12:43918022**

Předkladatel výsledku do Pilíře II.:
Západočeská univerzita v Plzni Fakulta aplikovaných věd

Podíl předkladatele na výsledku: **75 %**

Anotace dle RIV:

Byl vyvinut systém pro automatické ustavování klikových hřídelí v procesu jejich obrábění. Cílem ustavení hřídele je minimalizovat pružnou deformaci do soustruhu upnuté a lunetami podepřené hřídele během otáčení. Pružná deformace je charakterizována rozevíráním sousedních ramen spojujících dva přilehlé klikové čepy s příslušným ojničním čepem. Systém využívá novou metodu optimálního ustavování klikové hřídele změnou poloh bočních válců podpěrných lunet. Součástí systému je sada bezdrátových čidel pro měření deformací a grafický operátorský panel s dotykovou obrazovkou.

Odůvodnění předkladatele:

A system for automatic alignment of crankshafts in the machining process has been developed. The aim is to minimize the shaft elastic deformation clamped to the lathe and supported by lunettes during rotation. Elastic deformation is characterized by broadening and narrowing the space between the two neighboring arms adjacent to connecting rods. The device validates a new method for optimal crankshaft alignment by positioning of the side pistons of the supporting lunettes. The system contains a set of wireless measuring nodes and a graphical user interface with touchscreen. The system significantly reduces the production time (up to 70%) and increases the quality of the crankshaft. The new technology received the Jury Award during the Gold medal competition at the International Engineering Fair Brno 2012 which is the most important industrial fair in central Europe.

Odůvodnění panelu:

Brilliant applied research result, well proven by successful application the major Czech heavy machinery company where it enabled significant reduction of production time.

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Temporal Logic Control of Discrete-Time Piecewise Affine Systems

Jana TŮMOVÁ, Ivana ČERNÁ, Jiří BARNAT

Identifikátor: **RIV/00216224:14330/12:00057211**

Předkladatel výsledku do Pilíře II.:
Masarykova univerzita Fakulta informatiky

Podíl předkladatele na výsledku: **75 %**

Anotace dle RIV:

We present a computational framework for automatic synthesis of a feedback control strategy for a discrete-time piece-wise affine (PWA) system from a specification given as a linear temporal logic (LTL) formula over an arbitrary set of linear predicatesin the system's state variables. Our approach consists of two main steps. First, by defining appropriate partitions for its state and input spaces, we construct a finite abstraction of the PWA system in the form of a control transition system. Second, byleveraging ideas and techniques from LTL model checking and Rabin games, we develop an algorithm to generate a control strategy for the finite abstraction. While provably correct and robust to state measurements and small perturbations in the applied inputs, the overall procedure is conservative and expensive. The proposed algorithms have been implemented as a software package and made available for download. Illustrative examples are included.

Odůvodnění předkladatele:

Motion planning is a core problem dealt with in the filed of autonomous robotics, however, the results achieved within automated motion planning find applications in other areas, such as robotic surgery, video game artificial intelligence, or the study of biological molecules. Within the motion planning field our paper presents a computational framework for automatic synthesis of a feedback control strategy for a discrete-time piece-wise affine (PWA) system (model of a robot system) from a specification given as a linear temporal logic (LTL) formula over an arbitrary set of linear predicates in the system's state variables. Our approach consists of two main steps. First, by defining appropriate partitions for its state and input spaces, we construct a finite abstraction of the PWA system in the form of a control transition system. Second, by leveraging ideas and techniques from LTL model checking and Rabin games, we develop an algorithm to generate a control strategy for the finite abstraction. While provably correct and robust to state measurements and small perturbations in the applied inputs, the overall procedure is conservative and expensive The method described in the paper was implemented in MATLAB as the software package conPAS2 and made available for download. The implementation has been used to control models of robot systems. The results achieved has been applied, among others, in the DARPA Robotics Challenge that has been focused on the development of ground robots capable of executing complex tasks in dangerous, degraded or human-engineered environments. The paper has been published in a prestigious IEEE TRANSACTIONS ON AUTOMATIC CONTROL journal with a high impact on the control community. According to Google Scholar Citation Report the paper has 33 citations since its publication in 2012.

Odůvodnění panelu:

Excellent result, published as a full paper in the best journal in the field, programmed into a software package that was successfully applied in DARPA Robotics Challenge and downloaded by many other users worldwide.

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

The targeted antibacterial and antifungal properties of magnetic nanocomposite of iron oxide and silver nanoparticles

Prucek Robert, Tuček Jiří, Kilianová Martina, Panáček Aleš, Kvítek Libor, Filip Jan, Kolář Milan, Tománková Kateřina, Zbořil Radek

Identifikátor: **RIV/61989592:15310/11:33118219**

Předkladatel výsledku do Pilíře II.:
Univerzita Palackého v Olomouci Přírodovědecká fakulta

Podíl předkladatele na výsledku: **100 %**

Anotace dle RIV:

Two types of magnetic binary nanocomposites, Ag@Fe3O4 and g-Fe2O3@Ag, were synthesized and characterized and their antibacterial activities were tested. As a magnetic component, Fe3O4 (magnetite) nanoparticles with an average size of about 70 nm and monodisperse g-Fe2O3(maghemite) nanoparticles with an average size of 5 nm were used. Nanocomposites were prepared via in situ chemical reduction of silver ions by maltose in the presence of particular magnetic phase and molecules of polyacrylate serving asa spacer among iron oxide and silver nanoparticles. In the case of the Ag@Fe3O4 nanocomposite, silver nanoparticles, caught at the surfaces of Fe3O4nanocrystals, were around 5 nm in a size. On the contrary, in the case of the g-Fe2O3@Ag nanocomposite, ultrafine g-Fe2O3 nanoparticles surrounded silver nanoparticles ranging in a size between 20 and 40 nm. In addition, the molecules of polyacrylate in this nanocomposite type suppress considerably interparticle magnetic interactions as prove

Odůvodnění předkladatele:

This work brings the unique view on the preparation and biological activity of the nanocomposites composed from silver and iron oxide. One of the prepared nanocomposite is based on interconnection of the very small Ag nanoparticles and bigger iron oxide particles, the second one has a reverse arrangement. While he antibacterial activity of both type of composites is nearly the same, the cytotoxicity is significantly higher for composite with smaller iron oxide particles. By this way the significant influence of nanocomposite architecture on the biological activity was proved for this type of nanocomposite which are intensively studied due to their high application potential.

Odůvodnění panelu:

Excellent result presented in a good journal. Significant impact on the international research community as also evidenced by numerous citations.

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Tracking by an Optimal Sequence of Linear Predictors

Zimmermann Karel, Matas Jiří, Svoboda Tomáš

Identifikátor: **RIV/68407700:21230/09:00157040**

Předkladatel výsledku do Pilíře II.:
České vysoké učení technické v Praze Fakulta elektrotechnická

Podíl předkladatele na výsledku: **100 %**

Anotace dle RIV:

We propose a learning approach to tracking explicitly minimizing the computational complexity of the tracking process subject to user-defined probability of failure (loss-of-lock) and precision. The tracker is formed by a Number of Sequences of Learned Linear Predictors (NoSLLiP). Robustness of NoSLLiP is achieved by modeling the object as a collection of local motion predictors --- object motion is estimated by the outlier-tolerant Ransac algorithm from local predictions. Efficiency of the NoSLLiP tracker stems from (i) the simplicity of the local predictors and (ii) from the fact that all design decisions - the number of local predictors used by the tracker, their computational complexity (ie the number of observations the prediction is based on), locations as well as the number of Ransac iterations are all subject to the optimization (learning) process. All time-consuming operations are performed during the learning stage - t.

Odůvodnění předkladatele:

(1) Published in the journal with the highest impact factor in the field of computer vision (IF=4.3). (2) It has 59 citation according to google scholar and 22 citations according WoS. (3) It contains core of Karel Zimmermann's (first author) PhD thesis, which was awarded the Antonin Svoboda prize for the best PhD dissertation in Czech Republic in the fields of cybernetics and informatics in 2008.

Odůvodnění panelu:

Excellent result with a strong citation impact worldwide, awarded by a national prize.

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Two-Step Sintering of Oxide Ceramics with Various Crystal Structures

Maca Karel, Pouchlý Václav, Žalud Pavel

Identifikátor: **RIV/00216305:26210/09:PU83020**

Předkladatel výsledku do Pilíře II.:
Vysoké učení technické v Brně Fakulta strojního inženýrství

Podíl předkladatele na výsledku: **100 %**

Anotace dle RIV:

The influence of Two-Step Sintering (TSS) process on the final microstructure of oxide ceramic materials with three different crystal structures was studied. Two kinds of alumina (particle size 100nm resp. 240nm) as well as tetragonal zirconia (stabilized with 3mol%Y2O3, particle size 60nm) and cubic zirconia (8mol%Y2O3, 140nm) powders were cold isostatically pressed and pressureless sintered with different heating schedules. The microstructures achieved with TSS method were compared with microstructures achieved with conventional Single-Step Sintering schedule (SSS). The results showed that the efficiency of the TSS of these oxide ceramics was more dependent on their crystal structure than on their particle size and green body microstructure. The method of TSS brought only negligible improvement of the microstructure of tetragonal zirconia and hexagonal alumina ceramics. On the other hand, TSS was successful in the sintering of cubic zirconia ceramics; it led to a decrease in grain size by a factor o0

Odůvodnění předkladatele:

The paper “Two-Step Sintering of oxide ceramics with various crystal structures” was written by the team of prof. Karel Maca and his (that time) two master students Vaclav Pouchly and Pavel Zalud in the framework of their master thesis. It was published in year 2010 in the Journal of the European Ceramic Society, which is the top-ranked journal in Thompson Reuters category Materials Science, Ceramics. High-impact of this paper on the research community is supported by the fact that it already has 27 citations in ISI Web of Knowledge and 31 citations in Scopus. The topic of the paper is based on Two-Step Sintering method which was firstly published in year 2000 by Chen and Wang in Nature (paper titled “Sintering dense nanocrystalline ceramics without final-stage grain growth"). This sintering technique allows producing the ceramic and metal materials with small grains together with high density, which can lead to improvement of mechanical or functional properties such as hardness, wear resistance, strength, fracture toughness, ionic conductivity, optical transparency, etc… The idea of the paper of Maca, Pouchly and Zalud was to extend the spectrum of materials for which the Two-Step Sintering method had previously been used. Therefore, the experimental work contained hundreds of sintering experiments, where not only results of Two-Step Sintering method were included, but also results of conventional sintering were shown for comparison. The extensiveness of this paper enables to formulate the new idea, that the efficiency of Two-Step Sintering method is different for different material. This hypothesis has not yet been disproved. This is probably the reason why the paper is highly cited (e.g. the original paper in nature has now 406 citations, but during the first 4 years had a similar number of citations like this paper). Summary: highly cited paper with participation of young researchers 100 Original idea published in a top journal, important international impact obvious from a large number of citations. Original idea published in a top journal, important international impact obvious from a large number of citations.

Odůvodnění panelu:

Excellent result with a strong citation impact worldwide, awarded by a national prize.

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Způsob kalibrace délky předmětu a zařízení pro kalibraci délky předmětu

Buchta Zdeněk, Číp Ondřej, Lazar Josef

Identifikátor: **RIV/68081731:_____/11:00387845**

Předkladatel výsledku do Pilíře II.:
Ústav přístrojové techniky AV ČR, v. v. i.

Podíl předkladatele na výsledku: **100 %**

Anotace dle RIV:

Vynález se týká způsobu kalibrace délky předmětu, například koncových měrek, a zařízení pro kalibraci délky předmětu.

Odůvodnění předkladatele:

In metrology of length gauge blocks are at the end of the calibration chain of mechanical standards. Calibration of gauge blocks represents one of the key challenges of dimensional metrology. It is the moment when optics meets mechanics; gauge blocks are calibrated by laser interferometry methods to achieve full traceability to the fundamental standard of length - stabilized laser. The system we developed offers a completely new approach in calibration of gauge blocks. The present concept relies on mechanical referencing of one surface to a reference flat and differential interferometric measurement of the front end with respect to this flat. Contacting of the gauge block to the reference contributes to the uncertainty of the measurement. We invented a method of both-side contactless interferometric calibration with full traceability to the fundamental standard combining white-light and laser interferometry. The technique allows absolute length measurement of a gauge block in a single-step measurement giving information of the gauge block length without comparison with a mechanical reference standard. The measurement is fully automatic, with no operator influence. This novel approach completely redefines the metrological methodology of gauge block calibration. It means a small revolution in dimensional metrology. Since the patent was registered, the designed experimental system has been transformed into a robust device which is going to be used at Czech National Metrology Institute. This novel principle of gauge blocks calibration designed at ISI ASCR was awarded by Werner von Siemens Excellence Award in 2012. The complex system designed in cooperation with company Mesing was awarded Gold medal at International Engineering Fair held in Brno, Czech Republic, in 2012 and by the Czech Association of Electrical Engineering Companies in 2014. All these awards prove the outstanding importance of this principle in the field of fundamental and industrial metrology.

Odůvodnění panelu:

Highly awarded original patented engineering work with potential practical impact.

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Analysis of proteome and frost tolerance in chromosome 5A and 5B reciprocal substitution lines between two winter wheats during long-term cold acclimation

Vítámvás Pavel; Prášil Ija Tom; Kosová Klára

Identifikátor: **RIV/00027006:_____/12:00002114**

Předkladatel výsledku do Pilíře II.:
Výzkumný ústav rostlinné výroby, v.v.i.

Podíl předkladatele na výsledku: **60 %**

Anotace dle RIV:

Dynamics of cold tolerance and crown proteome composition has been analysed in a set of two winter wheat cultivars Mironovskaya 808 and Bezostaya 1 and four reciprocal substitution lines with interchanged chromosomes 5A and 5B during a long-term cold-acclimation (CA) treatment. Proteome analysis has revealed 298 differently abundant spots during experiment. Most of them (260) were changed due to CA process and only 52 spots displayed differences between genotypes. Two hundred and seven protein spots were successfully identified by tandem mass spectrometry. Comparison of samples before and after vernalization fulfillment by a combination of ANOVA and Student? T-test displayed ten differentially abundant protein spots (e.g. chopper chaperones). However,differences in the accumulation of these spots did not reflect differences in vernalization requirement of genotypes. Therefore, our results indicate that vernalization process has not influenced total proteome of CA wheat crowns. A few p

Odůvodnění předkladatele:

This original research paper focuses on the winter-wheat crown proteome response to long-term cold treatment using two-dimensional fluorescence difference in-gel electrophoresis (2D-DIGE). The plant stress proteomics research at the Crop Research Institute (CRI) has been awarded in 2014: Dr. Klára Kosová (one of the authors from CRI of the nominated research result) has become one of the 13 finalists of L´Oreal Foundation „For Women in Science“ for young female scientists (under the age of 35) for her research work in the field of plant stress proteomics. The research on plant proteome response to abiotic stress factors represents a novel research approach to study plant (crop) response to abiotic stress leading to an identification and functional characterization of protein markers responsible for an enhanced plant (crop) stress tolerance. Two cultivars of winter wheats Mironovskaya 808 and Bezostaya 1 and four chromosome substitution lines, differing in acquired frost tolerance as well as vernalization requirements, were investigated using 2D-DIGE. The work is focused at identifying proteins that reveal a differential abundance between the two genotypes, as well as proteins that reveal differential abundance between unvernalized vs vernalized plants. Out of 298 differentially abundant proteins detected on 2D-DIGE gels, 212 were identified by MALDI-TOF/TOF MS. The identification of 52 differentially abundant proteins revealing differences between the genotypes, as well as 14 proteins revealing differences between the substitution lines, is of high importance for the scientific community. These proteins can serve as protein markers associated either with differences in acquired frost tolerance, or with differences between unvernalized and vernalized plants.

Odůvodnění panelu:

Výsledek výzkumu se značným potenciálem prezentovaný ve vysoce hodnoceném periodiku (IF 4), špičková metodika, postupy se značnými možnostmi v dalším výzkumu. Výsledky mohou přinést i cenné praktické výstupy pro vývoj a pěstování zemědělských plodin. Kval

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Antimicrobial properties of selected essential oils in vapour phase against foodborne bacteria

Nedorostová Lenka, Klouček Pavel, Kokoška Ladislav, Štolcová Miluše, Pulkrábek Josef

Identifikátor: **RIV/60460709:41610/09:29801**

Předkladatel výsledku do Pilíře II.:
Česká zemědělská univerzita v Praze Institut tropů a subtropů

Podíl předkladatele na výsledku: **100 %**

Anotace dle RIV:

The aim of this study was to identify antimicrobial properties of essential oils in vapour phase. In vitro antibacterial activity against five foodborne bacteria (Escherichia coli, Listeria monocytogenes, Pseudomonas aeruginosa, Salmonella enteritidis, Staphylococcus aureus) was evaluated by disc volatilization method. The results were expressed as minimum inhibitory concentrations (MIC) in μl/cm3 of air. Thirteen of the 27 essential oils were active at least against one bacterial strain in the range of tested concentrations (0.0083–0.53 μl/cm3). The best results were shown by Armoracia rusticana (MIC 0.0083 μl/cm3) against all of the strains, followed by Allium sativum > Origanum vulgare > Thymus vulgaris > Satureja montana, Thymus pulegioides > Thymus serpyllum > Origanum majorana > Caryopteris x clandonensis, Hyssopus officinalis, Mentha villosa, Nepeta x faassenii, Ocimum basilicum var. grant verte. In conclusion, certain essential oils are highly effective in vapour phase and coul0

Odůvodnění předkladatele:

Natural products have always been associated with food preservation and there is ongoing trend to explore new alternatives to control foodborne diseases, giving priority to methods that reduce disease incidence and avoid negative and side effects on human. This article identifies antimicrobial properties of essential oils in vapour phase against five foodborne bacteria (Escherichia coli, Listeria monocytogenes, Pseudomonas aeruginosa, Salmonella enteritidis, Staphylococcus aureus) by disc volatilization method. The results confirm the antimicrobial properties of essential oils from following commonly used plants (in erspective order of their antimicrobial aktivity) Armoracia rusticana > Allium sativum > Origanum vulgare > Thymus vulgaris > Satureja montana. Thymus pulegioides > Thymus serpyllum > Origanum majorana and others. The study has got not only high citation rate, but is also important because it justifies the use of selected aromatic plants as food preservatives and reveals their future potential in food processing and preservation. The citation of the article: 52 in all databases, 49 in Web of Science Core Collection. The journal Food Control belongs to Q1 of the category FOOD SCIENCE & TECHNOLOGY. Impact factor 2012 is 2,738, 5-year impact factor is 3,006.

Odůvodnění panelu:

Vědecká práce na mezinárodní úrovni, studující dopad kontaminace potravních řetězců bakteriemi na kvalitu potravin a lidské zdraví. Práce se značným odborným i praktickým přínosem, publikovaná v kvalitním periodiku (IF 3) s velmi dobrým citačním ohlasem (

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

BioBos IBR delet in, vakcína

Kovařčík Kamil, Fichtelová Věra

Identifikátor: **RIV/00027162:_____/13:#0001080**

Předkladatel výsledku do Pilíře II.:
Výzkumný ústav veterinárního lékařství, v.v.i.

Podíl předkladatele na výsledku: **100 %**

Anotace dle RIV:

The aim of this study was to identify antimicrobial properties of essential oils in vapour phase. In vitro antibacterial activity against five foodborne bacteria (Escherichia coli, Listeria monocytogenes, Pseudomonas aeruginosa, Salmonella enteritidis, Staphylococcus aureus) was evaluated by disc volatilization method. The results were expressed as minimum inhibitory concentrations (MIC) in μl/cm3 of air. Thirteen of the 27 essential oils were active at least against one bacterial strain in the range of tested concentrations (0.0083–0.53 μl/cm3). The best results were shown by Armoracia rusticana (MIC 0.0083 μl/cm3) against all of the strains, followed by Allium sativum > Origanum vulgare > Thymus vulgaris > Satureja montana, Thymus pulegioides > Thymus serpyllum > Origanum majorana > Caryopteris x clandonensis, Hyssopus officinalis, Mentha villosa, Nepeta x faassenii, Ocimum basilicum var. grant verte. In conclusion, certain essential oils are highly effective in vapour phase and coul0

Odůvodnění předkladatele:

Natural products have always been associated with food preservation and there is ongoing trend to explore new alternatives to control foodborne diseases, giving priority to methods that reduce disease incidence and avoid negative and side effects on human. This article identifies antimicrobial properties of essential oils in vapour phase against five foodborne bacteria (Escherichia coli, Listeria monocytogenes, Pseudomonas aeruginosa, Salmonella enteritidis, Staphylococcus aureus) by disc volatilization method. The results confirm the antimicrobial properties of essential oils from following commonly used plants (in erspective order of their antimicrobial aktivity) Armoracia rusticana > Allium sativum > Origanum vulgare > Thymus vulgaris > Satureja montana. Thymus pulegioides > Thymus serpyllum > Origanum majorana and others. The study has got not only high citation rate, but is also important because it justifies the use of selected aromatic plants as food preservatives and reveals their future potential in food processing and preservation. The citation of the article: 52 in all databases, 49 in Web of Science Core Collection. The journal Food Control belongs to Q1 of the category FOOD SCIENCE & TECHNOLOGY. Impact factor 2012 is 2,738, 5-year impact factor is 3,006.

Odůvodnění panelu:

Vědecká práce na mezinárodní úrovni, studující dopad kontaminace potravních řetězců bakteriemi na kvalitu potravin a lidské zdraví. Práce se značným odborným i praktickým přínosem, publikovaná v kvalitním periodiku (IF 3) s velmi dobrým citačním ohlasem (

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

CTX-M-15-producing Escherichia coli clone B2-O25b-ST131 and Klebsiella spp. isolates in municipal wastewater treatment plant effluents

Monika Dolejská; Frolková Petra; Kutilová Iva; Alois Čížek; Ivan Literák

Identifikátor: **RIV/62157124:16270/11:43870880**

Předkladatel výsledku do Pilíře II.:
Veterinární a farmaceutická univerzita Brno Fakulta veterinární hygieny a ekologie

Podíl předkladatele na výsledku: **60 %**

Anotace dle RIV:

The global occurrence of antibiotic resistance genes in bacteria in water environments is an increasing concern. Treated wastewater was sampled daily over a 45 day period from the outflow of a municipal wastewater treatment plant in Brno, Czech Republic,and examined for extended-spectrum beta-lactamase (ESBL)-producing bacteria. The results highlight the inadequacy of the treatment process in removing multiresistant bacteria from municipal wastewater and point to a risk of transmission of clinically important multiresistant strains, such as the pandemic ST131 clone, to the environment.

Odůvodnění předkladatele:

The study highlights municipal waste waters as an important source of virulent and antibiotic-resistant bacteria. Treated waste water was sampled daily from the outflow of a municipal wastewater treatment plant in the city of Brno, Czech Republic, and examined for bacteria with clinically important resistance to cephalosporin antibiotics. Two thirds of water samples contained cephalosporin-resistant bacteria; majority of the samples were positive for multiresistant highly virulent uropathogenic clone E. coli B2-O25b-ST131. This clone represents high risk bacterial lineage currently disseminating in humans and animals all round the world. This is the first evidence of the role of urban waste waters in transmission of high risk clones to the environment. The study demonstrates insufficient waste water treatment process in removing highly resistant virulent bacteria. Project information: Project no. GPP502/10/P083, Grant Agency: Czech Science Foundation, Years od investigation: 2010-2012. Information about project is available in atachement.

Odůvodnění panelu:

Hodnotný výsledek mezinárodního týmu, publikovaný v renomovaném periodiku (IF 5,4). Výsledek s potenciální možností praktických aplikací, zabývající se humánními riziky, spojenými s výskytem patogenních bakterií rezistentních vůči antibiotikům, ve vyčiště

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Effect of drought on yield variability of key crops in Czech Republic

Hlavinka Petr, Trnka Miroslav, Semerádová Daniela, Dubrovský Martin, Žalud Zdeněk

Identifikátor: **RIV/62156489:43210/09:00131583**

Předkladatel výsledku do Pilíře II.:
Mendelova univerzita v Brně Agronomická fakulta

Podíl předkladatele na výsledku: **73 %**

Anotace dle RIV:

The relationship between seasonal agricultural drought and detrended yields (within a period from 1961 to 2000) of selected crops was assessed in the conditions of the Czech Republic, which are to some extent representative of a wider area of Central Europe. Impact of water stress was analyzed using time series of yields for 8 crops (spring barley, winter wheat, grain maize, potato, winter rape, oats, winter rye and hay from permanent meadows) for 77 districts in the Czech Republic (average district area is 1025 km2).

Odůvodnění předkladatele:

This article is very important contribution to understand of global climate change and its impact on production of agricultural products. The relationship between seasonal agricultural drought and detrended yields (within a period from 1961 to 2000) of selected crops was assessed in the conditions of the Czech Republic, which are to some extent representative of a wider area of Central Europe. Impact of water stress was analyzed using time series of yields for 8 crops (spring barley, winter wheat, grain maize, potato, winter rape, oats, winter rye and hay from permanent meadows).

Odůvodnění panelu:

Rozsáhlá komplexní studie s velmi aktuálním tématem dopadu sucha na variabilitu klíčových plodin v ČR a s významným potenciálním dopadem, publikovaná v kvalitním vědeckém periodiku (IF 4,2). Vysokou mezinárodní odezvu potvrzuje množství citací (40 citací

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Effects of exposure to sublethal propiconazole on the antioxidant defense system and Na+-K+-ATPase activity in brain of rainbow trout, Oncorhynchus mykiss

Li Zhihua
Žlábek Vladimír

Identifikátor: **RIV/60076658:12520/10:00011407**

Předkladatel výsledku do Pilíře II.:
Jihočeská univerzita v Českých Budějovicích Fakulta rybářství a ochrany vod

Podíl předkladatele na výsledku: **90 %**

Anotace dle RIV:

Propiconazole (PCZ), a triazole fungicide, is widely present in the aquatic environment, but little is known regarding its chronic toxicity in the fish brain. This study assessed the effects of long-term exposure to PCZ on the antioxidant defense systemand Na+-K+-ATPase activity of rainbow trout brain. Fish were exposed to sublethal concentrations of PCZ (0.2, 50, and 500_g/l) for 7, 20, and 30 days, respectively. Oxidative stress indices (reactive oxygen species, lipid peroxidation, and carbonyl protein) and antioxidantparameters (superoxide dismutase, catalase, glutathione peroxidase, glutathione reductase, and reduced glutathione) were measured, as well as Na+-K+-ATPase activity. Adaptive responses to PCZ-induced stress were observed at 7 days. With prolonged exposure, significantly higher levels of oxidative indices were indicative of oxidative stress, as also were the significant inhibition of antioxidant enzyme activity and reduced glutathione content. Na+-K+-ATPase activity was

Odůvodnění předkladatele:

Currently public concern about the impact of pesticides, including fungicides, on environmental health is greater than ever before. Pesticides are essential in agricultural production, but they constitute a potential risk to non target organisms which are exposed to them through various ways. Propiconazole, a triazole fungicide, is widely present in the aquatic environment, but little is known regarding its chronic toxicity to aquatic organisms. Therefore, wide range of biomarkers was used to study in vivo effects of chronic exposure of fish to propiconazole. In brief, this study assessed the effects of long-term exposure to sublethal concentrations of propiconazole on the antioxidant defense system and membrane transport proteins of rainbow trout (Oncorhynchus mykiss). Advanced chemometric evaluation of collected data was used for comprehensive interpretation of results. In summary, even low level of oxidative stress induced the adaptive responses of the antioxidant defense system, while prolonged exposure to propiconazole lead to serious oxidative damage in fish brain. The study revealed harmful effects of propiconazole to non target organisms. It was concluded, that selected biochemical markers in fish brain can be used as potential biomarkers for monitoring residual fungicides present in the aquatic environments. Therefore the present study brought new insights into risk evaluation of emerging pesticides in the aquatic environment.

Odůvodnění panelu:

Hodnotný výsledek mezinárodního týmu, publikovaný v renomovaném časopise (IF 3,9) s vysokým citačním ohlasem (30 citací světového rozsahu za 4 roky, z toho 13 autocitací). Přes relativně úzké zaměření se jedná o kvalitní výsledek významný pro rozvoj oboru

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Imunoenzymatická souprava k průkazu antigenu viru jarní virémie kaprů (SVCV) v orgánových homogenátech

Kovařčík Kamil, Matějíčková-Cinková Kateřina, Veselý Tomáš

Identifikátor: **RIV/00027162:_____/11:#0000839**

Předkladatel výsledku do Pilíře II.:
Výzkumný ústav veterinárního lékařství, v.v.i.

Podíl předkladatele na výsledku: **100 %**

Anotace dle RIV:

Byla vyvinuta imunoenzymatická souprava k průkazu antigenu viru jarní virémie kaprů (SVCV) v orgánových homogenátech.

Odůvodnění předkladatele:

Production of fish is important source and component of human nutrition and it is in worldwide focus nowadays. One of limiting factors are diseases of fish. Carp as a main species in the Czech Republic suffers with few viral diseases among them spring viremia of carp (SVC) is most important. SVC is economically important infection disease affecting all categories of carp especially in springtime. Fish have swollen body cavity, exophthalmos and hemorrhages in eye, skin, fish bases and internal organs. Mortality reaches sometimes 90%. Due to lack of commercially available vaccine main goal is elimination of affected fish from production aquaculture conditions. Precise, fast and robust diagnostics is of inevitable necessity, thus development of "Imunoenzymatic kit for the detection of spring viremia of carp virus in organ homogenates" exactly follows this aim. Method is based on reaction of specific antibodies to structural proteins of SVC virus (SVCV). Specific antibodies were prepared in experimental animals by use of hyperimunization with Czech isolate of SVCV. Samples of organs from affected fish are investigated in serial reactions in microtitration plate and finally visualized with reaction peroxidase conjugate – chromogen. Negative and positive control samples are included. The method was commercialized in collaboration with Test-Line Diagnostics and is recently used in different fish virological laboratories in EU member states.

Odůvodnění panelu:

Výsledek aplikovaného výzkumu na mezinárodní úrovni, který finalizoval testy ELISA (metoda detekce antigenu viru) do komerčního setu, jehož využití je deklarováno v mnoha laboratořích zemí EU.

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Multi-residue method for trace level determination of pharmaceuticals in environmental samples using liquid chromatography coupled to triple quadrupole mass spectrometry

Grabic Roman Fedorova Ganna

Identifikátor: **RIV/60076658:12520/12:43883487**

Předkladatel výsledku do Pilíře II.:
Jihočeská univerzita v Českých Budějovicích Fakulta rybářství a ochrany vod

Podíl předkladatele na výsledku: **75 %**

Anotace dle RIV:

A multi-residue method for the simultaneous determination of more than 90 pharmaceuticals in water samples was developed and validated. The developed method utilizes a single liquid chromatography-tandem mass spectrometry (LC-MS/MS) run after sample enrichment using solid-phase extraction (SPE). The pharmaceuticals included in this method were chosen based on their potency (effect/concentration ratio) and potential to bioaccumulate in fish. Because the selection was based on ecotoxicological criteria and not on ease of detection, the pharmaceuticals have a wide range of physico-chemical properties and represent 27 distinct classes. No method for surface, waste water or similar matrices was previously described for 52 of the 100 target analytes. Four chromatographic columns were tested to optimize the separation prior to detection by mass spectrometry (MS). The resulting method utilizes a Hypersil Gold aQ column. Three different water matrices were tested during method validation: Milli

Odůvodnění předkladatele:

Pharmaceuticals were recently recognized as emerging pollutants originated from its human and veterinary use. The relevancy of the active pharmaceutical ingredients to its possible effect on aquatic organisms can be predicted with different models. The development of the liquid chromatography mass spectrometric method for determination of pharmaceuticals range, prioritized using fish plasma model, is described in the article. One hundred of analytes were selected based on the model criterions. The included compounds represent 27 different pharmaceuticals classes with a wide variety of physico-chemical properties. Both chromatographic and mass spectrometry conditions were optimized to achieve acceptable method performance for all of the compounds in one LC/MS run. Matrix matching standard method had to be applied for correction of matrix effects on mass spectrometric detection. For significant part of this range it was the first analytical protocol in environmental matrices published. It has laid the bases for revealing of pharmaceuticals fate in the environment and monitoring of the target compounds in fishery products. The method enables further development of analytical tools needed in environmental chemistry as well as in food safety areas.

Odůvodnění panelu:

Významný výsledek mezinárodního týmu s pozitivním dopadem pro rozvoj oboru. Výsledek je publikovaný v kvalitním časopise (IF 3,75) s dobrým citačním ohlasem (13 citací za 2 roky, z toho 3 autocitace). Práce je vysoce hodnocena přes relativně nižší podíl č

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Natural development and regeneration of a Central European mountain spruce forest

Svoboda Miroslav, Janda Pavel, Bače Radek, Zenáhlíková Jitka

Identifikátor: **RIV/60460709:41320/10:#0000004**

Předkladatel výsledku do Pilíře II.:
Česká zemědělská univerzita v Praze Fakulta lesnická a dřevařská

Podíl předkladatele na výsledku: **80 %**

Anotace dle RIV:

Mountain Norway spruce forests of Central Europe have a very long tradition of use for timber production; however, recently there has been increasing concern for their role in maintaining biological diversity. This concern, coupled with recent severe windstorms that led to wide-spread bark beetle outbreaks, has brought the management of mountain spruce forests to the forefront of public policy discussions in Central Europe. In order to shed light on the natural development and current structure of mature mountain spruce forests, we established four 0.25 ha research plots in a semi-natural mountain spruce forest in the Šumava Mountains, Czech Republic.

Odůvodnění předkladatele:

The novelty of this study is the innovative perspective of the development and dynamics of mountain spruce forests in central Europe. The authors demonstrated the critical role of disturbances that influence the structural development of mountain spruce forests; traditional paradigms of structural development typically disregarded the importance of disturbance in providing structural diversity. The results are very relevant for the management in protected forests in central Europe and will help forest managers better manage for a diversity of ecosystem values. The importance of this study was demonstrated by a high number of citations in the WOS database; as of 20.6.2014, the study had been cited 30 times. This study has advanced our knowledge of forest dynamics within the European and worldwide scientific community.

Odůvodnění panelu:

Komplexní studie mezinárodního týmu s klíčovou rolí českých autorů na vysoké úrovni v daném oboru. Práce je publikovaná v kvalitním periodiku (IF 2,667) s velmi dobrou citační odezvou (30 citací, z toho 17 citací v pracích mezinárodních výzkumných organiz

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Pivo se sníženým obsahem glutenu a způsob jeho výroby

Škach Josef, Prokeš Josef, Hašková Danuša

Identifikátor: **RIV/60193697:_____/13:#0000841**

Předkladatel výsledku do Pilíře II.:
Výzkumný ústav pivovarský a sladařský, a.s.

Podíl předkladatele na výsledku: **100 %**

Anotace dle RIV:

Pivo se sníženým obsahem glutenu vyrobené ze sladiny obsahující 50 až 100 % hmotnostních ječného sladu, přičemž toto pivo obsahuje maximálně 10 mg glutenu na 100 g sušiny. Způsob výroby tohoto piva se sníženým obsahem glutenu, zejména piva vhodné pro celiatiky, obsahujícího sypání ječného sladu 50 až 100 % hmotnostních, přičemž ječný slad obsahuje gluten, spočívá ve snižování obsahu glutenu ve vyrobeném pivu srážením bílkovin taninem a/nebo hydrolýzou bílkovin proteázami a/nebo náhradou části ječného sladu do 50 % hmotnostních sladem z pohanky a/nebo škrobovými sirupy, přičemž maximální obsah glutenu je 10 mg na 100 g sušiny.

Odůvodnění předkladatele:

viz příloha KV04_ico_60193697

Odůvodnění panelu:

Významný výsledek aplikovaného výzkumu s potenciálem širokého praktického využití a pozitivním dopadem pro rozvoj oboru, završený patentem. Rozšiřuje stravovací možnosti širokému okruhu spotřebitelů, trpících celiakií. Přesto, že se jedná o národní patent

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Preparation of the Formaurindicarboxylic Acid Base and its Derivations and Use

Klein Pavel

Identifikátor: **RIV/00027014:_____/11:#0001352**

Předkladatel výsledku do Pilíře II.:
Výzkumný ústav živočišné výroby, v.v.i.

Podíl předkladatele na výsledku: **75 %**

Anotace dle RIV:

A pharmaceutical composition comprising at least 0,1 ?mol of formaurindicarboxylic acid or its derivatives in 1 kg of pharmaceutically acceptable carrier. The pharmaceutical composition of claim 1 wherein the composition is in the form of solution prepared using aqueous alcali or water.

Odůvodnění předkladatele:

The invention relates to the preparation for prevention and therapy of coccidial infections, against which formaurindicarboxylic acid and its derivatives are used as highly effective anticoccidical agent. Coccidia parasites infect a wide range of animal species, especially farm animals where they cause significant economic losses due to mortality, morbidity, lower performance and extra costs associated with treatment and prevention. One of common coccidian genera found in farm animals is Cryptosporidium. Cryptosporidium parvum typically infests the small intestine of neonates of ruminants, and is also human pathogen. Ruminant species must be treated by anticoccidials covering now all known coccidian species. A problem accompanying the use of these drugs is the risk of resistance and the need to rotate treatment programmes. These drawbacks of existing treatments are eliminated using a preventive and therapeutical treatment against coccidioses by the invention, wherein 1 kg of suitable carrier contains at least 0.1 μmol of formaurindicarboxylic acid and its derivatives. In addition, because of the mechanism of action of these compounds, there is reason to believe that may be also used against other protozoal infections, if administered in an appropriate formulation.

Odůvodnění panelu:

Významný výsledek mezinárodně patentově chráněný (U.S. patent) s přínosem pro rozvoj oboru a potenciálem pro praktické využití, zavádějící metodologii výroby ormaurindicarboxylové kyseliny jako prostředku pro potlačení aktivity patogenů rodu Cryptosporidi

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Streamlining sample preparation and gas chromatography-tandem mass spectrometry analysis of multiple pesticide residues in tea

Čajka T.; Bachanova V.; Drábová L.; Kalachová K.; Pulkrabová J.; Hajšlová J.

Identifikátor: **RIV/60461373:22330/12:43894736**

Předkladatel výsledku do Pilíře II.:
Vysoká škola chemicko-technologická v Praze Fakulta potravinářské a biochemické technologie

Podíl předkladatele na výsledku: **95 %**

Anotace dle RIV:

In this work, a new rapid method for the determination of 135 pesticide residues in green and black dry tea leaves and stalks employing gas chromatography coupled to tandem mass spectrometry (GC-MS/MS) with a triple quadrupole was developed and validated. A substantial simplification of sample processing prior to the quantification step was achieved: after addition of water to a homogenised sample, transfer of analytes into an acetonitrile layer was aided by the addition of inorganic salts. Bulk co-extracts, contained in the crude organic extract obtained by partition, were subsequently removed by liquid-liquid extraction using hexane with the assistance of added 20% (w/w) aqueous NaCl solution. The importance of matrix hydration prior to the extraction for achieving good recoveries was demonstrated on tea samples with incurred pesticide residues. For most of the analytes, recoveries in the acceptable range of 70-120% and repeatabilities (relative standard deviations, RSDs) ?20% were a

Odůvodnění předkladatele:

To reduce consumers´ dietary exposure to potentially toxic chemicals, efficient control methods have to be available. Tea represents a commodity that may contain various contaminants, mainly pesticide residues that are of health concern. However, their analysis is rather complicated due to high amounts of caffeine that is commonly co-isolated with target analytes and interferes with their reliable determination. In this work, a new rapid method for the determination of 135 pesticide residues in green and black dry tea leaves and stalks employing gas chromatography coupled to tandem mass spectrometry (GC-MS/MS) was developed and validated. A substantial simplification of sample processing prior to the quantification step was achieved. The importance of matrix hydration prior to the extraction for achieving good recoveries was demonstrated on tea samples with incurred pesticide residues. For most of the analytes, recoveries in the acceptable range and repeatabilities were achieved for both matrices. Under optimized GC-MS/MS conditions, most of the analytes gave lowest calibration level ? 0.01 mg/kg, permitting the control at the maximum residue levels (MRLs) laid down in Regulation (EC) No 396/2005. The analyses of real tea samples documented a frequent occurrence of pesticide residue cocktails (up to 18 different residues determined in a single sample) thus documenting the need of an efficient contamination control.

Odůvodnění panelu:

Výsledek s významným mezinárodním přesahem, prezentující formou publikace v prestižním vědeckém časopise (IF 4,5) metodiku nově vyvinuté špičkové laboratorní analýzy k detekci 135 reziduí pesticidů v suchých listech čaje. Zájem vědecké komunity o výsledek

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

A multi-phase model of runaway core-mantle segregation in planetary embryos

Ondřej Šrámek

Identifikátor: **RIV/00216208:11320/09:00207182**

Předkladatel výsledku do Pilíře II.:
Univerzita Karlova v Praze Matematicko-fyzikální fakulta

Podíl předkladatele na výsledku: **50 %**

Anotace dle RIV:

We present a new multiphase model of core-mantle ifferentiation in growing planetary embryos, we develop a numerical method to resolve the equations, and we analyze simulations of impact-trigerred global metal-silicate segregation

Odůvodnění předkladatele:

The paper using geophysical numerical modeling to elucidate the early evolution of planets. It disputes the classical scenario of core formation which requires both metallic and silicate components to be partially molten. The authors show that core formation starts earlier and it does not require a significant melting of the silicates. The planetary cores do not form at the end of accretion as expected earlier, but result from the merging of the already differentiated cores of planetary embryos.

Odůvodnění panelu:

Geophysical numerical modelling concerning with the early evolution of planets is very progressive set of methods for a better understanding of long-term history of the Earth and other planets in the solar system. The paper is an excellent study of very h

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

A thermodynamic model for titanium and ferric iron solution in biotite

Tajčmanová, Lucie

Identifikátor: **RIV/00025798:_____/09:00000016**

Předkladatel výsledku do Pilíře II.:
Česká geologická služba

Podíl předkladatele na výsledku: **90 %**

Anotace dle RIV:

Recent crystallographic data indicate that in biotite Ti and Fe3+ order preferentially onto the M2 octahedral site rather than onto the M1 site as assumed in previous solution models for K2O?FeO?MgO?Al2O3?SiO2?H2O?TiO2?O2 (KFMASHTO) biotite. In view of these data, we reformulate and reparameterize the former biotite solution model. Our reparameterization takes into account Fe-Mg order-disorder and ferric iron contents of natural biotites as well as both natural and experimental observations on biotite Ti-content over a wide range of physicochemical conditions. In comparison to previous biotite models, the new model reproduces the Ti-content and stability field of biotite as constrained by experiments with significantly better accuracy. The predictive power of the model is tested by comparison with petrologically well-characterized natural samples of SiO2-saturated and SiO2-undersaturated rocks that were not used in the parameterization. In all of these tests, the reformulated model per

Odůvodnění předkladatele:

Thermodynamic modelling of phase equilibria is an important tool for quantification of petrology observations. Results of the modelling serve as key inputs in the geodynamic models which reflect our understanding the processes in the Earth's interor. It is therefore important that our petrology quantification methods are accurate. Biotite is one of the most common minerals in the Earth's crust. It is an important phase that participates in the crustal melting. However, the thermodynamic models for biotite were not satisfactory. The former available models predicted the meting curve in about 70-100?C lower than documented by experimental data. Therefore, our publication brought a new thermodynamic model which was calibrated against the experimental data where the melting curve is controlled with respect to pressures and temperatures. Furthermore, the new model is also based on carefully selected crystallographic information on cation substitutions. The model allows for more accurate modeling of crustal melting and therefore contributes to our better understanding the Erath's processes. The scientific quality of the paper is evidenced by a high number of citations since 2009 (55 in all data bases, WOS).

Odůvodnění panelu:

The original publication about new thermodynamic modelling of phase equilibrium in relation to geochemical processes in the Earth crust (using biotite, etc.) is an excellent example of progress in these specific topics. The research was mainly performed a

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Atlas půd České republiky

Kozák Josef

Identifikátor: **RIV/60460709:41210/09:30676**

Předkladatel výsledku do Pilíře II.:
Česká zemědělská univerzita v Praze Fakulta agrobiologie, potravinových a přírodních zdrojů

Podíl předkladatele na výsledku: **50 %**

Anotace dle RIV:

Atlas se skládá ze sedmi částí. První část se zaměřuje na obecné stati o půdě, problematiku funkcí půd, ohrožení půd, vyčleňování ohrožených oblastí, průzkum a mapování půd a informační systémy o půdě. Druhá je zaměřena na moderní digitální techniky mapování půd. Třetí část představuje půdu jako porézní prostředí. Čtvrtá část je zaměřena na hodnocení a oceňování půd. Pátá část se zabývá pozemkovými úpravami. Šestá část sestává z taxonomického klasifikačního systému půd, doplněného obrázky a mapkami. Sedmá část sestává z mapových materiálů.0

Odůvodnění předkladatele:

viz. příloha

Odůvodnění panelu:

The atlas is a complex of presentations of many regional results in the topic. "Atlas of soils ...." is original as well as review publication based on many long-term pedological and pedogeographical surveys and related earlier original studies. It also i

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Constructed Wetlands for Wastewater Treatment: Five Decades of Experience

Vymazal Jan

Identifikátor: **RIV/60460709:41330/11:51661**

Předkladatel výsledku do Pilíře II.:
Česká zemědělská univerzita v Praze Fakulta životního prostředí

Podíl předkladatele na výsledku: **80 %**

Anotace dle RIV:

The paper describes the development of the technology of wastewater treatment in constructed wetlands during the last five decades. The paper also evaluates the of of constructed treatment wetlands for various types of wastewater around the world. In conclusion, the paper reveals that constructed treatment wetlands are recognized as a reliable wastewater treatment technology and they represent a suitable solution for the treatment of many types of wastewater.0

Odůvodnění předkladatele:

The paper describes the development of constructed treatment wetlands technology during the last five decades across the world and special attention was paid to the specific features in all continents. The paper summarizes the use of various types of constructed wetlands for municipal, industrial and agricultural wastewaters as well as for mine drainage waters and landfill leachate. The paper also evaluates the applicability of constructed wetlands for particular wastewaters, various design models and treatment efficiency with respect to major pollutants. Also, the current pitfalls and problems of this technology are described together with present efforts aimed at treatment efficiency improvement. The papr was the first of this kind published in the literature.

Odůvodnění panelu:

Various types of constructed wetlands for municipal, industrial and agricultural wastewaters as well as for mine drainage waters are summarized. Applicability of constructed wetlands for particular wastewaters, various design models and treatment efficien

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Diamond and coesite discovered in Saxony-type granulite: Solution to the Variscan garnet peridotite enigma

Kotková, Jana

Identifikátor: **RIV/00025798:_____/11:00000372**

Předkladatel výsledku do Pilíře II.:
Česká geologická služba

Podíl předkladatele na výsledku: **90 %**

Anotace dle RIV:

Diamond and coesite were discovered in-situ as inclusions in garnet, kyanite and zircon in high-pressure granulites from northern Bohemian Massif. These continental crustal rocks were therefore subducted to depths of c. 140 km, which also explains theircommon association with mantle garnet-bearing peridotites. Models involving crustal thickening for these high-pressure granulites need to be significantly modified. Whole Variscan belt with numerous HP granulite occurrences can represent a large ultrahigh-pressure terrain.

Odůvodnění předkladatele:

The paper represents the first report on discovery and confirmation of microdiamonds, and coesite, in granulites – the rocks which are clearly of crustal origin - of Variscan Europe. The importance of this publication lies in several aspects. First, the discovery of microdiamond represents a milestone in the studies of high-pressure rocks in the Czech Republic, after decades of search inspired by relatively recent (25 years) advancements in the understanding of deep subduction and ultrahigh-pressure metamorphism of continental crust. Second, the find of microdiamonds in granulites explains, why the mantle rocks, garnet peridotites, are commonly associated with these crustal rocks: as presence of diamond requires pressures above 4 GPa (ultrahigh-pressures), the crustal rocks travelled down to minimum depth of 140 km, where the mantle rocks were incorporated. Third, the discovery brings along a completely new scenario of the tectonic evolution of the Bohemian Massif with ultra-deep subduction, leaving the previous models of crustal thickening behind. Fourth, if our finds are extrapolated to all the high-pressure granulite-garnet peridotite bodies which are characteristic for the Variscan Europe, this would make the area a candidate for one of the largest UHP terranes in the world. Last but not least, the in-situ find of microdiamonds is considered in the paper as a confirmation of the provenance of the "Bohemian Diamonds" found in 1869 and 1927 in gravels containing the world-renowned Bohemian Pyrope: stones proudly displayed in the National Museum in Prague. For the reasons above, the paper has attracted attention of the international geological community, and it has been widely cited (29 times – equally Web of Science and Scopus - since its publication in July 2011). Journal "Geology", where the paper has been published, has been the Web of Science´s No 1 ranked "geology" journal for seven years in a row, its impact factor corresponding to 4.087 (5-year IF 4.66)

Odůvodnění panelu:

It is very interesting paper with important results for the understanding of the formation of ultra high pressure terranes during the Variscan orogeny in Europe and also in general. A deep continental subduction is required to explain in situ discovery of

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Dynamical consequences in the lower mantle with the post-perovskite phase change and strongly depth-dependent thermodynamic and transport properties

Nicola Tosi, Ondřej Čadek

Identifikátor: **RIV/00216208:11320/10:10050637**

Předkladatel výsledku do Pilíře II.:
Univerzita Karlova v Praze Matematicko-fyzikální fakulta

Podíl předkladatele na výsledku: **80 %**

Anotace dle RIV:

We have carried out numerical simulations of large aspect-ratio 2-D mantle convection with the deep phase change from perovskite (pv) to post-perovskite (ppv). Using the extended Boussinesq approximation for a fluid with temperature- and pressure-dependent viscosity, we have investigated the effects of various ppv phase parameters on the convective planform, heat transport and mean temperature and viscosity profiles. Since ppv is expected to have a relatively weak rheology with respect to pv and a largethermal conductivity, we have assumed that the transition from pv to ppv is accompanied by both a reduction in viscosity by 1 to 2 orders of magnitude and by an increase in thermal conductivity by a factor of 2. Furthermore, we have analyzed the combined effects of a strongly decreasing thermal expansivity in pv and steeply increasing thermal conductivity according to recent evidence from high-pressure experiments and first-principle calculations.

Odůvodnění předkladatele:

Geophysical paper demonstrating the effects of post-perovskite, a new mineralogical phase discovered in the lower mantle, on the style of mantle convection. By means of numerical modeling, the authors show that the presence of low-viscosity post-perovskite can explain the existence of long-lived large-scale thermal structures, observed by seismic tomography in the lower mantle.

Odůvodnění panelu:

Methodologically very progressive paper in which experimental and field data are integrated to numerical and conceptual models used for an explanation of main features of mantle convection, etc. It is an excellent research study about composition and very

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

European climate of the past 500 years: new challenges for historical climatology

BRÁZDIL, Rudolf, Petr DOBROVOLNÝ, Christian PFISTER

Identifikátor: **RIV/00216224:14310/10:00044278**

Předkladatel výsledku do Pilíře II.:
Masarykova univerzita Přírodovědecká fakulta

Podíl předkladatele na výsledku: **50 %**

Anotace dle RIV:

Temperature reconstructions from Europe for the past 500 years based on documentary and instrumental data are analysed. First, the basic documentary data sources, including information about climate and weather-related extremes, are described. Then, thestandard palaeoclimatological reconstruction method adopted here is discussed with a particular application to temperature reconstructions from documentary-based proxy data. The focus is on two new reconstructions; January April mean temperatures for Stockholm (1502-2008), based on a combination of data for the sailing season in the Stockholm harbour and instrumental temperature measurements, and monthly Central European temperature (CEuT) series (1500-2007) based on documentary-derived temperature indices of the Czech Republic, Germany and Switzerland combined with instrumental records from the same countries.

Odůvodnění předkladatele:

This is one of leading published articles which are related to the field of historical climatology. The article summarises progress achieved in climate reconstructions based on documentary data with using of standard paleoclimatological approach. These reconstructions have no temporal restrictions (monthly, seasonal and annual resolution) and compared to reconstructions based on natural climate proxies give much higher explained variance, i. e. giving better results of interannual, interdecadal and century climate variability in the European scale during the past 500 years. The article brings broad comparison of results of various reconstructions characterising their strengths and weaknesses. Moreover, it brings new characterisation of types of documentary evidence and formulates the new research challenges for research in historical climatology. The paper has a character of original research article giving concurrently many important ideas and knowledge concerning of the topic. It was published in the Climatic Change journal with editorial office in the USA and the recent impact factor is 3.63. This journal belongs to leading climatological journals and the article has recently 41 citations on WoS. Its future citing potential is still quite high and there is expected it will be very probably cited also in many new papers related to historical climatology, paleoclimatology and related fields of sciences dealing with environment and its changes during the past 500 years. See the list of reviews and bibliometrics indicators in the attachement!

Odůvodnění panelu:

The article summarises progress achieved in climate reconstructions based on documentary data with using of standard paleoclimatological approach. These reconstructions of climate variability are performed in the European region during the past 500 years.

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Heat sources and trigger mechanisms of exhumation of HP granulites inVariscan orogenic root

Ondrej Lexa, Vojtěch Janoušek, Alexandra Guy, Martin Racek

Identifikátor: **RIV/00216208:11310/11:10098788**

Předkladatel výsledku do Pilíře II.:
Univerzita Karlova v Praze Přírodovědecká fakulta

Podíl předkladatele na výsledku: **80 %**

Anotace dle RIV:

The structure of the Moldanubian domain is marked by felsic granulitesof Ordovician protolith age forming the cores of domes that are separated from mid-crustal Neoproterozoic and Palaeozoic metasedimentary rocks that occur in synclines by a late Ordovician to Silurian metabasic unit. Reflection and refraction seismic sections combined with gravity inversion modelling suggest the presence of a low density layer at the bottom of the crust (interpreted as felsic granulite) overlain by a denser layer (interpreted as amphibolite) with layers of intermediate density at the top (interpreted as metasedimentary rocks). It is proposed that the granulite domes surrounded by middle crustal rocks reflect transposed horizontal layering originally similar to that preserved in the deep crust and imaged by the geophysical surveys.

Odůvodnění předkladatele:

In this paper, we discuss a particular structural pattern in the Variscan orogenic root in which orogenic lower crust composed of felsic granulites of Ordovician protolith age forming cores of domes that are separated from mid-crustal Neoproterozoic and Palaeozoic metasedimentary rocks in synclines by a late Ordovician–Silurian metabasic layer. We argue that the origin of these structures was related to diapiric material exchange within the orogenic lower crust. The exhumation of high-pressure felsic granulites in the Bohemian Massif is interpreted in terms of tectonically triggered gravity redistribution of felsic orogenic lower crust and high density mafic crust. Our presented model shows that radioactive heat production of 4 μW/m3 for lower crustal rocks, which is corroborated by calculated values from likely protolith rocks, and the calculated P–T–t evolution satisfy the thermal and geochronological evolution of the Bohemian Massif granulites. This radioactive heat production is typical of Ordovician felsic igneous rocks, which are believed to have been relaminated at the bottom of thickened continental crust during late Devonian–early Carboniferous continental subduction. The significance of this paper is in demonstration, that processes of accretion of highly radioactive upper-crustal fragments to mantle depth, by underplating along a subduction zone may be fundamental processes controlling dynamic evolution of many collisional orogens.

Odůvodnění panelu:

In the excellent paper important concepts and original results for lithosphere dynamics are presented. It is argued that main structural patterns in the Variscan orogenic roots was related to diapiric material exchange within the orogenic lower crust. The

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Identification of beta-carotene in an evaporitic matrix-evaluation of Raman spectroscopic analysis for astrobiological research on Mars

Petr Vítek, Jan Jehlička, Kateřina Osterrothová

Identifikátor: **RIV/00216208:11310/09:10000222**

Předkladatel výsledku do Pilíře II.:
Univerzita Karlova v Praze Přírodovědecká fakulta

Podíl předkladatele na výsledku: **75 %**

Anotace dle RIV:

In this paper, Raman microspectrometry was tested as a nondestructive method of determining the lowest detectable ?-carotene content in experimentally prepared evaporitic matrices?namely, gypsum, halite and epsomite. Two excitation wavelengths were compared?514.5 and 785 nm, ?-carotene signals at the 0.1 to 10 mg kg?1 level?the number of registered ?-carotene Raman bands differed depending on the particular mineral matrix and the excitation wavelength. Concentrations of ?-carotene of about one order ofmagnitude higher were identified when analysed through single crystals of gypsum and epsomite, respectively.

Odůvodnění předkladatele:

Since evaporitic rocks on the Martian surface could serve as potential habitats for microbial life on Mars, there is a reasonable possibility that these rocks may sustain molecular remnants as evidence for the presence of extinct or extant living organisms on Mars. It is shown that ?-carotene could be a suitable biomarker for planetary surface/subsurface environments. It has been proven that Raman spectrometry is a powerful tool for the characterization of various biomarkers which are produced by microbial colonies in extreme habitats as part of their survival strategy. Some of them are UV-protective pigments including carotenoids. In this work, the analytical potential of Raman microspectrometry has been demonstrated for the first time for the identification of ?-carotene in a two-component system comprising a biomarker in an evaporitic matrix. Although the 785-nm excitation wavelength is not so effective as the 514.5 nm source when analyzing carotenoids in this context, our study has shown that spectra achieved using the former wavelength excitation can still be useful in detecting ?-carotene. It was possible to identify the characteristic Raman signals of ?-carotene at a very low levels. The importance of this paper consists in the fact that this is the first paper where analytical aspects including detection limits of the biomarker/evaporitic matrix mixtures were investigated for astrobiology purposes.

Odůvodnění panelu:

The well-written paper with a good citation index is an original contribution in the field of astro-biogeochemistry. Evaporitic rocks on the Martian surface could serve as potential habitats for microbial life on Mars and they may sustain molecular remnan

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Increased dissolved organic carbon (DOC) in Central European streams is driven by reductions in ionic strength rather than climate change or decreasing acidity

Hruška, Jakub; Krám, Pavel; Oulehle, Filip

Identifikátor: **RIV/00025798:_____/09:00000139**

Předkladatel výsledku do Pilíře II.:
Česká geologická služba

Podíl předkladatele na výsledku: **90 %**

Anotace dle RIV:

Increased dissolved organic carbon (DOC) in Central European streams is driven by reductions in ionic strength rather than climate change or decreasing acidity. Investigations were performed at two geochemically distinct small forested catchments.

Odůvodnění předkladatele:

Dissolved organic carbon (DOC) concentrations have increased over the past decades in streams throughout the Northern Hemisphere. These increases have important implications for drinking water quality as well as long-term carbon balance, but it has proven difficult to ascribe changes in DOC concentrations to a specific environmental driver. Several hypotheses have been invoked to explain the observed increases in DOC concentrations. Increasing temperature leading to higher production of humic and fulvic acids in soils and peatlands was initially proposed as the cause of observed DOC increase. Other hypotheses based on climatic changes were connected with rising CO2 in the atmosphere and increasing net primary production or increasing amounts of precipitation and runoff. Recent studies conclude that DOC has increased in streams as a result of decreases in the ionic strength (IS) or acidity of soil solution and streamwater resulting from changes in atmospheric deposition. We present data from a 15-year study of DOC concentrations in soil-waters and streams draining two catchments in the Czech Republic with contrasting lithology and stream pH. Both catchments have recovered during the last 15 years from exceedingly high levels of acidic deposition, and thus provide a unique opportunity to disentangle the impacts of ionic strength, acidity, and climate on stream DOC. These long-term increases in streamwater DOC were correlated with only modest increases in stream pH in both catchments, but large declines in IS, that resulted from declining atmospheric deposition. We conclude that changes in IS of soil-water and streamwater, rather than acidity, are the primary drivers of changes in streamwater DOC in Central Europe. Temperature, precipitation and discharge show no statistically significant trends during the study period, suggesting that climate change has played no role in the changes in DOC. The paper has been cited 45x byWOS and 53x by SCOPUS.

Odůvodnění panelu:

An excellent interpretation of long-term monitoring and all relevant data about organic carbon in the streams of central Europe is based on systematic knowledge in the matter and it is correlated / confronted with climate change hypothese. It is topically

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Long memory of mantle lithosphere fabric — European LAB constrained from seismic anisotropy

Jaroslava Plomerová, Vladislav Babuška

Identifikátor: **RIV/67985530:_____/10:00348507**

Předkladatel výsledku do Pilíře II.:
Geofyzikální ústav AV ČR, v. v. i.

Podíl předkladatele na výsledku: **100 %**

Anotace dle RIV:

We present a uniform updated model of the European lithosphere?asthenosphere boundary (LAB) recalculated from data collected during our regional studies of seismic anisotropy and other tomographic experiments, and show results of mapping of large-scale domains of mantle lithosphere characterized by uniform fossil fabrics. Exploiting the long memory of the fabric of the deep continental lithosphere, we define the LAB as a boundary between a fossil anisotropy in the lithospheric mantle and an underlying seismic anisotropy related to present-day flow in the asthenosphere.

Odůvodnění předkladatele:

The authors are widely renowned for their work on structure of the lithosphere, especially by studying its anisotropic features. They originated a new model where – contrary to the traditional idea of a transversely isotropic layer with the horizontal symmetry axis representing the asthenosphere with the flow of melted mantle material overlayed by the brittle lithosphere with a vertical symmetry axis – they suggested blocks with an inclined anisotropy modelling fossil plates. To investigate the anisotropy, they developed an original approach of retrieving it in the combined search using P wave residuals and S wave splitting. Based on mapping the changes of the fossil fabric understood as the domain boundaries within the mantle lithosphere, they proposed processes which could create the observed pattern as a consequence of successive subduction and accretion of micro continent fragments outboard of continental cratons and a gradual stabilization of the lithosphere-astenosphere boundary (LAB) by a mantle flow after a detachment of the lower parts of subducting slabs. To the date, the paper has already gathered 14 citations (Web of Science, excluding auto-citations).

Odůvodnění panelu:

The paper gives original results based on a long-term theoretical and experimental (field, etc.) research. It is presented a new (updated) model of dynamic processes and patterns evolving the structure of lithosphere and lithosphere – asthenosphere bounda

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Monthly, seasonal and annual temperature reconstructions for Central Europe derived from documentary evidence and instrumental records since AD 1500

DOBROVOLNÝ, Petr, Rudolf BRÁZDIL, Monika BĚLÍNOVÁ, Jarmila BURIANOVÁ

Identifikátor: **RIV/00216224:14310/10:00058902**

Předkladatel výsledku do Pilíře II.:
Masarykova univerzita Přírodovědecká fakulta

Podíl předkladatele na výsledku: **60 %**

Anotace dle RIV:

Monthly temperature series for Central Europe back to AD 1500 are developed from documentary index series from Germany, Switzerland and the Czech Republic (1500-1854) and 11 instrumental temperature records (1760-2007). Documentary evidence from the LowCountries, the Carpathian Basin and Poland are used for cross-checking for earlier centuries. The instrumental station records are corrected for inhomogeneities, including insufficient radiation protection of early thermometers and the urban heat islandeffect. For overlapping period (1760-1854), the documentary data series correlate with instrumental temperatures, most strongly in winter (86% explained variance in January) and least in autumn (56% in September). For annual average temperatures, 81% ofthe variance is explained. Verification statistics indicate high reconstruction skill for most months and seasons.

Odůvodnění předkladatele:

This article represents one of the milestones for historical climatology. For the first time researchers dealing with historical climatology put together available documentary evidence and long instrumental measurements from Central Europe and these sources were used for quantitative reconstruction of air temperature since AD 1500. This reconstruction was compiled for all months and seasons and this is a unique feature compared to natural proxies such as tree rings. Monthly resolution allows a direct comparison of different proxy reconstructions form the same time and space. Importance of this article also lies in methodology. Statistical methods that were invented especially in dendroclimatology and that are used for calibration and verification processes were applied here to temperature indices derived from documentary evidence. Resulting proxy-reconstruction was completed with uncertainty estimates. The article was published in the Climatic Change journal with editorial office in the USA and the recent impact factor is 3.63. This journal belongs to leading climatological journals and the article has recently (June 2014) 50 citations on WoS. Its future citing potential is still quite high and there is expected it will be very probably cited also in many new papers related to historical climatology, paleoclimatology and related fields of sciences dealing with environment and its changes during the past 500 years. In the Information Register of R&D results (RIV) this article was incorrectly merged with an article of Brázdil, Rudolf, Dobrovolný, Petr, Luterbacher, Jürg, Moberg, Anders, Pfister, Christian, Wheeler, Dennis, Zorita, Eduardo. European climate of the past 500 years: new challenges for historical climatology. Climatic Change, 2010, roč. 101, č. 1–2, s. 7–40. DOI:10.1007/s10584-009-9783-z. This was a mistake of Research, Development and Innovation Council (RVVI).Correction was approved from the side of RVVI and both articles will be evaluated individually.

Odůvodnění panelu:

The fundamental summarizing contribution to paleoclimatological reconstructions published in the top journal is highly cited. Statistical methods were invented especially in dendro-climatology and used for calibration and verification processes. Results o

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

The impact of different operating conditions on membrane fouling and EPS production

Dvořák, L.; Gómez, M.; Dvořáková, M.; Růžičková, I.; Wanner, J.

Identifikátor: **RIV/60461373:22320/11:43885716**

Předkladatel výsledku do Pilíře II.:
Vysoká škola chemicko-technologická v Praze Fakulta technologie ochrany prostředí

Podíl předkladatele na výsledku: **100 %**

Anotace dle RIV:

The main goal of this research was to investigate how different factors influence membrane fouling. The impact of the different concentrations of activated sludge and the amount of extracellular polymer substances (EPS) were monitored. Two pilot plants with submerged membrane modules (hollow fiber and flat sheet) were operated and the raw wastewater was used. Humic substances were identified as the major components of EPS in the activated sludge (more than 34 %) in both pilot plants. As the basic constituent in permeate, humic substances were identified as the most dominant components in the effluent (61 %) in both pilot plants. Conversely, proteins were mostly analyzed in permeate and supernatant below the detection limit. The total amount of EPS [mg?g-1 (VSS)] was similar for concentrations of activated sludge 6, 10 and 14 g?L-1. Carbohydrates were identified as the component of EPS which tends most to clog membranes.

Odůvodnění předkladatele:

Application of membrane separation has been increasingly becoming a new widespreading field of technology mainly due to ever stricter requirements for the quality of treated waste water and the possibilities arising from its reuse. The main factor preventing a more massive utilization of this technology in the treatment of waste waters lies in the problems related to fouling of the membrane surface causing a decrease in the specific flow rate of permeate, which, in turn, reduces the efficiency of the whole membrane system and increases its financial costs. Therefore, the main aim of the research was to identify effects of different technological and operating conditions on the membrane fouling, particularly the concentration of extracellular polymers which are understood to be a major biological factor in this respect. An article summarizing the most significant results of the experiments performed was published in the world renowned magazine Bioresource Technology and it was the first complex study of its kind. Having been written exclusively by a group of authors from the ICT Prague, this article had the highest impact factor among those published within the scope of the research activities at the Faculty of Environmental Technology in the years from 2007 to 2011. The topicality of the issue is clearly reflected by other research studies frequently referring to this work. In fact, the references amounted to 24 by April 2014 including the most renowned foreign expert magazines in this domain. The quality of the article is also indicated by its stable ranking position (8th place by April 2014) in the list of the Top 20 articles dealing with this topic published since 2011 at www.WIPIMD.com.

Odůvodnění panelu:

The aims of the research were to identify effects of different technological and operating conditions on the membrane fouling, particularly the concentration of extracellular polymers which are a major biological factor in this respect. The original paper

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

The Kutná Hora Complex (Moldanubian zone, Bohemian Massif): A composite of crustal and mantle rocks subducted to HP/UHP conditions

Shah Wali Faryad

Identifikátor: **RIV/00216208:11310/09:00012737**

Předkladatel výsledku do Pilíře II.:
Univerzita Karlova v Praze Přírodovědecká fakulta

Podíl předkladatele na výsledku: **100 %**

Anotace dle RIV:

Two tectonic lenses of garnet peridotites and one of eclogite, all occurring in high-pressure granulites from the Kutná Hora Complex, were investigated. These rocks are thought to be correlative with the high-grade metamorphic Gföhl unit of the Moldanubi

Odůvodnění předkladatele:

The Bohemian massif is one of the best example of continental collision zones, where garnet-bearing ultramafic rocks and eclogites occur as fragments or boudins within gneisses or felsic granulites that mostly indicate medium- to lower-pressure conditions. Most garnet peridotites are interpreted as representing slices of an overlying subcontinental mantle wedge that were exhumed together with subducted crustal rocks. The traditionally accepted model assumed their formation by isothermal decompression or exhumation during cooling. Detailed study of mineral micro-textures and their phase and compositional relations from high-grade rocks of the Kutná Hora Complex in the Moldanubian Zone showed that they were not simply exhumed from mantle depths. This is documented by the presence of eclogite bodies with prograde zoning garnet as well as of garnet peridotites with lenses and layers of eclogite, garnet pyroxenites and garnetite that have contrast zoning garnets and do not support a simple exhumation model of these rocks from mantle depth. All these mafic and ultramafic bodies are part of felsic rocks that were reequilibrated in the granulite facies conditions. This finding led to assumption that some of mafic and ultramafic bodies could derived from shallow mantle level that were taken by felsic crustal material during subduction and reached ultrahigh-pressure conditions. These results helped to streamline further research focusing on similar rocks in the Bohemian Massif as well as worldwide occurring along orogenic zones and necessitate to modify the widely accepted model about the European Variscan Orogeny. The paper is result of research work at CUNI.

Odůvodnění panelu:

This is an important contribution in metamorphic petrology and lithosphere dynamics of the Bohemian Massif. The study deals with the PT conditions of the formation of garnet peridotite lenses in high-presure granulites and its results can be accepted as a

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

The Margins of Laurussia in Central and Southeast Europe and Southwest Asia

KALVODA, Jiří a Ondřej BÁBEK

Identifikátor: **RIV/00216224:14310/10:00047656**

Předkladatel výsledku do Pilíře II.:
Masarykova univerzita Přírodovědecká fakulta

Podíl předkladatele na výsledku: **100 %**

Anotace dle RIV:

The continuation of the Laurussian margin into central and southeast Europe and southwest Asia is defined by the Rheic suture, which becomes harder to trace to the southeast because of complex post-Variscan strike-slip displacements and tectonic stackinglinked to the Cimmerian and Alpine cycles. The uncertain extent of the Neoproterozoic Baikalian orogeny fringing Baltica, ambiguous early Paleozoic paleobiogeographic data, and strike-slip activity complicate the distinction of the Tornquist suture fromthe Transeuropean Suture Zone. There is growing evidence for the incorporation of the Brunovistulian, Malopolska and West Moesian terranes into the late Neoproterozoic?Cambrian Baltican margin. The Istanbul?Zonguldak terrane, along with the Bítesh and East Moesia terranes, may have been part of the Avalonian terrane assemblage, although an Arabian?Nubian Shield or Baltica provenance cannot be excluded.

Odůvodnění předkladatele:

The paper was published in a top ranked journal which is among 3 journals with highest impacts in geological sciences. It brings new ideas on Variscan orogeny and Paleozoic paleogeography interconnecting the area from Central Europe to Central Asia. In mid-Paleoozic the principal Rheic Ocean separated the major palaeocontinents of Gondwana and Laurussia (Laurentia–Baltica–Avalonia) and intervening Armorican Assemlage terranes. The Variscan orogeny was a result of the collision of several separate Armorican terranes with the Laurussian margin following the closure of the Rheic Ocean. The continuation of the Laurussian margin into central and southeast Europe and southwest Asia defined by the Rheic suture is masked by post-Variscan strike-slip displacements and tectonic stacking linked to the Cimmerian and Alpine cycles.The uncertain extent of the Neoproterozoic Baikalian orogeny fringing Baltica, ambiguous early Paleozoic paleobiogeographic data, and strike-slip activity complicate the distinction of the Tornquist suture (i.e. Laurussian margin) from the Transeuropean Suture Zone (i.e. Baltica margin). There is growing evidence for the incorporation of the Brunovistulian, Malopolska and West Moesian terranes into the late Neoproterozoic–Cambrian Baltican margin. The Istanbul–Zonguldak terrane, along with the Bítesh and East Moesia terranes, may have been part of the Avalonian terrane assemblage, although an Arabian–Nubian Shield or Baltica provenance cannot be excluded. The terranes of the Armorican terrane assemblage bordering the Rheic suture include the Outer Carpathian, Tatra, Getic and Balkan terranes in southeast Europe and Sakarya and the Anatolide–Tauride terrane in Turkey. Further east, the Rheic suture may be present in the Caucasus, in all probability between the Greater Caucasus and the Scythian Platform or, alternatively, between the Greater Caucasus and Transcaucasia. Alborz, in northern Iran, is interpreted as a distal part of Transcaucasia.

Odůvodnění panelu:

The evaluated paper brings actual ideas on Variscan orogeny and Paleozoic paleogeography interconnecting the area from Central Europe to Central Asia. It involves very large amount of geological and geophysical data which are critically analyzed and incor

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Approximations and Endomorphism Algebras of Modules

Jan Trlifaj

Identifikátor: **RIV/00216208:11320/12:10129322**

Předkladatel výsledku do Pilíře II.:
Univerzita Karlova v Praze Matematicko-fyzikální fakulta

Podíl předkladatele na výsledku: **67 %**

Anotace dle RIV:

This second, revised and substantially extended edition of Approximations and Endomorphism Algebras of Modules reflects both the depth and the width of recent developments in the area since the first edition appeared in 2006. The new division of the monograph into two volumes roughly corresponds to its two central topics, approximation theory (Volume 1) and realization theorems for modules (Volume 2). It is a widely accepted fact that the category of all modules over a general associative ring is too complex to admit classification. Unless the ring is of finite representation type we must limit attempts at classification to some restricted subcategories of modules. The wild character of the category of all modules, or of one of its subcategories C, isoften indicated by the presence of a realization theorem, that is, by the fact that any reasonable algebra is isomorphic to the endomorphism algebra of a module from C. This results in the existence of pathological direct sum decompositio

Odůvodnění předkladatele:

The two volumes of this monograph present the state of the art in two major areas of contemporary representation theory: the approximation theory of modules (including tilting theory), and the realization theory for endomorphism algebras. Recent results of the teams headed by the authors at Univ.Essen and Charles Univ., and by S.Shelah at Hebrew Univ. (and supported by DAAD and the German-Israeli GIF projects) are also presented here. Cf. MathSciNet reviews MR:295554 and MR:2985654.

Odůvodnění panelu:

The monograph presents the state of the art in the approximation theory of modules (including tilting theory), and the realization theory for endomorphism algebras.

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Baire classes of Banach spaces and strongly affine functions

Jiří Spurný

Identifikátor: **RIV/00216208:11320/10:10051930**

Předkladatel výsledku do Pilíře II.:
Univerzita Karlova v Praze Matematicko-fyzikální fakulta

Podíl předkladatele na výsledku: **100 %**

Anotace dle RIV:

The paper investigates strongly affine functions on metrizable simplices and their relation to the structure of Banach spaces

Odůvodnění předkladatele:

The paper presents a deep result on behavior of strongly affine functions on simplices. The main result of he paper provides a counterexample to a conjecture of Argyros, Godefroy and Rosenthal published in the monograph S.A. Argyros, G. Godefroy and H.P. Rosenthal, Descriptive set theory and Banach spaces, Handbook of the geometry of Banach spaces, Vol. II, North-Holland, Amsterdam, 2003, 1007-1069. The journal Transactions of the American Mathematical Society has the impact factor 1.019 which ranks it on the 38th place out of 296 journals and is considered to be one of the most prestigious journals in the field of functional analysis.

Odůvodnění panelu:

Presenting a counter-example of a pass-current conjecture, the paper presents a top-level result on behavior of strongly affine functions on simplices.

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Deformation theory of algebras and their diagrams

Markl Martin

Identifikátor: **RIV/67985840:_____/12:00379741**

Předkladatel výsledku do Pilíře II.:
Matematický ústav AV ČR, v. v. i.

Podíl předkladatele na výsledku: **50 %**

Anotace dle RIV:

This book brings together both the classical and current aspects of deformation theory. The presentation is mostly self-contained, assuming only basic knowledge of commutative algebra, homological algebra and category theory. In the interest of readability, some technically complicated proofs have been omitted when a suitable reference was available. The relation between the uniform continuity of algebraic maps and topologized tensor products is explained in detail, however, as this subject does not seem to be commonly known and the literature is scarce.

Odůvodnění předkladatele:

The book is based on the idea formulated independently by M. Markl and Fields medalist Maxim Kontsevich at the beginning of the 1990s. They suggested that, in order to understand deformations of an algebraic structure, one needs to study free acyclic resolutions of the corresponding colored operad. The monograph summarizes the achievements of the last two decades, treating the subject of deformation theory from a modern perspective, which emphasizes the role of differential graded (Lie algebras, Maurer-Cartan spaces and operadic structures). The author substantially contributed to this new understanding of the subject. The presentation is mostly self-contained, assuming only basic knowledge of commutative algebra, homological algebra and category theory. In the interest of readability, some technically complicated proofs have been omitted when a suitable reference was available. The relation between the uniform continuity of algebraic maps and topologized tensor products is explained in detail, as this subject does not seem to be commonly known and the literature is scarce. The exposition begins by recalling Gerstenhaber's classical theory for associative algebras. The focus then shifts to a homotopy-invariant setup of Maurer-Cartan moduli spaces. As an application, Kontsevich's approach to deformation quantization of Poisson manifolds is reviewed. Then, after a brief introduction to operads, a strongly homotopy Lie algebra governing deformations of (diagrams of) algebras of a given type is described, followed by examples and generalizations. This part of the book depends heavily on the previous work of the author. Markl's monograph is a valuable addition to the existing literature on deformation theory; it gives a concise and relatively elementary introduction to the subject, leading up to topics of current research.

Odůvodnění panelu:

Deep mathematics collected in the book with quite a piece contributed by the author.

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Forcing with random variables and Proof Complexity

Jan Krajíček

Identifikátor: **RIV/00216208:11320/11:10105303**

Předkladatel výsledku do Pilíře II.:
Univerzita Karlova v Praze Matematicko-fyzikální fakulta

Podíl předkladatele na výsledku: **50 %**

Anotace dle RIV:

We develop a new method for constructing models of bounded arithmetic and apply it to proof complexity.

Odůvodnění předkladatele:

The book provides quite a new method for lower estimates in the theory of proof complexity. The research presents one of the few theories aiming at the "P vs. NP" problem, which is listed among the 7 most important mathematical ("Millenium") problems according to Clay's Mathematical Institute. New method, presented in the book, covers all known results in the field, proves some new ones, and formulates completely new problems. From Math.Rev. Report: Jan Krajíček is the leading expert on these problems and in this book he provides a new approach to building models of bounded arithmetic which combines methods and techniques from model theory, forcing and computational complexity. … I find Krajíček's approach a highly stimulating collage of ideas.

Odůvodnění panelu:

Very important book collecting a good piece of work of the author, who is one of the most prominent researchers in complexity theory and its connection to logic.

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Generalized ordinary differential equations : not absolutely continuous solutions

Kurzweil Jaroslav

Identifikátor: **RIV/67985840:_____/12:00375634**

Předkladatel výsledku do Pilíře II.:
Matematický ústav AV ČR, v. v. i.

Podíl předkladatele na výsledku: **100 %**

Anotace dle RIV:

This book provides a systematic treatment of the Volterra integral equation by means of a modern integration theory which extends considerably the field of differential equations. It contains many new concepts and results in the framework of a unifying theory. In particular, this new approach is suitable in situations where fast oscillations occur.

Odůvodnění předkladatele:

The book represents a major addition to the theory of nonlinear generalized ordinary differential equations. The origins of theory of generalized ordinary differential equations go back to author‘s papers from 1957-9. The main motivation was the study of continuous dependence of solutions on the right-hand side as well as the related averaging method. A representative model is the equation of motion of Kapitza’s pendulum. Since then, a number of works devoted to generalized ODEs have appeared. It became clear that many familiar types of equations (such as ODEs with impulses, measure differential equations, functional differential equations, dynamic equations on time scales) are in fact special cases of generalized ODEs. Theory of such equations is strongly connected with the theory of non-absolutely convergent integrals of the Kurzweil-Henstock type. In particular, solutions to generalized differential equations are defined as solutions of related integral equations containing this kind of an integral. This book results from author’s recent research concerning equations whose solutions take values in a Banach space. As the Kurzweil-Henstock integral is a non-absolutely convergent integral, the main aim of the treatise is exploiting this property in some convergence problems in ordinary differential equations and in some situations where solutions of finite variation can occur. The equation describing the motion of Kapitza’s pendulum is exposed and various estimates for equations of similar types are obtained by elementary methods. The results presented in the book concern two main domains: a) theory of integration, in particular, the formula for integration by parts for strong Kurzweil-Henstock integrals and integrability of a product of functions; b) existence and uniqueness of solutions of generalized ordinary differential equations and their continuous dependence on the right-hand side. A very general variant of the classical Gronwall inequality is presented.

Odůvodnění panelu:

The important book represents a major addition to the theory of nonlinear generalized ordinary differential equations, connected with the theory of non-absolutely convergent integrals of the Kurzweil-Henstock type.

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Integral representation theory : Applications to convexity, Banach spaces and potential theory

Jaroslav Lukeš, Jan Malý, Ivan Netuka, Jiří Spurný

Identifikátor: **RIV/00216208:11320/10:10053430**

Předkladatel výsledku do Pilíře II.:
Univerzita Karlova v Praze Matematicko-fyzikální fakulta

Podíl předkladatele na výsledku: **100 %**

Anotace dle RIV:

This monograph provides an extensive and largely self-contained exposition of integral representation theory with emphasis on applications in mathematical analysis. It is focused on the Choquet theory of function spaces, function cones and compact convexsets. An important feature of the book is the interplay between various mathematical subjects, such as functional analysis, measure theory, descriptive set theory, Banach spaces and classical as well as abstract potential theory. A substantial part of the material is of fairly recent origin and many results appear in book form for the first time.

Odůvodnění předkladatele:

The comprehensive monograph on the integral representation theory, written on more than 700 pages. Large sections of the book are based on or at least related to research by the authors, and a considerable part of the material appears in book form for the first time. each chapter finishes with extremely careful notes and comments, based on a rich bibliography. In many of the comments various subtle open problems are explained in detail. The book may clearly serve as a perfect basis for undestanding the integral representation theory, offering an enjoyable and comprehensive account of today's knowledge in the field and a rich source for references to the specialists.

Odůvodnění panelu:

Substantial monograph in an important area. Large sections of the book are based on or at least related to research by the authors, and a considerable part of the material appears in book form for the first time.

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Matrices and Graphs in Geometry

Fiedler Miroslav

Identifikátor: **RIV/67985807:_____/11:00356557**

Předkladatel výsledku do Pilíře II.:
Ústav informatiky AV ČR, v. v. i.

Podíl předkladatele na výsledku: **100 %**

Anotace dle RIV:

Simplex geometry is a topic generalizing geometry of the triangle and tetrahedron. The appropriate tool for its study is matrix theory, but applications usually involve solving huge systems of linear equations or eigenvalue problems, and geometry can help in visualizing the behaviour of the problem. In many cases, solving such systems may depend more on the distribution of non-zero coefficients than on their values, so graph theory is also useful. The author has discovered a method that in many (symmetric) cases helps to split huge systems into smaller parts. Many readers will welcome this book, from undergraduates to specialists in mathematics, as well as non-specialists who only use mathematics occasionally, and anyone who enjoys geometric theorems.It acquaints the reader with basic matrix theory, graph theory and elementary Euclidean geometry so that they too can appreciate the underlying connections between these various areas of mathematics and computer science.

Odůvodnění předkladatele:

The book written by one of the greatest experts on matrices and graphs, prof. Miroslav Fiedler, represents a survey and summary of author's results comprising over 50 years of research. It is unique and unparalleled as no book in the field of Euclidean simplex geometry appeared so far. Simplex geometry is a topic generalizing geometry of the triangle and tetrahedron. The appropriate tool for its study is matrix theory, but applications usually involve solving huge systems of linear equations or eigenvalue problems, and geometry can help in visualizing the behaviour of the problem. In many cases, solving such systems may depend more on the distribution of non-zero coefficients than on their values, so graph theory is also useful. The author has discovered a method that in many (symmetric) cases helps to split huge systems into smaller parts. Many readers may welcome this book, from undergraduates to specialists in mathematics, as well as non-specialists who only use mathematics occasionally, and anyone who enjoys geometric theorems. It acquaints the readers with basic matrix theory, graph theory and elementary Euclidean geometry so they can appreciate the many, usually unknown, underlying relationships among these various areas of mathematics and computer science. More details about this book can be found on pages of the publisher Cambridge University Press under the DOI link http://dx.doi.org/10.1017/CBO9780511973611. The book presents also applications, including a proof of equivalence of the theory of resistive electrical networks with the theory of Euclidean simplexes without obtuse interior angles. This book is in the catalog of The National Library of the Czech Republic under the following link: http://aleph.nkp.cz/F/?func=direct&doc_number=002180484&local_base=NKC

Odůvodnění panelu:

A very interesting book by one of the leading international authorities in the areas of matrix theory and graph theory.

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

On Unsteady Flows of Implicitly Constituted Incompressible Fluids

Miroslav Bulíček, Josef Málek

Identifikátor: **RIV/00216208:11320/12:10124069**

Předkladatel výsledku do Pilíře II.:
Univerzita Karlova v Praze Matematicko-fyzikální fakulta

Podíl předkladatele na výsledku: **67 %**

Anotace dle RIV:

We consider unsteady flows of incompressible fluids with a general implicit constitutive equation relating the deviatoric part of the Cauchy stress and the symmetric part of the velocity gradient in such a way that it leads to a maximal monotone (possibly multivalued) graph and the rate of dissipation is characterized by the sum of a Young function. Such a framework is very robust and includes, among others, classical power-law fluids, stress power-law fluids, fluids with activation criteria of Binghamor Herschel--Bulkley type, and shear rate--dependent fluids with discontinuous viscosities as special cases. We establish long-time and large-data existence of weak solution to such a system completed by the initial and the Navier slip boundary conditions in both the subcritical and supercritical cases. We use tools such as Orlicz functions, properties of spatially dependent maximal monotone operators, and Lipschitz approximations of Bochner functions taking values in Orlicz--Sobolev spa

Odůvodnění předkladatele:

The implicit constitutive theory is a novel physical approach to the modelling of the mechanical response of non-Newtonian fluids. The corresponding systems of governing partial differential equations are impossible to be treated using the standard methods. The new concepts and techniques introduced in the paper lead to the proof of long-time and large-data existence of weak solution to the governing equations. The results provide the solid foundation for any ongoing work focused on numerical simulations, and they present the decisive step in the development of the mathematical theory of complex fluids.

Odůvodnění panelu:

A novel physical approach to the modelling of the mechanical response of non-Newtonian fluids,impossible to be treated using the standard methods.

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Subcomplexes in curved BGG-sequences

Vladimír Souček

Identifikátor: **RIV/00216208:11320/12:10129248**

Předkladatel výsledku do Pilíře II.:
Univerzita Karlova v Praze Matematicko-fyzikální fakulta

Podíl předkladatele na výsledku: **67 %**

Anotace dle RIV:

BGG-sequences offer a uniform construction for invariant differential operators for a large class of geometric structures called parabolic geometries. For locally flat geometries, the resulting sequences are complexes, but in general the compositions ofthe operators in such a sequence are nonzero. In this paper, we show that under appropriate torsion freeness and/or semi-flatness assumptions certain parts of all BGG sequences are complexes. Several examples of structures, including quaternionic structures, hypersurface type CR structures and quaternionic contact structures are discussed in detail. In the case of quaternionic structures we show that several families of complexes obtained in this way are elliptic.

Odůvodnění předkladatele:

In a very influential paper A. Čap, J. Slovák and V. Souček: Bernstein-Gelfand-Gelfand (BGG) sequences, Ann. of Math. (2) 154 (2001), no. 1, 97–113, (having 68 citations), the authors construct the BGG sequences of linear differential operators between natural vector bundles as a generalization of the de Rham complex. In general, the sequences do not form a complex, adjacent operators in the sequences have nontrivial compositions. It is hence of substantial interest to find conditions, when subsequences of the BGG sequences are complexes. The current article shows that, under suitable conditions of partial torsion freeness and/or partial vanishing of curvature, subcomplexes arise as certain parts of the BGG sequences. It is also shown that, in quaternionic case, the complexes constructed in the paper are new examples of elliptic complexes, extending in a substantial way the partial results obtained by S. Solomon. The journal itself (Mathematische Annalen) is one of top mathematical journals in the world with a long tradition.

Odůvodnění panelu:

Very deep result in differential geometry by prominent authors

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

0.4 mJ quasi-continuously pumped picosecond Nd:GdVO4 laser with selectable pulse duration

Kubeček Václav, Jelínek Michal, Čech Miroslav, Hiršl Petr

Identifikátor: **RIV/68407700:21340/10:00177514**

Předkladatel výsledku do Pilíře II.:
České vysoké učení technické v Praze Fakulta jaderná a fyzikálně inženýrská

Podíl předkladatele na výsledku: **90 %**

Anotace dle RIV:

A quasi-continuously pumped picosecond oscillatoramplifier Nd:GdVO4 laser system based on two identical slabs in a single bounce geometry is reported. Pulse duration is from 160 to 55 ps resulting from the pulse shortening along the extended mode lockedtrain from passively mode locked oscillator, which was measured directly from a single laser shot. The shortest 55 ps long cavity dumped single pulses from the oscillator with the energy of 15 +- 1 ? J and the contrast better than 10-3 were amplified tothe energy of 150 ? J with the contrast better than 10-3 after the single-pass amplification and to the energy of 400 ? J after the double-pass amplification

Odůvodnění předkladatele:

A quasi-continuously pumped picosecond oscillator-amplifier Nd:GdVO4 laser system based on two identical slabs in a single bounce geometry is reported. Pulse duration is from 160 to 55 ps resulting from the pulse shortening along the extended mode locked train from passively mode locked oscillator, which was measured directly from a single laser shot. The shortest 55 ps long cavity dumped single pulses from the oscillator with the energy of 15±1 ?J and the contrast better than 10?3 were amplified to the energy of 150 ?J with the contrast better than 10?3 after the single-pass amplification and to the energy of 400 ?J after the double-pass amplification.

Odůvodnění panelu:

This paper reports the construction and testing of a quasi-continuously diode-pumped solid state laser. Its active element is a slab of Nd:GdVO4 crystal while another slab of this crystal is used for amplification of the laser light. The set-up allows t

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

A 2D Quantum Walk Simulation of Two-Particle Dynamics

Gábris Aurél, Štefaňák Martin, Potoček Václav, Hamilton Craig, Jex Igor

Identifikátor: **RIV/68407700:21340/12:00192841**

Předkladatel výsledku do Pilíře II.:
České vysoké učení technické v Praze Fakulta jaderná a fyzikálně inženýrská

Podíl předkladatele na výsledku: **55 %**

Anotace dle RIV:

Multidimensional quantum walks can exhibit highly nontrivial topological structure, providing a powerful tool for simulating quantum information and transport systems. We present a flexible implementation of a two-dimensional (2D) optical quantum walk ona lattice, demonstrating a scalable quantum walk on a nontrivial graph structure. We realized a coherent quantum walk over 12 steps and 169 positions by using an optical fiber network. With our broad spectrum of quantum coins, we were able to simulate the creation of entanglement in bipartite systems with conditioned interactions. Introducing dynamic control allowed for the investigation of effects such as strong nonlinearities or two-particle scattering. Our results illustrate the potential of quantumwalks as a route for simulating and understanding complex quantum systems.

Odůvodnění předkladatele:

Multi-dimensional quantum walks can exhibit highly non-trivial topological structure, providing a powerful tool for simulating quantum information and transport systems. We realized a flexible implementation of a 2D optical quantum walk on a lattice, demonstrating a scalable quantum walk on a non-trivial graph structure beyond a linear configuration. We realized a coherent quantum walk over 12 steps and 169 positions using an all optical fiber network. We have been able to implement a broad spectrum of quantum coins and hence able to simulate the creation of entanglement in bipartite systems with conditioned interactions. Introducing dynamic control allowed for the investigation of e_ects such as strong non-linearities or two-particle scattering. Our results illustrate the potential of quantum walks as a route for simulating and understanding complex quantum systems.

Odůvodnění panelu:

The paper reports important results which may be used for simulations of the transfer of quantum information and quantum-transport systems. In particular, quantum-walk regimes with nontrivial geometry, demonstrated in this work, is an essential finding. T

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

A high-fidelity noiseless amplifier for quantum light states

Fiurášek Jaromír

Identifikátor: **RIV/61989592:15310/11:10225472**

Předkladatel výsledku do Pilíře II.:
Univerzita Palackého v Olomouci Přírodovědecká fakulta

Podíl předkladatele na výsledku: **50 %**

Anotace dle RIV:

Noise is the price to pay when trying to clone or amplify arbitrary quantum states. However, the quantum noise associated with linear phase-insensitive amplifiers can be avoided by relaxing the requirement of a deterministic operation. Here we present the experimental realization of a novel concept of a probabilistic noiseless linear amplifier that is able to amplify coherent states at the highest levels of effective gain and final state fidelity ever reached. Based on a sequence of photon addition andsubtraction, this high-fidelity amplification scheme is likely to become an essential tool for applications of quantum communication and metrology.

Odůvodnění předkladatele:

In this work a high-fidelity probabilistic noiseless amplifier for quantum states of light is demonstrated. Following the theoretical proposals developed at Palacky University [J. Fiurášek, Phys. Rev. A 80, 053822 (2009); P. Marek and R. Filip, Phys. Rev. A 81, 022302 (2010)], noiseless amplification is achieved by sequence of conditional photon addition and subtraction. Significant amplification of coherent states of light is achieved without introducing additional noise or other large distortions. This scheme significantly outperforms previous implementations of noiseless quantum amplifiers based on quantum scissors. The high-fidelity operation achieved in the present work paves the way towards various applications of noiseless quantum amplifier in quantum communication and quantum metrology tasks. The noiseless amplifier can suppress losses in quantum communication and it can improve the performance of phase estimation schemes. The amplifier could also be used to distill and concentrate entanglement, and amplify highly non-classical Schrödinger cat-like states represented by superpositions of two coherent states.

Odůvodnění panelu:

The paper reports on a beautiful experiment demonstrating a noise-less linear amplifier for quantum light. Normally, amplification noise is an unavoidable feature that become particularly apparent in the quantum properties of light. The scheme of the pape

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

A multiferroic material to search for the permanent electric dipole moment of the electron

Knížek Karel, Nuzhnyy Dmitry, Savinov Maxim, Vaněk Přemysl, Goian Veronica, Kamba Stanislav

Identifikátor: **RIV/00025798:_____/10:00000127**

Předkladatel výsledku do Pilíře II.:
Česká geologická služba

Podíl předkladatele na výsledku: **55 %**

Anotace dle RIV:

We describe the first-principles design and subsequent synthesis of a new material with the specific functionalities required for a solid-state-based search for the permanent electric dipole moment of the electron. TIt has been computationally showed, that he perovskite-structure europium barium titanate should exhibit the required large and pressure-dependent ferroelectric polarization, local magnetic moments and absence of magnetic ordering at liquid-helium temperature.

Odůvodnění předkladatele:

We suggested using strong internal electric field in multiferroic Eu0.5Ba0.5TiO3 for the search of permanent electric dipole moment (EDM) of the electron. According to standard model of particles its value should be of order of 10–40 e.cm. Recently it has been shown that spontaneous violation of charge parity symmetry is much larger then it follows from the standard model, therefore this model needs an extension. New particle theories propose EDM of electrons 8 or 12 orders of magnitude larger then the standard model. The physicists try to measure EDM of electron already 40 years, unfortunately fruitlessly. They reached sensitivity of only 10–27 e.cm. We have shown that in multiferroic Eu0.5Ba0.5TiO3 the sensitivity should be one order of magnitude higher. In case of successful determination of EDM value it will be possible to prove and specify new theories going beyond the standard model.

Odůvodnění panelu:

The paper describes the first-principles design and subsequent synthesis of a new material with the specific functionalities required for a solid-state-based search for the permanent electric dipole moment of the electron. It is shown computationally tha

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

A spin-valve-like magnetoresistance of an antiferromagnet-based tunnel junction

Wunderlich Joerg, Martí Xavier, Shick Alexander, Jungwirth Tomáš

Identifikátor: **RIV/68378271:____/11:00366915**

Předkladatel výsledku do Pilíře II.:
Fyzikální ústav AV ČR, v. v. i.

Podíl předkladatele na výsledku: **47 %**

Anotace dle RIV:

In this paper we demonstrate >100 % spin-valve-like signal in a NiFe/IrMn/MgO/Pt stack with an antiferromagnet (AFM) on one side and a non-magnetic metal on the other side of the tunnel barrier. Our work demonstrates a spintronic element whose transportcharacteristics are governed by an AFM.

Odůvodnění předkladatele:

The paper reports an experimental discovery of a more than 100% magnetoresitance effect in a spintronic device whose active electrode is made of an antiferromagnet. This is in contrast to conventional spintronic devices relying on ferromagnets. The work was highlighted in a News and Views article in Nature Mater. 10, 344 (2011). This experimental result initiated a new research field of antiferromagnetic spintronics. Antiferromagnets are attractive for spintronics because they offer insensitivity to magnetic field perturbations, produce no perturbing stray fields, are readily compatible with metal, semiconductor, or insulator electronic structure, can act as a magnetic memory, can generate large magneto-transport effects, and can operate on ultra-short timescales unparalleled in ferromgnets. The ongoing research in this area is among the central topics of the ERC Advanced Grant 0MSPIN of the team from the Institute of Physics AS CR.

Odůvodnění panelu:

The paper reports an experimental discovery of a very strong magnetoresitance effect in a spintronic device based on an antiferromagnetic active electrode. This result initiated a new direction in the spintronics research. The discovered properties are at

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

A spin-valve-like magnetoresistance of an antiferromagnet-based tunneljunction

Xavier Martí, Václav Holý

Identifikátor: **RIV/00216208:11320/11:10103803**

Předkladatel výsledku do Pilíře II.:
Univerzita Karlova v Praze Matematicko-fyzikální fakulta

Podíl předkladatele na výsledku: **47 %**

Anotace dle RIV:

In this paper we demonstrate >100 % spin-valve-like signal in a NiFe/IrMn/MgO/Pt stack with an antiferromagnet (AFM) on one side and a non-magnetic metal on the other side of the tunnel barrier. Our work demonstrates a spintronic element whose transportcharacteristics are governed by an AFM.

Odůvodnění předkladatele:

The paper reports an experimental discovery of a more than 100% magnetoresitance effect in a spintronic device whose active electrode is made of an antiferromagnet. This is in contrast to conventional spintronic devices relying on ferromagnets. The work was highlighted in a News and Views article in Nature Mater. 10, 344 (2011). This experimental result initiated a new research field of antiferromagnetic spintronics. Antiferromagnets are attractive for spintronics because they offer insensitivity to magnetic field perturbations, produce no perturbing stray fields, are readily compatible with metal, semiconductor, or insulator electronic structure, can act as a magnetic memory, can generate large magneto-transport effects, and can operate on ultra-short timescales unparalleled in ferromgnets. The ongoing research in this area is among the central topics of the ERC Advanced Grant 0MSPIN of the team from the Institute of Physics AS CR.

Odůvodnění panelu:

The paper reports an experimental discovery of a very strong magnetoresitance effect in a spintronic device based on an antiferromagnetic active electrode. This result initiated a new direction in the spintronics research. The discovered properties are at

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

A strong ferroelectric ferromagnet created via spin-lattice coupling

Kamba Stanislav, Goian Veronica

Identifikátor: **RIV/68378271:____/10:00348764**

Předkladatel výsledku do Pilíře II.:
Fyzikální ústav AV ČR, v. v. i.

Podíl předkladatele na výsledku: **14 %**

Anotace dle RIV:

Our work demonstrates that mechanical strain in epitaxial thin film of EuTiO3 can cause a creation of a strong ferroelectric ferromagnet, though the bulk EuTiO3 is paraelectric and antiferromagnetic. It means we have discovered a new route for artificialpreparation of new multiferroics with high magnetoelectric coupling.

Odůvodnění předkladatele:

The work was carried out in frame of Czech-French-Belgium collaboration within prestigious FP6 Marie-Curie research training network MULTIMAT in the years 2004-8. The manuscript was jointly written by R. Delville, PhD student of D. Schryvers from EMAT Antwerps and P. Šittner, who lead the NiTi wire research in FZU. B. Mallard worked as a postdoc researcher in FZU team in 2007-8 and collaborated on this topic by performing in-situ synchrotron X-ray diffraction studies on NiTi wires, the results of which were reported separately. J. Pilch, PhD student of P. Šittner from FZU, developed the FTMT-EC method which enabled the preparation of the nanosized fully recrystallized microstructures in the studied NiTi wires. D. Schryvers was the coordinator of the FP6 MULTIMAT network. Magnetoelectric multiferroics are materials that exhibit magnetic and ferroelectric order simultaneously. Unfortunately, there are only few multiferroics in nature and they have usually low critical temperatures and their magnetoelectric coupling is small. In this paper we experimentally demonstrated for the first time that new „artificial“ multiferroics can be prepared using strain in the thin films. We proved that originally antiferromagnetic and paraelectric EuTiO3 changes in strained films to a strong ferromagnet and ferroelectric due to strong spin-lattice coupling. Such system should exhibit strong magnetoelectric coupling which can be used in future memories.

Odůvodnění panelu:

The paper presents the first-time experimental demonstration of producing a novel multiferroic induced by strain in a suitable thin film multiferroic. EuTiO3 behaving as a paraelectric antiferromagnet in ambient conditions transforms to a strong ferroelec

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Ab Initio Investigation of the Elliott-Yafet Electron-Phonon Mechanism in Laser-Induced Ultrafast Demagnetization

Karel Carva

Identifikátor: **RIV/00216208:11320/11:10103771**

Předkladatel výsledku do Pilíře II.:
Univerzita Karlova v Praze Matematicko-fyzikální fakulta

Podíl předkladatele na výsledku: **50 %**

Anotace dle RIV:

The spin-flip (SF) Eliashberg function is calculated from first principles for ferromagnetic Ni to accurately establish the contribution of Elliott-Yafet electron-phonon SF scattering to Ni"s femtosecond laser-driven demagnetization. This is used to compute the SF probability and demagnetization rate for laser-created thermalized as well as nonequilibrium electron distributions. Increased SF probabilities are found for thermalized electrons, but the induced demagnetization rate is extremely small. A larger demagnetization rate is obtained for nonequilibrium electron distributions, but its contribution is too small to account for femtosecond demagnetization.

Odůvodnění předkladatele:

The article has contributed significantly to understanding microscopic origin of femtosecond magnetization dynamics. Authors have calculated for the first time the spin-flip rate due to electron-phonon scattering in a system excited by a pump laser pulse for a magnetic material by first-principles methods. The overall conclusion about the studied role of electron-phonon scattering is that its contribution is too small to account for the observed effects and it appears to be less important than other processes causing demagnetization.

Odůvodnění panelu:

The paper evaluates the phonon-induced SF probability and demagnetization in laser-pumped Ni and demonstrates a strong dependence of these quantities on the electron energy, which is not tracked by the commonly used Elliott approximation. The paper is of

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Adaptive modulations of martensites

Heczko Oleg

Identifikátor: **RIV/68378271:_____/10:00348782**

Předkladatel výsledku do Pilíře II.:
Fyzikální ústav AV ČR, v. v. i.

Podíl předkladatele na výsledku: **25 %**

Anotace dle RIV:

Modulated phases occur in numerous functional materials like giant ferroelectrics and magnetic shape memory alloys. To understand the origin of these phases, we employ and generalize the concept of adaptive martensite. As a starting point, we investigatethe coexistence of austenite, adaptive 14M phase, and tetragonal martensite in Ni-Mn-Ga magnetic shape-memory alloy epitaxial films. We show that the modulated martensite can be constructed from nanotwinned variants of the tetragonal martensite phase. By combining the concept of adaptive martensite with branching of twin variants, we can explain key features of modulated phases from a microscopic view. This includes metastability, the sequence of 6M- 10M-14M-NM intermartensitic transitions, and the magnetocrystalline anisotropy.

Odůvodnění předkladatele:

Modulated phases occur in numerous functional materials like giant ferroelectrics and magnetic shape-memory alloys. The giant magnetically induced strain (magnetic shape memory effect) in Ni-Mn-Ga is conditioned by presence of modulated martensite phase. We showed for the first time that this phase can be considered as adaptive phase. This profoundly changes the perception of modulated phases which is important for understanding the origin of the effect. We investigated the coexistence of austenite, adaptive 14M phase, and tetragonal martensite in Ni-Mn-Ga magnetic shape-memory alloy epitaxial films and showed that the modulated martensite can be constructed from nanotwinned variants of the tetragonal martensite phase. By combining the concept of adaptive martensite with branching of twin variants, we could explain key features of modulated phases from a microscopic view and introduced experimental measurements, which support the idea of adaptive phase.

Odůvodnění panelu:

The highly cited paper represents the crucial contribution to an understanding of the widely used, but not fully understood, martensitic transformation. The experimental work of top international quality revealed that the modulated martensite phases facil

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

An Archaean heavy bombardment from a destabilized extension of the asteroid belt

David Vokrouhlický

Identifikátor: **RIV/00216208:11320/12:10129176**

Předkladatel výsledku do Pilíře II.:
Univerzita Karlova v Praze Matematicko-fyzikální fakulta

Podíl předkladatele na výsledku: **22 %**

Anotace dle RIV:

The barrage of comets and asteroids that produced many young lunar basins (craters over 300 kilometres in diameter) has frequently been called the Late Heavy Bombardment(1) (LHB). Many assume the LHB ended about 3.7 to 3.8 billion years (Gyr) ago with the formation of Orientale basin(2,3). Evidence for LHB-sized blasts on Earth, however, extend into the Archaean and early Proterozoic eons, in the form of impact spherule beds: globally distributed ejecta layers created by Chicxulub-sized or larger cratering events(4). At least seven spherule beds have been found that formed between 3.23 and 3.47 Gyr ago, four between 2.49 and 2.63 Gyr ago, and one between 1.7 and 2.1 Gyr ago(5-9). Here we report that the LHB lasted much longer than previously thought, with most late impactors coming from the E belt, an extended and now largely extinct portion of the asteroid belt between 1.7 and 2.1 astronomical units from Earth. This region was destabilized by late giant planet migration(10-13). E-belt

Odůvodnění předkladatele:

The Moon and terrestrial planets experienced intense bombardment by D10 km bodies had a chance to impact Moon and terrestrial planets.

Odůvodnění panelu:

The study shows that the heavy bombardment of the Moon and terrestrial planets by large asteroids, which led to the formation of large craters on these bodies, lasted longer that so far believed. The authors showed that most of the late impactors came fro

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

An omnidirectional retroreflector based on the transmutation of dielectric singularities

Tomáš TYC a Ulf LEONHARDT

Identifikátor: **RIV/00216224:14310/09:00036743**

Předkladatel výsledku do Pilíře II.:
Masarykova univerzita Přírodovědecká fakulta

Podíl předkladatele na výsledku: **25 %**

Anotace dle RIV:

Transformation optics is a concept used in some metamaterials to guide light on a predetermined path. In this approach, the materials implement coordinate transformations on electromagnetic waves to create the illusion that the waves are propagating through a virtual space. Transforming space by appropriately designed materials makes devices possible that have been deemed impossible. In particular, transformation optics has led to the demonstration of invisibility cloaking for microwaves, surface plasmons and infrared light. Here, on the basis of transformation optics, we implement a microwave device that would normally require a dielectric singularity, an infinity in the refractive index. To fabricate such a device, we transmute a dielectric singularity in virtual space into a mere topological defect in a real metamaterial. In particular, we demonstrate an omnidirectional retroreflector, a device for faithfully reflecting images and for creating high visibility from all directions.

Odůvodnění předkladatele:

In 1952 J. Eaton invented a new type of lens, an omnidirectional retroreflector, that sends the incoming light rays back to their source. However, for many decades nobody was able to build this lens because of the extreme optical properties of the medium required for its construction. In 2008 Prof Tomas Tyc from Masaryk University (in collaboration with Prof Ulf Leonhardt for University of St Andrews, UK) invented an idea how to overcome this problem and eliminate the optical singularity; the method was called "transmutation of singularities". Based on this idea, a successful experimental construction of the Eaton lens followed that is reported in this paper. The experiment showed that this lens really works as expected. This way, the Eaton lens was constructed, for the first time, almost sixty years after its discovery thanks to the idea by the co-author from Masaryk University. The paper has received 86 citations (Web of Science) since its publication in 2009. The research also received attention in the media.

Odůvodnění panelu:

The paper reports on an experimental implementation of a microwave omnidirectional retroreflector that would normally require an infinity in the refractive index. To fabricate such device, a dielectric singularity in virtual space is transmuted into a mer

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Anisotropy of hardness from first principles: The cases of ReB2 and OsB2.

Šimůnek Antonín

Identifikátor: **RIV/68378271:_____/09:00336341**

Předkladatel výsledku do Pilíře II.:
Fyzikální ústav AV ČR, v. v. i.

Podíl předkladatele na výsledku: **100 %**

Anotace dle RIV:

The expression for hardness related to crystal orientation is proposed. Because all quantities in the equation are inherently coupled to the atomistic structure of matter, the anisotropy of hardness can be determined by first-principles methods.

Odůvodnění předkladatele:

A substantial difference between the highest and lowest measured hardness was reported in literature for ultra-incompressible, superhard ReB2 and OsB2. The difference was attributed to the anisotropic structure of both crystals. Theorists had thought that the strength came from strong vertical bonds within the crystal, similar to the ridges in a sheet of corrugated cardboard, and that hardness is governed by the strongest bonds which prevent the close approach of atoms under compression. The presented paper implies that, contrary to common sense, hardness is determined mainly by the bonds which prevent breaking bonds by transversal extension rather than by their compression of material under pressure. The transversely oriented bonds are the key factor determining hardness, not compression but extension of atomic bonds determines hardness of crystals. In this paper the expression for hardness related to crystal orientation is proposed. Because all quantities in the expression are inherently coupled to the atomistic structure of matter, the anisotropy of hardness can be determined by first-principles methods. For the first time it is possible to do calculations that can look at the hardness in different directions. The theory could lead to development of new super-hard materials.

Odůvodnění panelu:

The original work opens a possibility to determine hardness and its anisotropy by first-principles calculations for the first time. The work of top international quality revealed, contrary to common sense, that hardness is determined mainly by the bonds w

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Asteroid pairs formed by rotational fission

David Vokrouhlický

Identifikátor: **RIV/00216208:11320/10:10057783**

Předkladatel výsledku do Pilíře II.:
Univerzita Karlova v Praze Matematicko-fyzikální fakulta

Podíl předkladatele na výsledku: **6 %**

Anotace dle RIV:

Pairs of asteroids sharing similar heliocentric orbits, but not bound together, were found recently. Backward integrations of their orbits indicated that they separated gently with low relative velocities, but did not provide additional insight into their formation mechanism. Here we report photometric observations of a sample of asteroid pairs, revealing that the primaries of pairs with mass ratios much less than 0.2 rotate rapidly, near their critical fission frequency. As the mass ratio approaches 0.2, the primary period grows long. We conclude that asteroid pairs are formed by the rotational fission of a parent asteroid into a proto-binary system, which subsequently disrupts under its own internal system dynamics soon after formation.

Odůvodnění předkladatele:

Vokrouhlicky and Nesvorny (2008, AJ 136, 280) discovered a population of asteroid pairs that share nearly identical heliocentric orbits. Their origin remained unknown. In this paper we prove that the asteroid pairs formed by rotational fission of a parent body which was slightly larger than the primary in the pair. We also proved that the fission was caused by secular increase of the precursor's rotational rate due to the solar radiation torques (the so called YORP effect).

Odůvodnění panelu:

The study explains the existence of a population of gravitationally bound pairs of asteroids in the solar system that share nearly identical heliocentric orbits. It was demonstrated that these binary asteroids were formed by rotational fission of one pare

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Blinking Statistics of Silicon Quantum Dots

Jan Valenta

Identifikátor: **RIV/00216208:11320/11:10109172**

Předkladatel výsledku do Pilíře II.:
Univerzita Karlova v Praze Matematicko-fyzikální fakulta

Podíl předkladatele na výsledku: **40 %**

Anotace dle RIV:

The blinking statistics of numerous single silicon quantum dots fabricated by electron-beam lithography, plasma etching, and oxidation have been analyzed. Purely exponential on- and off-time distributions were found consistent with the absence of statistical aging. This is in contrast to blinking reports in the literature where power-law distributions prevail as well as observations of statistical aging in nanocrystal ensembles. A linear increase of the switching frequency with excitation power densityindicates a domination of single-photon absorption processes, possibly through a direct transfer of charges to trap states without the need for a bimolecular Auger mechanism. Photoluminescence saturation with increasing excitation is not observed; however, there is a threshold in excitation (coinciding with a mean occupation of one exciton per nanocrystal) where a change from linear to square-root increase occurs. Finally, the statistics of blinking of single quantum dots in terms of ave

Odůvodnění předkladatele:

The on-off switching (blinking) of luminescence under continuous excitation is one of the most intriguing effects of the single object studies. Here we demonstrate that blinking in special arrays of Si nanowires has (in contrast to literature reports of power-law distributions) purely exponential on- and off-time distributions indicating the absence of statistical aging. The linear increase of switching frequency with excitation power indicates a direct transfer of charges to trap states.

Odůvodnění panelu:

Light emitters based on quantum dots suffer from a serious problem: they blink. It has been paramount to find out the cause of the blinking, for finding a remedy. The present paper makes a pioneering contribution to finding out the causes of quantum-dot b

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Brightly Luminescent Organically Capped Silicon Nanocrystals Fabricated at Room Temperature and Atmospheric Pressure

Kůsová Kateřina, Cibulka Ondřej, Dohnalová Kateřina, Pelant Ivan, Fučíková Anna, Žídek Karel

Identifikátor: **RIV/61388980:_____/10:00352063**

Předkladatel výsledku do Pilíře II.:
Ústav anorganické chemie AV ČR, v. v. i.

Podíl předkladatele na výsledku: **50 %**

Anotace dle RIV:

We desribe a novel method of preparation of organically capped silicon nanocrystals based on photo-chemical treatment of oxide-covered silicon nanocrystals and thoroughly study the chemical and optical properties of the final product. The results includemeasurments of single-nanocrystal spectroscopy.

Odůvodnění předkladatele:

Silicon is a material of choice in electronics, but it falls behind other materials when it comes to light emission due to its indirect bandgap. Silicon nanocrystals are a silicon-based material that emits light better than their bulk counterpart and thus they have applications prospects in optoelectronics, bio-imaging or photovoltaics. Unlike other nanocrystalline materials based on direct-bandgap bulk semiconductors, the physical properties of silicon nanocrystals are still not well understood, partially also as a result of difficulties in the preparation process. In this article, we propose a novel preparation method yielding colloidal silicon nanocrystals with intense yellow photoluminescence characterized by short radiative lifetime, being, in terms of light emission, on par with direct-bandgap semiconductors. The key to the excellent light-emission properties of these nanocrystals lies in a phohochemical treatment of oxide-passivated nanocrystals in a mixture of aromatic hydrocarbons, which leads to the change in the surface passivation from oxide to methyl-based capping. This change in surface passivation is documented by FTIR and sophisticated NMR measurements, while the light emission is proved to originate in silicon nanocrystals using single-nanocrystal spectroscopy. The excellent light-emission properties of these nanocrystals make them a very important argument in the still on-going discussion about the application feasibility of light-emitting silicon; in our follow-up study, these nanocrystals were shown to actually be a direct-bandgap material (Kusova et al. Adv. Mater. Int. 2014 1, 1300042.) The preparation method put forward in this article is also subject to a European patent EP2279231.

Odůvodnění panelu:

The authors report on a new synthesis technique to modify surface passivation of Silicon nanocrystals to improve the optical properties and enhance the photoluminescence quantum efficiency. The new method is shown to be simple and can be used at ambient c

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Broadband Invisibility by Non-Euclidean Cloaking

LEONHARDT, Ulf a Tomáš TYC

Identifikátor: **RIV/00216224:14310/09:00034472**

Předkladatel výsledku do Pilíře II.:
Masarykova univerzita Přírodovědecká fakulta

Podíl předkladatele na výsledku: **50 %**

Anotace dle RIV:

Invisibility is an application of transformation optics where the material of a device performs a coordinate transformation for electromagnetic fields. The device creates the illusion that light propagates through empty flat space, whereas in physical space, light is bent around a hidden interior. All of the previous proposals for invisibility require materials with extreme properties. We show that transformation optics of a curved, non-Euclidean space relax these requirements and can lead to invisibility in a broad band of the spectrum.

Odůvodnění předkladatele:

This paper is a theoretical proposal for a new type of invisibility cloak. It employs the concepts of non-Euclidean geometry to overcome a severe limitation that all the previous invisibility cloaks had, namely the fact that they could not work in the broad band of the spectrum of light but could work only for one wavelength (color). The cloak proposed in this paper does not require such extreme properties of the optical medium, therefore it can in principle work for many wavelengths at the same time. This may open the way to practical invisibility cloaking. The paper has received 197 citations (Web of Science) since its publication in 2009, which is well above the average even for the journal Science. The research received a large attention in the media, both authors were interviewed by several radio and TV stations as well as newspapers both in the UK and the Czech Republic. The research was also popularized by the authors at the prestigious exhibition Science Live in 2011 at the Royal Society in London and at many other occasions.

Odůvodnění panelu:

This paper presents an intriguing theoretical proposal for a new type of optical invisibility cloak. The authors employ the concepts of non-Euclidean geometry to overcome a severe limitation that all the previous invisibility cloaks had, namely the fact t

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Coherence-controlled holographic microscope

Kolman Pavel, Chmelík Radim

Identifikátor: **RIV/00216305:26210/10:PU88294**

Předkladatel výsledku do Pilíře II.:
Vysoké učení technické v Brně Fakulta strojního inženýrství

Podíl předkladatele na výsledku: **100 %**

Anotace dle RIV:

Transmitted-light coherence-controlled holographic microscope (CCHM) based on an off-axis achromatic interferometer allows us to use light sources of arbitrary degree of temporal and spatial coherence. Besides the conventional DHM modes such as quantitative phase contrast imaging and numerical 3D holographic reconstruction it provides high quality (speckle-free) imaging, improved lateral resolution and optical sectioning by coherence gating. Optical setup parameters and their limits for a technical realization are derived and described in detail. To demonstrate the optical sectioning property of the microscope a model sample uncovered and then covered with a diffuser was observed using a low-coherence light source.0

Odůvodnění předkladatele:

The paper presents a world-unique optical system of holographic microscope that is capable of imaging with fully incoherent light, in contrast to current holographic microscopes, which have to use mainly coherent (laser) light sources. Incoherent illumination brings better resolution, high quality of imaging without speckles and coherence artifacts and capability of optical sectioning, which makes possible holographic microscopy imaging of objects in turbid and 3D complex media. The paper has been published in a high impact factor (3.546) journal that ranks 5th in Optics category among 80 journals in this category (according to ISI Web of Knowledge). The paper has been 23 times cited. Open access to the paper: http://dx.doi.org/10.1364/OE.18.021990

Odůvodnění panelu:

The paper presents a unique optical system of holographic microscope,demonstrating the imaging capability with fully incoherent light. Substantial improvements of the imaging using the laser light sources have been achieved: a better resolution, no spurio

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Colloquium: Gripped by light: Optical binding

Zemánek Pavel

Identifikátor: **RIV/68081731:_____/10:00350855**

Předkladatel výsledku do Pilíře II.:
Ústav přístrojové techniky AV ČR, v. v. i.

Podíl předkladatele na výsledku: **67 %**

Anotace dle RIV:

The light-matter interaction has been at the heart of major advances from the atomic scale right to the microscopic scale over the past four decades. Confinement by light, embodied by the area of optical trapping, has had a major influence across all ofthe natural sciences. However, an emergent and powerful topic within this field that has steadily merged but not gained much recognition is optical binding: the importance of exploring the optically mediated interaction between assembled objects that cancause attractive and repulsive forces and dramatically influence the way they assemble and organize themselves. This offers routes for colloidal self-assembly, crystallization, and organization of templates for biological and colloidal sciences. In thisColloquium, this emergent area is reviewed looking at the pioneering experiments in the field and the various theoretical approaches that aim to describe this behavior.

Odůvodnění předkladatele:

The result is related to the field of optical micromanipulation with objects and is focused on relatively forgotten phenomena of mutual force interaction between objects via scattered light – so called optical binding. Both authors are leaders of groups that have made principle discoveries in this area and the paper for the first time summarizes all the achievements in this field. It was published in the most prestigious physical journal (IF 51.695) and even if the field is relatively narrow, it collected over 80 citations. The ongoing research at ISI led to further unique discoveries of two-dimensional, three-dimensional and moving optically self-arranged and bound optical matter.

Odůvodnění panelu:

This is a useful review on the topic of optical attraction between microscopic bodies produced by scattered light. The results collected in the review help to design techniques for handling microscopic objects by means of optical tools. The review compare

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Creation and diagnosis of a solid-density plasma with an X-ray free-electron laser

Burian Tomáš, Hájková Věra, Chalupský Jaromír, Juha Libor, Vyšín Luděk

Identifikátor: **RIV/68378271:_____/12:00377604**

Předkladatel výsledku do Pilíře II.:
Fyzikální ústav AV ČR, v. v. i.

Podíl předkladatele na výsledku: **28 %**

Anotace dle RIV:

We report the experimental creation of a solid-density plasma at temperatures in excess of one million kelvin on inertial-confinement time-scales using an X-ray free-electron laser. We discuss the pertinent physics of the intense X-ray-matter interactions, and illustrate the importance of electron-ion collisions. Detailed simulations of the interaction process conducted with a radiative-collisional code show good qualitative agreement with the experimental results. We obtain insights into the evolutionof the charge state distribution of the system, the electron density and temperature, and the time-scales of collisional processes.

Odůvodnění předkladatele:

Solid-density plasmas at a temperature > 106 K were produced by a volumetric heating of aluminium using the focused x-ray free-electron laser LCLS (Linac Coherent Light Source). Matter with a high energy density is prevalent throughout the Universe, being present in all types of stars and in centres of giant planets. Its thermodynamic and transport properties are very challenging to measure, requiring the creation of sufficiently long-lived samples at homogeneous temperatures and densities. The LCLS facility provides the most intense x-ray source on the planet and understanding the detailed interactions process of intense x-ray radiation with matter is important from a fundamental viewpoint as well as for applications. Although dense and hot systems can be generated in alternative ways, for example using intense optical lasers or particle beams, these never interact with a system at well-defined density. In the case of optical radiation this is because of the presence of a critical surface for the absorption, while for particle beams the pulse lengths are generally too long to justify neglecting hydrodynamic expansion. These intrinsic density gradients make the accurate study of dense plasma states extremely challenging. By using the LCLS pulse, the authors have been able to study extremely well-defined hot-dense plasma states for the first time ever, with unprecedented detail. Detailed simulations of the x-ray-matter interaction process conducted with a radiative-collisional code further showed good qualitative agreement with the experimental results, providing additional insight into the evolution of the charge state distribution of the system, the electron density and temperature, and the timescales of collisional processes. These results should feed back into future high-intensity x-ray experiments involving dense samples, such as x-ray diffractive imaging of biological systems, material science investigations, and the study of matter in extreme conditions.

Odůvodnění panelu:

Matter with a high energy density is prevalent throughout the Universe, being present in all types of stars and towards the centre of the giant planets; it is also relevant for inertial confinement fusion. The authors report the experimental creation of a

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Dark matter spin-dependent limits for WIMP interactions on F-19 by PICASSO

Pospíšil Stanislav, Štekl Ivan

Identifikátor: **RIV/68407700:21670/09:00164117**

Předkladatel výsledku do Pilíře II.:
České vysoké učení technické v Praze Ústav technické a experimentální fyziky ČVUT

Podíl předkladatele na výsledku: **12 %**

Anotace dle RIV:

The PICASSO experiment at SNOLAB reports new results for spin-dependent WIMP interactions on F-19 using the Superheated droplet technique. A new generation of detectors and new features which enable background discrimination via the rejection of non-particle induced events are described. First results are presented for a subset of two detectors with target masses of F-19 of 65 g and 69 g respectively and a total exposure of 13.75 +/- 0.48 kgd. No dark matter signal was found and for WIMP masses around 24 GeV/c(2) new limits have been obtained on the spin-dependent cross section on F-19 of sigma(F) = 13.9 pb (90% C.L.) which can be converted into cross section limits on protons and neutrons of sigma(p) = 0.16 pb and sigma(n) = 2.60 pb respectively (90%C.L.). The obtained limits on protons restrict recent interpretations of the DAMA/LIBRA annual modulations in terms of spin-dependent interactions.

Odůvodnění předkladatele:

The PICASSO (international collaboration headed by Canadian institutions) experiment at SNOLAB was devoted to the spin-dependent WIMP interactions on F-19 using the Superheated droplet technique, which is promising detection technique with effective background discrimination. Detection of dark matter (neutralino) is very needed task of physics. No DM signal was found and for WIMP masses around 24 GeV/c(2) new limits have been obtained on the spin-dependent cross section on F-19 of sigma(F) = 13.9 pb (90% C.L.) which was converted into cross section limits on protons and neutrons of sigma(p) = 0.16 pb and sigma(n) = 2.60 pb respectively. The obtained limits on protons restricted interpretations of the DAMA/LIBRA annual modulations in terms of spin-dependent interactions. Active participation of IEAP staff in experiment allows us to develop experimental setups for underground experiments (ultra low background HPGe setup, facility providing radon free air at the level of mBq/m3 and its measurement). IEAP team cooperates with underground laboratories SNOLAB (Canada, dark matter experiment PICO), LSM (France, double beta decay experiments NEMO 3 and SuperNEMO) and LNGS (Italy, double beta decay experiment COBRA). Our participation in underground physics allows us also to obtain grant support from Technological agency of CR (TA02010881, Facility providing ultra low concentration of Rn in air) or from Ministry of education, youth and sports (Center of experimental nuclear astrophysics and nuclear physics, 2007-2011). Our participation in non-accelerator underground physics is also proved by regularly organized international conferences MEDEX (matrix elements calculations in double beta decay and dark matter, see eg. http://medex13.utef.cvut.cz/). Conference is organized every two years from 1997 and contributios are published by American Institute of Physics (eg. AIP Proceedings volume 1572, 2013).

Odůvodnění panelu:

The PICASSO experiment installed at SNOWLAB (Canada) searches for cold dark matter through the detection of weakly interacting massive particle (WIMP) with Fluor nuclei. No dark matter signal was found in the PICASSO detector and new limits have bee

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Detection of Gamma Rays from a Starburst Galaxy

Dalibor Nedbal, Ladislav Rob

Identifikátor: **RIV/00216208:11320/09:00207052**

Předkladatel výsledku do Pilíře II.:
Univerzita Karlova v Praze Matematicko-fyzikální fakulta

Podíl předkladatele na výsledku: **10 %**

Anotace dle RIV:

Starburst galaxies exhibit in their central regions a highly increased rate of supernovae, the remnants of which are thought to accelerate energetic cosmic rays up to energies of ~ 10^15 eV. We report the detection of gamma rays -- tracers of such cosmicrays -- from the starburst galaxy NGC 253 using the H.E.S.S. array of imaging atmospheric Cherenkov telescopes. The gamma-ray flux above 220 GeV is F = (5.5 /- 1.0stat /- 2.8sys) x 10^-13 ph. s-1 cm-2, implying a cosmic-ray density about three orders ofmagnitude larger than that in the center of the Milky Way. The fraction of cosmic-ray energy channeled into gamma rays in this starburst environment is 5 times larger than that in our Galaxy.

Odůvodnění předkladatele:

This paper describes the observation of the very-high-energy gamma rays from the core of starburst galaxy NGC 253 correlated with its optical image that is also a first extragalactic VHE gamma detection coming from supernova explosions. Scientists from IPNP contributed significantly to the building of the H.E.S.S. detector, this analysis has been led by Dalibor Nedbal of the IPNP team.

Odůvodnění panelu:

This paper reports on the first detection of the very-high-energy
extragalactic gamma rays coming from supernova explosions in the core of a starburst galaxy using the H.E.S.S. telescope system. This unigue observation is crucial for our deeper understand

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Domain walls of ferroelectric BaTiO33 within the Ginzburg-Landau-Devonshire phenomenological model

Marton Pavel, Rychetský Ivan, Hlinka Jiří

Identifikátor: **RIV/68378271:____/10:00354433**

Předkladatel výsledku do Pilíře II.:
Fyzikální ústav AV ČR, v. v. i.

Podíl předkladatele na výsledku: **100 %**

Anotace dle RIV:

Mechanically compatible and electrically neutral domain walls in tetragonal, orthorhombic, and rhombohedral ferroelectric phases of BaTiO3 are systematically investigated in the framework of the phenomenological Ginzburg-Landau-Devonshire model. Polarization and strain profiles within domain walls are calculated numerically and within an approximation leading to the quasi-one-dimensional analytic solutions. Domain-wall thicknesses and energy densities are estimated for all mechanically compatible and electrically neutral domain-wall species in the entire temperature range of ferroelectric phases. The calculation indicates that the lowest-energy structure of the 109 wall and few other domain walls in the orthorhombic and rhombohedral phases resemble Bloch walls known from magnetism.

Odůvodnění předkladatele:

The paper provides first systematic analysis of the properties of all mechanically compatible and electrically neutral domain walls in tetragonal, orthorhombic, and rhombohedral ferroelectric phases of ferroelectric BaTiO3. Polarization and strain profiles within domain walls are calculated within a phenomenological model specified for this prototype ferroelectric material. Domain-wall thicknesses and energy densities are estimated for all mechanically compatible and electrically neutral domain-wall species in the entire temperature range of ferroelectric phases. The model suggests that the lowest-energy walls in the orthorhombic phase of BaTiO3 are the 90 and 60 walls. Most interestingly, the calculation revealed that the lowest-energy structure of the 109 wall and few other domain walls in the orthorhombic and rhombohedral phases including 180 domain walls resemble Bloch walls known from magnetism. This work has attracted worldwide attention to the properties of ferroelectric Bloch walls, what can be documented by numerous follow-up studies devoted to this subject.

Odůvodnění panelu:

The paper provides an essential extension of the phenomenological theory of the pattern formation (in particular, the creation of domain walls of the Bloch type) in ferroelectric materials. Although phenomenological, the analysis has produced prediction o

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Experimental demonstration of optical transport, sorting and self-arrangement using a “tractor beam

Brzobohatý Oto, Karásek Vítězslav, Šiler Martin, Chvátal Lukáš, Zemánek Pavel

Identifikátor: **RIV/68081731:_____/13:00397687**

Předkladatel výsledku do Pilíře II.:
Ústav přístrojové techniky AV ČR, v. v. i.

Podíl předkladatele na výsledku: **90 %**

Anotace dle RIV:

Following the Keplerian idea of optical forces, one would intuitively expect that an object illuminated by sunlight radiation or a laser beam will be accelerated along the direction of photon flow. Recent theoretical studies have shown that small particles can be pulled by light beams against the photon stream, even in beams with uniform optical intensity along the propagation axis. Here, we present a geometry to generate such a tractor beam?, and experimentally demonstrate its functionality using spherical microparticles of various sizes, as well as its enhancement with optically self-arranged structures of microparticles. In addition to the pulling of the particles, we also demonstrate that their two-dimensional motion and one-dimensional sorting maybe controlled conveniently by rotation of the polarization of the linearly polarized incident beam. The relative simplicity of this geometry could serve to encourage its widespread application, and ongoing investigations will broaden the

Odůvodnění předkladatele:

The result is related to the field of optical micromanipulation with objects and is focused on a fascinating topic to attract illuminated objects towards the source of illumination – so called “tractor beam”. The result presents new experimental geometry and extensive theoretical study demonstrating motion of objects against the field wavevector caused by the pulling optical force and control of this force by polarization of the incident beam. The same result also demonstrates practical applications in separation of microparticles of different sizes. A relatively forgotten phenomenon of a mutual force interaction between more objects via the scattered light leads to so called optically bound matter and it was employed here to self-assemble microstructures and separate them from the rest of the sample by pure illumination with a single wide laser beam. The experimental setup is easy transferable upon the frame of commercial optical microscopes and applicable in biology or medicine for sorting of living samples. The result was published in the most prestigious optical journal (IF 27.254), frequently cited by experts in the field (17 citations), appreciated by the scientific community at conferences, highlighted by majority of Czech and important worldwide media, and awarded by the Werner von Siemens Excellence Award for the team in 2013 (for more details see the supplemental information).

Odůvodnění panelu:

This paper reports on an ingeniously simple experiment where a counter-intuitive optical effect was demonstrated. Normally, radiation pressure pushes particles way from a light sources. Here the author report on the opposite phenomenon - particles can be

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Experimental observation of the optical spin-orbit torque

Naďa Tesařová, Petr Němec, Eva Schmoranzerová, Tomáš Janda, Dagmar Butkovičová, František Trojánek, Petr Malý

Identifikátor: **RIV/00216208:11320/13:10173369**

Předkladatel výsledku do Pilíře II.:
Univerzita Karlova v Praze Matematicko-fyzikální fakulta

Podíl předkladatele na výsledku: **48 %**

Anotace dle RIV:

Electrical and optical control of magnetization are of central importance in the research and applications of spintronics. Non-relativistic angular momentum transfer or relativistic spin-orbit coupling provide efficient means by which electrical currentdriven through a ferromagnet can exert a torque on the magnetization. Ferromagnetic semiconductors like (Ga, Mn) As are suitable model systems with which to search for optical counterparts of these phenomena, where photocarriers excited by a laser pulseexert torque upon magnetization. Here, we report the observation of an optical spin-orbit torque (OSOT) in (Ga, Mn) As. The phenomenon originates from spin-orbit coupling of non-equilibrium photocarriers excitated by helicity-independent pump laser pulses, which do not impart angular momentum. In our measurements of the time-dependent magnetization trajectories, the signatures of OSOT are clearly distinct from the competing thermal excitation mechanism, and OSOT can even dominate in (Ga,

Odůvodnění předkladatele:

Electrical current can induce a magnetization vector rotation in a ferromagnet due to a relativistic spin-orbit coupling effect. This recently discovered spin-orbit-torque is extensively explored as new means for writing information in magnetic random access memories. This paper reports on the first experimental observation of an optical analog of this effect. For this work, members of the joint Labortory of Opto-Spintronics of MFF UK and FZU AV ČR were awarded the Bedřich Hrozný Prize of the Charles University.

Odůvodnění panelu:

The paper makes an important experimental contribution to the hot quickly developing area of the study of direct relativistically-induced spin-orbit interactions in photonic media. The paper is on par with best works on the same and similar topics which

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Experimental Results for H-2 Formation from H- and H and Implications for First Star Formation

Martin Čížek

Identifikátor: **RIV/00216208:11320/10:10079249**

Předkladatel výsledku do Pilíře II.:
Univerzita Karlova v Praze Matematicko-fyzikální fakulta

Podíl předkladatele na výsledku: **25 %**

Anotace dle RIV:

During the epoch of first star formation, molecular hydrogen (H-2) generated via associative detachment (AD) of H- and H is believed to have been the main coolant of primordial gas for temperatures below 10(4) kelvin. The uncertainty in the cross sectionfor this reaction has limited our understanding of protogalaxy formation during this epoch and of the characteristic masses and cooling times for the first stars. We report precise energy-resolved measurements of the AD reaction, made with the use of aspecially constructed merged-beams apparatus. Our results agreed well with the most recent theoretically calculated cross section, which we then used in cosmological simulations to demonstrate how the reduced AD uncertainty improves constraints of the predicted masses for Population III stars.

Odůvodnění předkladatele:

The first molecules in the early Universe were formed primarily by associative detachment reaction H- + H => H2 + e. The presence of the resulting molecules is essential for the dynamics of the formation of the first stars, because the radiation from the molecules is responsible for cooling of primordial gas below 10 000 kelvin. The associative detachment reaction thus influences the masses of the first stars in the Universe. Despite of its importance the reaction rate of this reaction has been known only with large uncertainty prior 2010. The Charles University team calculated the reaction rate for this reaction for a broad temperature range. The collaborators from Columbia University in New York, verified the accuracy of this prediction with specially designed experiment. The results show that the associative detachment reaction is three times more efficient than previously thought. This new reaction rate is now used in leading models of the early Universe evolution.

Odůvodnění panelu:

The paper reports precise measurements of the associative-detachment reaction of hydrogen anion with hydrogen atom leading to the formation of molecular hydrogen. In conjunction with theory these results were used to reduce notably the associative-detachm

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Extended-source effect and chromaticity in two-point-mass microlensing

David Heyrovský

Identifikátor: **RIV/00216208:11320/09:00207111**

Předkladatel výsledku do Pilíře II.:
Univerzita Karlova v Praze Matematicko-fyzikální fakulta

Podíl předkladatele na výsledku: **100 %**

Anotace dle RIV:

Analysis of the sensitivity of two-point-mass gravitational microlensing to the extended nature of the source star, as well as the related sensitivity to its limb darkening.

Odůvodnění předkladatele:

We explored the sensitivity of gravitational microlensing by a binary star to the size and limb darkening of the source star. We computed and systematically studied 2-D maps of the sensitivity zones. We showed that the source star may be told from a point source in a much broader region than previously assumed. Its size and limb darkening can then be measured from observed light curves. We presented a formula for estimating the amplification of a limb-darkened star approaching the caustic.

Odůvodnění panelu:

The study explores the sensitivity of gravitational microlensing by a binary star to the size and limb darkening of the source star and shows that the source star may be told from a point source in a much broader region than previously assumed and its siz

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Ferromagnetism vs. charge ordering in the Pr0.5Ca0.5MnO3 and La0.5Ca0.5MnO3 nanocrystals

Jirák Zdeněk, Hadová E., Kaman O., Knížek K., Maryško M., Pollert E.

Identifikátor: **RIV/68407700:21340/10:00174218**

Předkladatel výsledku do Pilíře II.:
České vysoké učení technické v Praze Fakulta jaderná a fyzikálně inženýrská

Podíl předkladatele na výsledku: **75 %**

Anotace dle RIV:

The half-doped manganites Pr0.5Ca0.5MnO3 and La0.5Ca0.5MnO3 have beenstudied by structural and magnetic methods. Though the room temperature structure is not affected by the nanosize form, the charge ordering transition, common for bulk systems, is not developed at low temperatures. This different behaviour is explaned by effects of the particle surface.

Odůvodnění předkladatele:

We have investigated by means of neutron diffraction and magnetic measurements the particle size effects on the structure and low-temperature spin arrangement in so-called half doped manganites. The study shows that the Mn3+/Mn4+ charge ordering and CE-type antiferromagnetic structure characteristic for bulk are completely suppressed when particle size is decreased down to 20 nm, and a ferromagnetic state is stabilized instead. The reason is not in a lower energy of the latter state, but in the hindering of displacive processes through which the charge ordering develops. The paper deals also with the problem of magnetic interactions in the surface layer of the particles. The results obtained are of general importance for the perovskite manganites. In particular, the room temperature crystal structures in the particle cores are found not to deviate from the bulk material, disproving thus former speculations about enormous structural distortions due to surface effects. Another issue is the changing character of charge carriers in the particle shell, which is at the root of the size-dependent reduction of magnetization observed commonly in manganites possessing ferromagnetic state.

Odůvodnění panelu:

The authors carefully investigate the interplay between charge order and the evolution of ferromagnetism in half doped pervoskite manganite (Pr,La)0.5Ca0.5MnO3 when reducing the crystalline size to nanocrystals. They clarify the triggering mechanism for t

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

First-principles theory of dilute magnetic semiconductors

Kudrnovský Josef

Identifikátor: **RIV/68081723:_____/10:00354510**

Předkladatel výsledku do Pilíře II.:
Ústav fyziky materiálů AV ČR, v. v. i.

Podíl předkladatele na výsledku: **13 %**

Anotace dle RIV:

The review summarizes recent first-principles investigations of the electronic structure and magnetic and transport properties of dilute magnetic semiconductors.

Odůvodnění předkladatele:

This review summarizes recent first-principles investigations of the electronic structure and magnetism of dilute magnetic semiconductors (DMSs) use in spintronics. Details of the electronic structure of transition-metal-doped III-V and II-VI semiconductors are described, especially how the electronic structure couples to the magnetic properties of an impurity. In addition, the underlying mechanism of the ferromagnetism in DMSs is investigated from the electronic structure point of view in order to establish a unified picture that explains the chemical trend of the magnetism in DMSs. A hybrid method (ab initio electronic-structure calculations coupled to Monte Carlo simulations for the thermal properties) is discussed for calculating the Curie temperature of DMSs. Finally, first-principles theory of transport properties of DMSs is reviewed.

Odůvodnění panelu:

Recent efforts to fabricate high-Curie temperature (TC) dilute magnetic semiconductors (DMSs) require accurate materials design and reliable (TC) predictions. In this connection, this review summarizes recent investigations of the electronic structure and

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Forces and Currents in Carbon Nanostructures: Are We Imaging Atoms?

Ondráček Martin, Rozsíval Vít, Jelínek Pavel

Identifikátor: **RIV/68378271:____/11:00361470**

Předkladatel výsledku do Pilíře II.:
Fyzikální ústav AV ČR, v. v. i.

Podíl předkladatele na výsledku: **67 %**

Anotace dle RIV:

First-principles calculations show that the rich variety of image patterns which has been reported in the literature for carbon nanostructures imaged by the atomic force and scanning tunneling microscopes can be rationalized in terms of the chemical reactivity of the tip and the distance of the tip from the sample.

Odůvodnění předkladatele:

Low-dimensional carbon materials derived from the graphite structure, like single- and multi-layer graphene, carbon nanotubes, or "buckyball" molecules, keep drawing much attention as promising materials for nanotechnology. Scanning tunneling microscopy (STM) and non-contact atomic force microscopy (ncAFM) are microscopic techniques ideally suited for investigating various materials, including the graphite-based structures, on the atomic scale. However, the diverse types of atomic contrast seen in different ncAFM and STM experiments hinder any unequivocal interpretation of the results. In our study, we apply first-principles simulations of atomic forces and tunneling conductance to clarify the origin of image contrast encountered in imaging a single graphene layer, graphite surface, or a carbon nanotube. We focused on the roles played by the distance of the scanning tip from the carbonic sample and by the atomic structure of the outermost tip termination. We showed that while the overall magnitude of the force detected in ncAFM is mainly determined by the weak but long-ranged van der Waals forces, the atomic contrast is governed by the stronger short-range chemical interactions. Our results reveal that the ncAFM tips can be classified according to their reactivity: reactive metallic tips tend to exhibit a contrast inversion when changing the tip-sample distance, a moderately reactive silicon-based tip terminated with a dangling bond renders force maxima on top of carbon atoms, while the least reactive passivated tips image six-fold inter-atomic hollow sites as the points of maximal force. Finally, we demonstrated that the STM contrast depends on the distance too, due to the effect of multiple-scattering of electrons on the tunneling barrier. Our theoretical results thus show that the various types of experimental images that appear in the literature do not necessarily contradict each other but can be rather explained by different experimental conditions.

Odůvodnění panelu:

Paper provides significant insight into details concerning the interaction between the tip and studied material in STM and AFM aiming for atomic resolution. The authors tackle the long-standing problem of atom identification in high-resolution STM and AFM

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Influence of the electron-cation interaction on electron mobility in dye-sensitized ZnO and TiO2 nanocrystals: a study using ultrafast terahertz spectroscopy

Němec Hynek, Kužel Petr

Identifikátor: **RIV/68378271:_____/10:00350369**

Předkladatel výsledku do Pilíře II.:
Fyzikální ústav AV ČR, v. v. i.

Podíl předkladatele na výsledku: **36 %**

Anotace dle RIV:

Charge transport and recombination in nanostructured semiconductors are poorly understood key processes in dye-sensitized solar cells. We have employed time-resolved spectroscopies in the terahertz and visible spectral regions supplemented with Monte Carlo simulations to obtain unique information on these processes. Our results show that charge transport in the active solar cell material can be very different from that in nonsensitized semiconductors, due to strong electrostatic interaction between injected electrons and dye cations at the surface of the semiconductor nanoparticle. For ZnO, this leads to formation of an electron-cation complex which causes fast charge recombination and dramatically decreases the electron mobility even after the dissociation of the complex. Sensitized TiO2 does not suffer from this problem due to its high permittivity efficiently screening the charges.

Odůvodnění předkladatele:

Dye-sensitized semiconductors are promising materials for applications in Grätzel solar cells. Here we are interested in the electron injection into the semiconductor and the initial phase of the electron transport towards the anode. We show that the charge transport in the nanostructured active solar cell material can be very different from that in nonsensitized semiconductors. For ZnO an electron-cation complex is formed within 5 ps which causes fast charge recombination. Moreover, the electron mobility is significantly decreased even after the dissociation of the complex (100 ps) due to strong electrostatic interaction between injected electrons and dye cations. In contrast, sensitized TiO2 nanocrystals do not suffer from this problem due to their high permittivity efficiently screening the charges. We believe that the described processes are responsible for the different power conversion efficiencies of TiO2 and ZnO-based Grätzel cells.

Odůvodnění panelu:

Investigation of the dynamics and transport properties of electrons in nanostructured semiconductors. It was shown that electron injection into ZnO results in the formation of a bound electron-cation complex, which breaks up into an electron and cation or

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Interplay of conductance, force, and structural change in metallic point contacts

Hapala Prokop, Jelínek Pavel, González César

Identifikátor: **RIV/68378271:____/11:00359002**

Předkladatel výsledku do Pilíře II.:
Fyzikální ústav AV ČR, v. v. i.

Podíl předkladatele na výsledku: **60 %**

Anotace dle RIV:

Here we report a detailed experimental and theoretical analysis of the relation between the chemical force and the tunneling current during bond formation in atom-scale metallic junctions and their dependence on distance, junction structure, and material.

Odůvodnění předkladatele:

We established a fundamental correlation between the tunelling current and formed chemical bond in atomic contacts by means of experimental AFM/STM and theoretical analysis. Both the tunelling current and the chemical force between two bodies are driven by wave-function overlap between their outermost atoms. We demonstrated that the quantum degeneracy determines the fundamental relationship between the conductance G and the chemical force F acting between two bodies in atomic-sized contacts. Namely, depending on the contact conditions, the following proportionalities hold, either G ~ F or G~F2. This work contributed significantly to our current understanding of the mechanical and transport properties of metallic atomic contacts.

Odůvodnění panelu:

The paper reports fundamental results for experimentally observed and theoretically analyzed correlations between the tunneling current and chemical bonds in atomic metallic contacts. The crucial role of the quantum degeneracy for the correlations is reve

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Long range rapidity correlations and jet production in high energy nuclear collisions

Bielčík Jaroslav, Bielčíková Jana, Bysterský Michal, Chaloupka Petr, Jakl Pavel, Kapitán Jan, Kushpil Vasily, Šumbera Michal, Tlustý David

Identifikátor: **RIV/61389005:_____/09:00336869**

Předkladatel výsledku do Pilíře II.:
Ústav jaderné fyziky AV ČR, v. v. i.

Podíl předkladatele na výsledku: **7 %**

Anotace dle RIV:

The STAR Collaboration at the Relativistic Heavy Ion Collider presents a systematic study of high-transverse-momentum charged-di-hadron correlations at small azimuthal pair separation Delta phi in d+Au and central Au+Au collisions at s(NN)=200 GeV. Significant correlated yield for pairs with large longitudinal separation Delta eta is observed in central Au+Au collisions, in contrast to d+Au collisions. The associated yield distribution in Delta eta x Delta phi can be decomposed into a narrow jet-like peak at small angular separation which has a similar shape to that found in d+Au collisions, and a component that is narrow in Delta phi and depends only weakly on Delta eta, the "ridge." Using two systematically independent determinations of the background normalization and shape, finite ridge yield is found to persist for trigger p(t)>6 GeV/c, indicating that it is correlated with jet production.

Odůvodnění předkladatele:

Measurements of di-hadron azimuthal correlations together with inclusive particle production at large transverse momentum (pT) in ultrarelativistic nuclear collisions at RHIC provide important insights into the properties of hot QCD matter. In particular, the high pT suppression and low pT enhancement of the correlated yield of hadrons recoiling from a high pT particle suggest a dramatic softening of jet fragmentation in dense matter, arising from strong partonic energy loss. The presented paper contains a systematic study of high transverse momentum (pT) charged di-hadron correlations at small azimuthal pair separation, in d+Au and central Au+Au collisions at the center of mass energy 200 GeV per nucleon pair at RHIC. Significant correlated yield for pairs with large longitudinal separation is observed in central Au+Au, in contrast to d+Au collisions, where no hot and dense medium is formed. This so called "ridge" phenomenon, was discovered by the STAR collaboration and triggered since then intense theoretical discussions and further detailed experimental studies both at RHIC as well as at the LHC at CERN. Several tens of theoretical and experimental papers were written to further explore and explain this phenomenon. Currently the prevailing understanding of this phenomenon is attributed to initial state fluctuations and the related triangular flow anisotropy.

Odůvodnění panelu:

The paper contains a systematic study of high transverse momentum (pT) charged di-hadron correlations in d+Au and central Au+Au collisions at the center of mass energy 200 GeV per nucleon pair. The measurement was carried out by the STAR collaboration at

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Long-period fiber grating as wavelength selective element in double-clad Yb-doped fiber-ring lasers

P. Peterka, R. Slavík, P. Honzátko

Identifikátor: **RIV/67985882:_____/09:00341057**

Předkladatel výsledku do Pilíře II.:
Ústav fotoniky a elektroniky AV ČR, v. v. i.

Podíl předkladatele na výsledku: **65 %**

Anotace dle RIV:

Selection of operating wavelength of the Yb-doped fiber-ring lasers using long-period fiber gratings (LPFGs) is proposed. In the proposed method, customized LPFG that sustains high powers serves as a broad-band rejection filter. It modifies the net gainprofile of the laser, enabling the peak gain to occur at a designed wavelength. The gratings were inscribed by CO2 laser and the grating period down to 175 ?m was achieved being, to our best knowledge, the shortest reported LPFG period using this technique

Odůvodnění předkladatele:

High power fiber lasers require novel types of components that withstand high photon flux. We demonstrated for the first time the selection of operating wavelength of the fiber-ring laser using long-period fiber gratings (LPFG). We inscribed the gratings by a CO2 laser which allows inherent high power handling of the fabricated spectral filters. The paper demonstrates maturity of the long period grating inscription technology developed in IPE. As far as we know, the 175um period of gratings is up to date the shortest reported for LPFG inscribed by CO2 laser. Coincidentally, we observed a spectacular effect of the periodic drift of the laser line in a wide range of almost 10 nm. The paper contains the first published observation of this effect that is now known as self-induced laser line sweeping in fiber lasers. On one side, it can find applications in compact single-frequency swept laser sources and on the other side this discovery may reveal origins of detrimental instabilities in fiber lasers. The paper was published in Laser Physics Letters. The impact factor of the journal is 7.714 and it is ranked as 3 of 80 in the field of Optics according to WOS.

Odůvodnění panelu:

This paper reports how, for the first time, the wavelength of an Yb-doped fiber-ring laser can be selected by means of so-called long-period fiber gratings (LPFGs). The work involves the manufacture of the LPFGs. Output radiation with wavelengths in the i

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Luminescence of Nanodiamond Driven by Atomic Functionalization: Towards Novel Biomolecular Detection Principles

Taylor Andrew, Kratochvílová Irena, Fendrych František

Identifikátor: **RIV/61388971:_____/12:00376576**

Předkladatel výsledku do Pilíře II.:
Mikrobiologický ústav AV ČR, v. v. i.

Podíl předkladatele na výsledku: **32 %**

Anotace dle RIV:

Here we present a novel method for remote monitoring of chemical processes in biological environments based on color changes from photoluminescence of NV centers in ND. We propose to drive the NV luminescence chemically, by alternating the surface electric field developed by interacting atoms and molecules with the diamond surface. We demonstrate this phenomenon on oxidized and hydrogenated ND as well as single crystal diamond containing engineered NV centers to the nm-depth. The hydrogenation of NDs leads to quenching of luminescence related to negatively charged (NV-) centers and this way produces changes in the intensity ratio between NV- (636 nm) to neutral NV0 (575nm) centers. We discuss how the reduction of diamond size increases the magnitude ofNV color shift mechanism.

Odůvodnění předkladatele:

High biocompatibility, variable size ranging from ~ 5 nm, stable luminescence from its color centers and simple carbon chemistry for biomolecule grafting make nanodiamond particles an attractive alternative to molecular dyes for drug-delivery. A novel method for remote monitoring of chemical processes in biological environments based on color changes from photoluminescence of NV centers in ND was presented. The NV luminescence was driven chemically, by alternating the surface electric field developed by interacting atoms and molecules with the diamond surface. Due to the ND small size, the developed electric field penetrates into the bulk of the ND and intermingles with the electronic NV states. This technique has advantages over Foerster Resonance Energy Transfer for which the sensitivity to size scales as 1/r6, allowing working with particles of molecules of size < 5 nm. In our method, due to 1/r2 scaling, luminescence effects are observed up to ~ 20 nm in depth. This allows construction of optical chemo-biosensors operating in cells visible in classical confocal microscopes. We demonstrate this phenomenon on oxidized and hydrogenated ND as well as single crystal diamond containing engineered NV centers to the nm-depth. The hydrogenation of NDs leads to quenching of luminescence related to negatively charged (NV-) centers and this way produces changes in the intensity ratio between NV- (636 nm) to neutral NV0 (575nm) centers.

Odůvodnění panelu:

A novel method for remote monitoring of chemical processes in biological environments based on color changes from photoluminescence of nitrogen-vacancy centers in nanodiamond. The paper of high-level quality represents an important contribution to underst

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Microscopic Analysis of the Valence Band and Impurity Band Theories of (Ga,Mn)As

Mašek Jan, Máca František, Kudrnovský Josef, Novák Vít, Sinova Jairo, Jungwirth Tomáš

Identifikátor: **RIV/68378271:_____/10:00357129**

Předkladatel výsledku do Pilíře II.:
Fyzikální ústav AV ČR, v. v. i.

Podíl předkladatele na výsledku: **63 %**

Anotace dle RIV:

We analyze microscopically the valence and impurity band models of ferromagnetic (Ga,Mn)As. We find that the tight-binding Anderson approach with conventional parametrization and the full potential local-density approximation+U calculations give a very similar band structure whose microscopic spectral character is consistent with the physical premise of the kp kinetic-exchange model.

Odůvodnění předkladatele:

We analyze microscopically the valence and impurity band models of ferromagnetic (Ga,Mn)As. We find that the tight-binding Anderson approach with conventional parametrization and the full potential local-density approximation with static electronic correlations gives a very similar band structure whose microscopic spectral character is consistent with the physical premise of the k p kinetic-exchange model. Importance of the work lies in that it was found by exploring the entire doping range that the assumed detached impurity band does not persist in any of these models in ferromagnetic (Ga,Mn)As. We demonstrated that the various models with a band structure comprising an impurity band detached from the valence band assume mutually incompatible microscopic spectral character.

Odůvodnění panelu:

The paper presents a complex theoretical analysis of the valence and impurity band models of ferromagnetic (Ga,Mn)As. Similar results are obtained within the tight-binding Anderson approach and the full potential local-density approximation. Very broad do

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Molecular Factors Controlling Photosynthetic Light Harvesting by Carotenoids

Polívka Tomáš

Identifikátor: **RIV/60077344:_____/10:00355266**

Předkladatel výsledku do Pilíře II.:
Biologické centrum AV ČR, v. v. i.

Podíl předkladatele na výsledku: **33 %**

Anotace dle RIV:

Paper summarizes current spectroscopic data describing the excited state energies and ultrafast dynamics of purified carotenoids in solution and bound in light-harvesting complexes from purple bacteria, marine algae, and green plants. Many of these complexes can be modified using mutagenesis or pigment exchange which facilitates the elucidation of correlations between structure and function. We describe the structural and electronic factors controlling the function of carotenoids as energy donors. We also discuss unresolved issues related to the nature of spectroscopically dark excited states, which could play a role in light harvesting.

Odůvodnění předkladatele:

Invited review in one of the most prestigious journals in the field. The paper summarizes recent achievements in the field of photosynthetic light-harvesting by carotenoids, a research field in which both authors of the paper are world-leading scientists. The paper compares various light-harvesting strategies that different photosynthetic organisms utilize to achieve efficient regulation of energy flow within their light-harvesting complexes. The paper has become a standard reference for many subsequent studies of photosynthetic light-harvesting by carotenoids as documented by a number of citations (65) just a few years after publication.

Odůvodnění panelu:

This invited review paper in a high-profile journal summarizes current spectroscopic data describing the excited state energies and ultrafast dynamics of purified carotenoids in solution and bound in light-harvesting complexes from purple bacteria, marine

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Molecular Factors Controlling Photosynthetic Light Harvesting by Carotenoids

Tomáš Polívka

Identifikátor: **RIV/60076658:12640/10:00012168**

Předkladatel výsledku do Pilíře II.:
Jihočeská univerzita v Českých Budějovicích Ústav fyzikální biologie

Podíl předkladatele na výsledku: **33 %**

Anotace dle RIV:

Paper summarizes current spectroscopic data describing the excited state energies and ultrafast dynamics of purified carotenoids in solution and bound in light-harvesting complexes from purple bacteria, marine algae, and green plants. Many of these complexes can be modified using mutagenesis or pigment exchange which facilitates the elucidation of correlations between structure and function. We describe the structural and electronic factors controlling the function of carotenoids as energy donors. We also discuss unresolved issues related to the nature of spectroscopically dark excited states, which could play a role in light harvesting.

Odůvodnění předkladatele:

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Odůvodnění panelu:

This invited review paper in a high-profile journal summarizes current spectroscopic data describing the excited state energies and ultrafast dynamics of purified carotenoids in solution and bound in light-harvesting complexes from purple bacteria, marine

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Noise-powered probabilistic concentration of phase information

Marek Petr, Filip Radim

Identifikátor: **RIV/61989592:15310/10:10212648**

Předkladatel výsledku do Pilíře II.:
Univerzita Palackého v Olomouci Přírodovědecká fakulta

Podíl předkladatele na výsledku: **40 %**

Anotace dle RIV:

Phase-insensitive optical amplification of an unknown quantum state is known to be a fundamentally noisy operation that inevitably adds noise to the amplified state(1-5). However, this fundamental noise penalty in amplification can be circumvented by resorting to a probabilistic scheme as recently proposed and demonstrated in refs 6-8. These amplifiers are based on highly non-classical resources in a complex interferometer. Here we demonstrate a probabilistic quantum amplifier beating the fundamental quantum limit using a thermal-noise source and a photon-number-subtraction scheme(9).

Odůvodnění předkladatele:

This work demonstrates a radically new and highly counterintuitive scheme for conditional noiseless amplification of quantum states of light – a noiseless quantum amplifier powered by noise. This work is a result of scientific collaboration between Palacky University, where the scheme was theoretically proposed and analyzed [P. Marek and R. Filip, Phys. Rev. A 81, 022302 (2010)], and Max-Planck Institute for Science of Light in Erlangen, where the experiment was performed. The noiseless amplification of coherent states of light was implemented by addition of classical thermal noise to a mode with input coherent state, followed by quantum mechanical subtraction of photons from the optical mode. The key aspect of the noiseless amplification, namely amplification without phase disturbance or distortion, was clearly observed, and it was shown that this effect becomes more pronounced as the number of subtracted photons increases. The noiseless amplifier thus conditionally reduces phase uncertainty, which can find applications in quantum communication and quantum metrology. In a subsequent work we used this amplifier for high- fidelity probabilistic cloning of coherent states [Ch.R. Müller et al., Phys. Rev. A 86, 010305R (2012)]. A remarkable feature of this cloning procedure is that it operates without access to any phase reference.

Odůvodnění panelu:

This paper reports on experimental demonstration of a highly counterintuitive scheme for conditional noiseless amplification of quantum states of light – a noiseless quantum amplifier driven by noise. Noiseless amplification of coherent states of light wa

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Observation of a new particle in the search for the Standard Model Higgs boson with the ATLAS detector at the LHC

Petr Balek, Ina Chalupková, Tomáš Davídek, Jiří Dolejší, Zdeněk Doležal, Peter Kodyš, Rupert Leitner, Jana Nováková, Martin Rybář, Martin Spousta, Pavel Strachota, Michal Suk, Tomáš Sýkora, Petr Tas, Štefan Valkár, Vít Vorobel, Ivan Wilhelm

Identifikátor: **RIV/00216208:11320/12:10130707**

Předkladatel výsledku do Pilíře II.:
Univerzita Karlova v Praze Matematicko-fyzikální fakulta

Podíl předkladatele na výsledku: **3 %**

Anotace dle RIV:

A search for the Standard Model Higgs boson in proton-proton collisions with the ATLAS detector at the LHC is presented. The datasets used correspond to integrated luminosities of approximately 4.8 fb(-1) collected at, root s = 7 TeV in 2011 and 5.8 fb(-1) at root s = 8 TeV in 2012. Individual searches in the channels H -> ZZ(()*()) -> 4l, H -> gamma gamma and H -> WW (()*()) -> ev mu v in the 8 TeV data are combined with previously published results of searches for H -> ZZ(()*()), WW(*()), b (b) over bar and tau(+)tau(-) in the 7 TeV data and results from improved analyses of the H -> ZZ(()*()) -> 4l and H -> gamma gamma channels in the 7 TeV data. Clear evidence for the production of a neutral boson with a measured mass of 126.0 +/- 0.4 (stat) +/- 0.4 (sys) GeV is presented. This observation, which has a significance of 5.9 standard deviations, corresponding to a background fluctuation probability of 1.7 x 10(-9), is compatible with the production and decay of the Standard Model Higg

Odůvodnění předkladatele:

Observation of a new particle consistent with the Higgs boson with the ATLAS detector was the breakthrough in particle physics. It is the first spinless elementary particle ever discovered. As a part of the Czech ATLAS team, experts from IPNP significantly contributed to the construction of the ATLAS detector, its maintenance and operation and data analysis. Members of the IPNP ATLAS team participated to the analyses of a Higgs boson decays to pairs of W bosons. In later stage decays to tau leptons have been investigated with the aim to confirm non-universal coupling of a new particle to leptons as predicted for the Higgs boson. The first paper is a Science description of the discovery for wider audience, the second one is a fully professional “discovery paper” with all the technical details. So Science paper is prestigious, but physicists will quote the Physics Letters B.

Odůvodnění panelu:

This work provides conclusive evidence for the groundbreaking observation of new particle consistent with the Higgs boson with the ATLAS detector at LHC, CERN. The discovery of a Higgs boson confirmed (after almost 50 years) mechanism of the generation of

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Observation of a new particle in the search for the Standard Model Higgs boson with the ATLAS detector at the LHC

J. Bohm, J. Chudoba, P. Gallus, J. Gunther, T. Jakoubek, V. Juranek, O. Kepka, A. Kupco, V. Kus, M. Lokajicek, M. Marcisovsky, M. Mikestikova, M. Myska, S. Nemecek, P. Ruzicka, J. Schovancova, P. Sicho, P. Staroba, M. Svatos, M. Tasevsky, V. Vrba, M. Zem

Identifikátor: **RIV/68378271:_____/12:00388309**

Předkladatel výsledku do Pilíře II.:
Fyzikální ústav AV ČR, v. v. i.

Podíl předkladatele na výsledku: **3 %**

Anotace dle RIV:

A search for the Standard Model Higgs boson in proton-proton collisions with the ATLAS detector at the LHC is presented. The datasets used correspond to integrated luminosities of approximately 4.8 fb(-1) collected at, root s = 7 TeV in 2011 and 5.8 fb(-1) at root s = 8 TeV in 2012. Individual searches in the channels H -> ZZ(()*()) -> 4l, H -> gamma gamma and H -> WW (()*()) -> ev mu v in the 8 TeV data are combined with previously published results of searches for H -> ZZ(()*()), WW(*()), b (b) over bar and tau(+)tau(-) in the 7 TeV data and results from improved analyses of the H -> ZZ(()*()) -> 4l and H -> gamma gamma channels in the 7 TeV data. Clear evidence for the production of a neutral boson with a measured mass of 126.0 +/- 0.4 (stat) +/- 0.4 (sys) GeV is presented. This observation, which has a significance of 5.9 standard deviations, corresponding to a background fluctuation probability of 1.7 x 10(-9), is compatible with the production and decay of the Standard Model Higg

Odůvodnění předkladatele:

Observation of a new particle consistent with the Higgs boson with the ATLAS detector was the breakthrough in particle physics. It is the first spinless elementary particle ever discovered. As a part of the Czech ATLAS team, experts from IPNP significantly contributed to the construction of the ATLAS detector, its maintenance and operation and data analysis. Members of the IPNP ATLAS team participated to the analyses of a Higgs boson decays to pairs of W bosons. In later stage decays to tau leptons have been investigated with the aim to confirm non-universal coupling of a new particle to leptons as predicted for the Higgs boson. The first paper is a Science description of the discovery for wider audience, the second one is a fully professional “discovery paper” with all the technical details. So Science paper is prestigious, but physicists will quote the Physics Letters B.

Odůvodnění panelu:

This work provides conclusive evidence for the groundbreaking observation of new particle consistent with the Higgs boson with the ATLAS detector at LHC, CERN. The discovery of a Higgs boson confirmed (after almost 50 years) mechanism of the generation of

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Phonon-Assisted Current Noise in Molecular Junctions (Article No. 136601)

Tomáš Novotný

Identifikátor: **RIV/00216208:11320/09:00206952**

Předkladatel výsledku do Pilíře II.:
Univerzita Karlova v Praze Matematicko-fyzikální fakulta

Podíl předkladatele na výsledku: **50 %**

Anotace dle RIV:

We investigate the effects of phonon scattering on the electronic current noise through nanojunctions using the nonequilibrium Green-s functions formalism extended to include the counting field. In the case of weak electron-phonon coupling and a single broad electronic level, we derive an analytic expression for the current noise at arbitrary temperature and identify physically distinct contributions based on their voltage dependence. We apply our theory to the experimentally relevant case of a D2 molecule placed in a break junction and predict a significant inelastic contribution to the current noise.

Odůvodnění předkladatele:

This article is the first theoretical study of inelastic contribution to the electronic current noise in nanostructures such as molecular junctions or atomic wires. Study of noise extends the more conventional inelastic electron tunneling spectroscopy (IETS), which addresses the mean current only, and provides more information on the transport mechanisms in nano-junctions. Our results were used for the interpretation of the first experiment in 2012.

Odůvodnění panelu:

The paper presents the first theoretical study of inelastic contribution to the electronic current noise in nanostructures such as molecular junctions or atomic wires. Investigation of noise extends the more conventional inelastic electron tunneling spect

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Quantum phase transitions in the shapes of atomic nuclei

Pavel Cejnar

Identifikátor: **RIV/00216208:11320/10:10062280**

Předkladatel výsledku do Pilíře II.:
Univerzita Karlova v Praze Matematicko-fyzikální fakulta

Podíl předkladatele na výsledku: **50 %**

Anotace dle RIV:

Signatures of criticality in the evolution of the nuclear ground-state shapes across the NxZ plane are discussed. Attention is paid to specific data indicating sudden structural changes in various isotopic and isotonic chains of medium-mass and heavy even-even nuclei, as well as to diverse theoretical aspects of the models used to describe these changes. The interacting boson model and the geometric collective model, in particular, are discussed in detail, the former providing global predictions for theevolution of collective observables in nuclei between closed shells and the latter yielding a parameter-efficient description of nuclei at the critical points of shape transitions. Some issues related to the mechanism of first- and second-order quantumphase transitions in general many-body systems are also outlined.

Odůvodnění předkladatele:

This prestigious article (written upon an editorial request) outlines recent theoretical and experimental investigations of quantum phase transitions in collective degrees of freedom of atomic nuclei and related many-body systems. The review attempts to make an up-to-date summary of the field and to define perspective direction of future development. The article is based on extensive original results of the authors in the relevant area of nuclear physics.

Odůvodnění panelu:

This excellent article summarizes in 51 pages the recent theoretical and experimental progress in the quantum phase transition in collective degrees of freedom of atomic nuclei and related many-body systems. The article is based on original results of the

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Solution structure of the ESCRT-I complex by small-angle X-ray scattering, EPR, and FRET spectroscopy

Jaroslav Večeř

Identifikátor: **RIV/00216208:11320/11:10105632**

Předkladatel výsledku do Pilíře II.:
Univerzita Karlova v Praze Matematicko-fyzikální fakulta

Podíl předkladatele na výsledku: **20 %**

Anotace dle RIV:

ESCRT-I is required for the sorting of integral membrane proteins to the lysosome, or vacuole in yeast, for cytokinesis in animal cells, and for the budding of HIV-1 from human macrophages and T lymphocytes. ESCRT-I is a heterotetramer of Vps23, Vps28, Vps37, and Mvb12. The crystal structures of the core complex and the ubiquitin E2 variant and Vps28 C-terminal domains have been determined, but internal flexibility has prevented crystallization of intact ESCRT-I. Here we have characterized the structureof ESCRT-I in solution by simultaneous structural refinement against small-angle X-ray scattering and double electron-electron resonance spectroscopy of spin-labeled complexes. An ensemble of at least six structures, comprising an equally populated mixture of closed and open conformations, was necessary to fit all of the data. This structural ensemble was cross-validated against single-molecule FRET spectroscopy, which suggested the presence of a continuum of open states. ESCRT-I in sol

Odůvodnění předkladatele:

The endosomal sorting complexes required for transport (ESCRT) machinery is made up of cytosolic protein complexes, known as ESCRT-0, ESCRT-I, ESCRT-II, and ESCRT-III. The heterotetramer ESCRT-I consisting of proteins Vps23, Vps28, Vps37 and Mvb12 is required for the sorting of integral membrane proteins to the lysosome, for cytokinesis in animal cells, and for the budding of HIV-1 from human macrophages and T-lymphocytes. The crystal structures of the core complex and the ubiquitin E2 variant and Vps28 C-terminal domains have been determined, but internal flexibility of the complex has prevented crystallization of intact ESCRT-I. In this article the structure of ESCRT-I was investigated using small angle X-ray scattering (SAXS), double electron-electron resonance spectroscopy of spin-labeled complexes (DEER EPR) and bulk and single molecule fluorescence energy transfer (FRET). The SAXS analysis of the full-length Cys-free yeast ESCRT-I in solution revealed that the maximal dimension of the complex is 22.5 nm and further refinement by Monte Carlo simulations predicted that at least half the population of ESCRT-I complexes in solution adopts a dynamic structure. By the simultaneous fitting of SAXS and DEER data six structures were predicted, comprising an equally populated mixture of closed and open conformations. Finally the model was validated against single molecule FRET measurements, which suggested the presence of a continuum of open states in accordance with bulk FRET measurements. In conclusion ESCRT-I in solution thus appears to consist of an approximately 50% of one or a few related closed conformations, with the other 50% populating a continuum of open conformations. These conformations provide reference points for the structural pathway by which ESCRT-I induces membrane buds.

Odůvodnění panelu:

The power of this paper lies in using a clever combination of experimental techniques to resolve structure of a protein that is essentially impossible to crystalize, because the studied protein contains flexible parts thus multiple forms of the protein n

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Spin Hall effect devices

Jungwirth Tomáš, Wunderlich Joerg, Olejník Kamil

Identifikátor: **RIV/68378271:_____/12:00383909**

Předkladatel výsledku do Pilíře II.:
Fyzikální ústav AV ČR, v. v. i.

Podíl předkladatele na výsledku: **100 %**

Anotace dle RIV:

We review the experimetal results that since the first experimental observation of the spin Hall effect, less than 10 years ago, have concurred in establishing the basic physical understanding of the phenomenon, and the role that several of the spin Halldevices have had in the demonstration of new spintronic functionalities and physical phenomena.

Odůvodnění předkladatele:

Spintronics is the leading technology for magnetic storage and sensing. In the near future, it is expected to provide high density magnetic random access memories and logic-in-memory architectures, opening a route to the new generation of high-speed, low-power instant on-and-off computers. While the potential for application has been a major drive for the field it would be a fallacy to consider the eventual applications more important than the fundamental insight provided by spintronics research. The spin is a purely quantum-mechanical entity and its interaction with the electron charge or the atomic environment provides a unique opportunity to understand the quantum nature of matter. The May 2012 special issue of Nature Materials introduced in a comprehensive format several of the most prominent areas of current spintronics research. Fourteen scientists from Europe, United States, and Japan, among which Tomas Jungwirth, Kamil Olejnik, and Jorg Wunderlich work in the Institute of Physics of the Academy of Science of the Czech Republic, have joined forces to prepare the special issue. The article by Jungwirth, Olejnik, and Wunderlich focuses on spin Hall effect devices, featuring recent progress in the field of the Prague group as well as results form other labs worldwide. The ongoing research in this area is among the central topics of the ERC Advanced Grant 0MSPIN of the team the Institute of Physics AS CR.

Odůvodnění panelu:

Fourteen scientists from Europe, United States, and Japan, among which Tomáš Jungwirth, Kamil Olejník, and Jorg Wunderlich have joined forces to prepare the May 2012 special issue of Nature Materials about the most prominent areas of current spintronics r

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Spin Hall Effect Transistor

Eva Rozkotová, Petr Němec

Identifikátor: **RIV/00216208:11320/10:10070154**

Předkladatel výsledku do Pilíře II.:
Univerzita Karlova v Praze Matematicko-fyzikální fakulta

Podíl předkladatele na výsledku: **25 %**

Anotace dle RIV:

The field of semiconductor spintronics explores spin-related quantum relativistic phenomena in solid-state systems. Spin transistors and spin Hall effects have been two separate leading directions of research in this field. We have combined the two directions by realizing an all-semiconductor spin Hall effect transistor. The device uses diffusive transport and operates without electrical current in the active part of the transistor. We demonstrate a spin AND logic function in a semiconductor channel with two gates. Our study shows the utility of the spin Hall effect in a microelectronic device geometry, realizes the spin transistor with electrical detection directly along the gated semiconductor channel, and provides an experimental tool for exploringspin Hall and spin precession phenomena in an electrically tunable semiconductor layer.

Odůvodnění předkladatele:

60 years after the discovery of a transistor its operation is still based on the electrical manipulation and detection of electron's charge in a semiconductor. Since the transistors are approaching the ultimate down-scaling limit it is now an eminent task to establish new physical principles of their operation. In this paper, recently discovered quantum-relativistic phenomena were used for both spin manipulation and detection to realize the spin transistor and to demonstrate spin-logic operation.

Odůvodnění panelu:

This innovative work presents a new trend in the field of spintronics. The authors were able to realize the combination of spin transistors with spin Hall effects in a one device and successfully demonstrate its precession. This pioneer work opens new way

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Spin Hall effect transistor

Wunderlich Joerg, Zârbo Liviu P., Novák Vít, Sinova Jairo, Jungwirth Tomáš

Identifikátor: **RIV/68378271:_____/10:00354545**

Předkladatel výsledku do Pilíře II.:
Fyzikální ústav AV ČR, v. v. i.

Podíl předkladatele na výsledku: **25 %**

Anotace dle RIV:

The field of semiconductor spintronics explores spin-related quantum relativistic phenomena in solid-state systems. Spin transistors and spin Hall effects have been two separate leading directions of research in this field. We have combined the two directions by realizing an all-semiconductor spin Hall effect transistor. The device uses diffusive transport and operates without electrical current in the active part of the transistor. We demonstrate a spin AND logic function in a semiconductor channel with two gates. Our study shows the utility of the spin Hall effect in a microelectronic device geometry, realizes the spin transistor with electrical detection directly along the gated semiconductor channel, and provides an experimental tool for exploringspin Hall and spin precession phenomena in an electrically tunable semiconductor layer.

Odůvodnění předkladatele:

60 years after the discovery of a transistor its operation is still based on the electrical manipulation and detection of electron's charge in a semiconductor. Since the transistors are approaching the ultimate down-scaling limit it is now an eminent task to establish new physical principles of their operation. In this paper, recently discovered quantum-relativistic phenomena were used for both spin manipulation and detection to realize the spin transistor and to demonstrate spin-logic operation.

Odůvodnění panelu:

This innovative work presents a new trend in the field of spintronics. The authors were able to realize the combination of spin transistors with spin Hall effects in a one device and successfully demonstrate its precession. This pioneer work opens new way

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Spin-injection Hall effect in a planar photovoltaic cell

Wunderlich Joerg, Sinova Jairo, Zarbo Liviu P., Novák Vít, Jungwirth Tomáš

Identifikátor: **RIV/68378271:_____/09:00336043**

Předkladatel výsledku do Pilíře II.:
Fyzikální ústav AV ČR, v. v. i.

Podíl předkladatele na výsledku: **71 %**

Anotace dle RIV:

We have experimentally discovered and theoretically descibed the spin-injenction Hall effect in a photovoltaic cell allowing electrical, scalable, local detection of the spin polarization of electrons injected into normal semiconductors.

Odůvodnění předkladatele:

Electrical detection of spin-polarized transport in semiconductors is one of the key prerequisites for successful incorporation of spin in semiconductor microelectronics. The present schemes are based on spin-dependent transport effects within the spin generation region in the semiconductor, or on non-local detection outside the spin-injection area using a ferromagnet attached to the semiconductor. Here, we report that polarized injection of carriers can be detected by transverse electrical signals directly along the semiconducting channel, both inside and outside the injection area, without disturbing the spin-polarized current or using magnetic elements. Our planar p–n diode microdevices enable us to demonstrate Hall effect symmetries and large magnitudes of the measured effect. Supported by microscopic calculations, we infer that the observed spin-injection Hall effect reflects spin dynamics induced by an internal spin–orbit field and is closely related to the anomalous and spin Hall effects. The spin-injection Hall effect is observed up to high temperatures and our devices represent a realization of a non-magnetic spin-photovoltaic polarimeter that directly converts polarization of light into transverse voltage signals.

Odůvodnění panelu:

The authors show that polarized injection of carriers can be detected by transverse electrical signals directly along the semiconducting channel, both inside and outside the injection area, without disturbing the spin-polarized current or using magnetic e

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Spin-orbit driven ferromagnetic resonance: a nanoscale magnetic characterisation technique

Wunderlich Joerg, Výborný Karel, Zarbu Liviu P., Jungwirth Tomáš

Identifikátor: **RIV/68378271:____/11:00366382**

Předkladatel výsledku do Pilíře II.:
Fyzikální ústav AV ČR, v. v. i.

Podíl předkladatele na výsledku: **57 %**

Anotace dle RIV:

We introduce an FMR technique applicable to individual nanomagnets in which the FMR driving field is generated in the probed magnet itself. The excitation is driven by the effective field generated by an alternating electrical current passing through theferromagnet, which results from the combined effect of spin-orbit (SO) coupling and exchange interaction.

Odůvodnění předkladatele:

Ferromagnetic resonance is the most widely used technique for characterizing ferromagnetic materials. However, its use is generally restricted to wafer-scale samples or specific micro-magnetic devices, such as spin valves, which have a spatially varying magnetization profile and where ferromagnetic resonance can be induced by an alternating current owing to angular momentum transfer. In this paper we have introduced a form of ferromagnetic resonance in which an electric current oscillating at microwave frequencies is used to create an effective magnetic field in the magnetic material being probed, which makes it possible to characterize individual nanoscale samples with uniform magnetization profiles.

Odůvodnění panelu:

The paper introduces a form of ferromagnetic resonance in which an electric current oscillating at microwave frequencies is used to create an effective magnetic field in the magnetic material, which makes it possible to characterize individual nanoscale s

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Step-like enhancement of luminescence quantum yield of silicon nanocrystals

Jan Valenta

Identifikátor: **RIV/00216208:11320/11:10109245**

Předkladatel výsledku do Pilíře II.:
Univerzita Karlova v Praze Matematicko-fyzikální fakulta

Podíl předkladatele na výsledku: **33 %**

Anotace dle RIV:

Carrier multiplication by generation of two or more electron-hole pairs following the absorption of a single photon may lead to improved photovoltaic efficiencies and has been observed in nanocrystals made from a variety of semiconductors, including silicon. However, with few exceptions, these reports have been based on indirect ultrafast techniques. Here, we present evidence of carrier multiplication in closely spaced silicon nanocrystals contained in a silicon dioxide matrix by measuring enhanced photoluminescence quantum yield. As the photon energy increases, the quantum yield is expected to remain constant, or to decrease as a result of new trapping and recombination channels being activated. Instead, we observe a step-like increase in quantum yield for larger photon energies that is characteristic of carrier multiplication. Modelling suggests that carrier multiplication is occurring with high efficiency and close to the energy conservation limit.

Odůvodnění předkladatele:

Conversion of high energy photons into lower energy photons plays important role in the lighting technology, solar cells etc. Reducing inherent energy losses of such transformation would be possible by generating several low energy photons from a high-energy photon – carrier multiplication (CM). By developing a sensitive technique to measure luminescence yield as function of excitation photon energy we demonstrate presence of efficient CM in some systems of closely packed Si nanocrystals.

Odůvodnění panelu:

Demonstration of so-called carrier multiplication - conversion of high-energy photon to several lower-energy photons - in systems of closely packed silicon nanocrystals is reported. Reported findings are important for potential application of silicon nano

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Strong Near-Field Enhancement of Radiative Heat Transfer between Metallic Surfaces

Králík Tomáš, Hanzelka Pavel, Zobač Martin, Musilová Věra, Fořt Tomáš, Horák Michal

Identifikátor: **RIV/68081731:_____/12:00385282**

Předkladatel výsledku do Pilíře II.:
Ústav přístrojové techniky AV ČR, v. v. i.

Podíl předkladatele na výsledku: **100 %**

Anotace dle RIV:

Near-field heat transfer across a gap between plane-parallel tungsten layers in vacuo was studied experimentally with the temperature of the cold sample near 5 K and the temperature of the hot sample in the range 10-40 K as a function of the gap size d.At gaps smaller than one-third of the peak wavelength lambda(m) given by Wien's displacement law, the near-field effect was observed. In comparison with blackbody radiation, hundred times higher values of heat flux were achieved at d approximate to 1 mum. Heat flux normalized to the radiative power transferred between black surfaces showed scaling (lambda(m)/d)(n), where n approximate to 2.6. This Letter describes the results of experiment and a comparison with present theory over 4 orders of magnitudeof heat flux.

Odůvodnění předkladatele:

Theoretical derivation of steady near?field (NF) heat transfer between plane?parallel surfaces was done by Polder and Van Hove in 1971 in the framework of classical electrodynamics and of fluctuation dissipation theorem which enables to predict behaviour of non-equilibrium thermodynamical systems. It has been demonstrated that at microscopic or nanoscopic distances and in dependence on temperature, heat transfer can be enhanced by the NF. Heat fluxes transferred by the NF may exceed by orders of magnitude those of far-field as described by Planck's law. Experimental studies on NF heat transfer were scarce at the time of our study. Especially experiments in the plane?parallel geometry had been a persisting challenge for many years since the first experiment of Hargreaves in 1969. Other studies were focused mainly on plane?sphere configuration, utilising SPM techniques. We have built a cryogenic apparatus with variable plane?parallel gap between samples (attach. 1). Low temperatures offer significant benefits for this experimental study such as well-defined conditions and longer distance of the NF effect. For the first time our experiment on NF heat transfer allowed to compare the measured heat fluxes with their values predicted by the NF theory within a broad span of temperatures and of heat fluxes. Reasonable agreement between theoretical values and experimental data was achieved. Work was appreciated by the NF community for the wide range of the heat flux values and for the unique apparatus. Cryogenic study of strong heat transfer by NF has a considerable potential for application in cryogenic electronics and contactless cooling. Deeper understanding of the NF heat transfer could find applications e.g. in thermal design of MEMS or in development of thermophotovoltaic components.

Odůvodnění panelu:

This paper features a cryogenic study of strong heat transfer by near field (NF) with variable plane‑parallel gap between samples. This configuration allowed the authors for the first time to successfully compare the measured heat fluxes with their

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Support nanostructure boosts oxygen transfer to catalytically active platinum nanoparticles

Nataliya Tsud, Vladimír Matolín

Identifikátor: **RIV/00216208:11320/11:10108238**

Předkladatel výsledku do Pilíře II.:
Univerzita Karlova v Praze Matematicko-fyzikální fakulta

Podíl předkladatele na výsledku: **27 %**

Anotace dle RIV:

Interactions of metal particles with oxide supports can radically enhance the performance of supported catalysts. At the microscopic level, the details of such metal-oxide interactions usually remain obscure. This study identifies two types of oxidativemetal-oxide interaction on well-defined models of technologically important Pt-ceria catalysts: (1) electron transfer from the Pt nanoparticle to the support, and (2) oxygen transfer from ceria to Pt. The electron transfer is favourable on ceria supports, irrespective of their morphology. Remarkably, the oxygen transfer is shown to require the presence of nanostructured ceria in close contact with Pt and, thus, is inherently a nanoscale effect. Our findings enable us to detail the formation mechanism ofthe catalytically indispensable Pt-O species on ceria and to elucidate the extraordinary structure-activity dependence of ceria-based catalysts in general.

Odůvodnění předkladatele:

The paper refers to an important catalytic material — platinum nanoparticles supported on cerium dioxide, studied by a combination of experimental and computational methods, i.e. synchrotron radiation-excited resonant photoemission and density functional theory, respectively, in order to reveal the importance of the nanostructure of the cerium dioxide support for the oxygen transfer towards platinum particles, a key factor influencing the so far unexplained catalytic activity. We discover the direct relationship between structure and reactivity of the metal/oxide system.

Odůvodnění panelu:

Heterogeneous catalytic processes play a decisive role in energy and materials efficient production of most industrial chemicals, as well as in future key technologies for energy and the environment. The materials studied are extremely complex, so that is

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Systematic study of Mn-doping trends in optical properties of (Ga,Mn)As

Jungwirth Tomáš, Kužel Petr, Kadlec Christelle, Mašek Jan, Orlita Milan, Novák Vít, Olejník Kamil, Šobáň Zbyněk, Vašek Petr, Svoboda Pavel, Sinova Jairo

Identifikátor: **RIV/00216208:11310/10:10062065**

Předkladatel výsledku do Pilíře II.:
Univerzita Karlova v Praze Přírodovědecká fakulta

Podíl předkladatele na výsledku: **62 %**

Anotace dle RIV:

We report on a systematic study of optical properties of (Ga,Mn)As epilayers spanning the wide range of accessible MnGa dopings. The results are consistent with the description of ferromagnetic (Ga,Mn)As based on the microscopic valence band theory.

Odůvodnění předkladatele:

We report on a systematic study of optical properties of (Ga,Mn)As epilayers spanning the wide range of accessible MnGa dopings. The material synthesis was optimized for each nominal Mn doping in order to obtain films which are as close as possible to uniform uncompensated (Ga,Mn)As mixed crystals. We observe a broad maximum in the mid-infrared absorption spectra whose position exhibits a prevailing blueshift for increasing Mn doping. In the visible range, a peak in the magnetic circular dichroism also shifts with increasing Mn doping. The results are consistent with the description of ferromagnetic (Ga,Mn)As based on the microscopic valence band theory. They also imply that opposite trends seen previously in the optical data on a limited number of samples are not generic and cannot serve as an experimental basis for postulating the impurity band model of ferromagnetic (Ga,Mn)As.

Odůvodnění panelu:

This paper of high international standard brings an important contribution to the segment of materials research of high current interest. It presents results of systematic investigation of optical properties of (Ga,Mn)As epilayers spanning the wide range

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

System-Dependent Signatures of Electronic and Vibrational Coherences in Electronic Two-Dimensional Spectra

Tomáš Mančal

Identifikátor: **RIV/00216208:11320/12:10127456**

Předkladatel výsledku do Pilíře II.:
Univerzita Karlova v Praze Matematicko-fyzikální fakulta

Podíl předkladatele na výsledku: **25 %**

Anotace dle RIV:

In this work, we examine vibrational coherence in a molecular monomer, where time evolution of a nuclear wavepacket gives rise to oscillating diagonal- and off-diagonal peaks in two-dimensional electronic spectra. We find that the peaks oscillate out-of-phase, resulting in a cancellation in the corresponding pump probe spectra. Our results confirm the unique disposition of two-dimensional electronic spectroscopy (2D-ES) for the study of coherences. The oscillation pattern is in excellent agreement withthe diagrammatic analysis of the third-order nonlinear response. We show how 2D-ES can be used to distinguish between ground- and excited-state wavepackets. On the basis of our results, we discuss coherences in coupled molecular aggregates involving bothelectronic and nuclear degrees of freedom. We conclude that a general distinguishing criterion based on the experimental data alone cannot be devised.

Odůvodnění předkladatele:

The paper presents an original contribution to the highly discussed determination of the origin of oscillatory features in 2D electronic spectroscopy (2DES). A molecule with a pronounced vibrational mode is studied theoretically, and the results are compared to measurements on a dye. The theory shows that in 2DES, cancelling of oscillatory features that applies to the pump-probe method is overcome. Theoretical analysis suggests that general criterion to assign the oscillations to electronic or vibrational degrees of freedom cannot be devised.

Odůvodnění panelu:

2D-electronic spectroscopy has been since its dawn applied to study number of photosynthetic systems and in the “wild” times, conclusions about designs preserving electronic coherences and “quantum computing” performed by photosynthetic systems were often

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

The molecular origin of like-charge arginine-arginine pairing in water

Vondrášek, Jiří - Heyda, Jan - Jungwirth, Pavel

Identifikátor: **RIV/61388963:_____/09:00328117**

Předkladatel výsledku do Pilíře II.:
Ústav organické chemie a biochemie AV ČR, v. v. i.

Podíl předkladatele na výsledku: **80 %**

Anotace dle RIV:

Molecular dynamics simulations show significant like-charge pairing of guanidinium side chains in aqueous poly-arginine.

Odůvodnění předkladatele:

It is a textbook knowledge that oposite charges exhibit mutual attraction, while like charges repell each other. In this study, we showed that in the biologically relevant aqueous environment, where all electrostatic interactions are drastically scaled down due to the large dielectric constant of water and other interactions can thus come into play, important exceptions to this textbook rule can occur. Namely, using molecular dynamics simulations of aqueous polypeptides we demonstrated that the positively charged side chains of the amino acid arginine exhibit a remarkable ability to agregate, despite the apparent electrostatic repulsion. A detailed analysis of molecular interactions based on ab initio calculations allows us to unravel the molecular origins of this effect. The cationic guanidinium groups tend to form contact like-charge ion pairs thanks to the flat geometry and inhomogeneous charge distribution of guanidinium, as well as due to cavitation and dispersion interactions. A database search and analysis shows that arginine-arginine side chain pairing is surprisingly abundant and plays an important role both within proteins and for protein-protein interactions. Since the publication of our paper, numerous experimental and computational studies confirmed the observation of „Coulomb-defying“ like-charge ion pairing between the guanidinium groups of arginine side chains. It has also been suggested that this effect is important not only for protein stability and association, but may also hold the key to elucidating the mechanism of the surprisingly facile translocation of arginine-rich cell penetrating peptides accross cellular membranes. The present study thus opened a new area of research in protein biophysics and chemistry, which is also demonstrated by the ~50 follow up papers elaborating on the original idea, which appeared since its publication. (No. of citations acording to WoS: 50).

Odůvodnění panelu:

The paper demonstrates that in biologically relevant aqueous environment, where all electrostatic interactions are drastically scaled down due to the large dielectric constant of water important exceptions from the widely accepted rule that opposite/like

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

The security of practical quantum key distribution

Dušek Miloslav

Identifikátor: **RIV/61989592:15310/09:00010195**

Předkladatel výsledku do Pilíře II.:
Univerzita Palackého v Olomouci Přírodovědecká fakulta

Podíl předkladatele na výsledku: **29 %**

Anotace dle RIV:

Quantum key distribution (QKD) is the first quantum information task to reach the level of mature technology, already fit for commercialization. It aims at the creation of a secret key between authorized partners connected by a quantum channel and a classical authenticated channel. The security of the key can in principle be guaranteed without putting any restriction on an eavesdropper's power. This article provides a concise up-to-date review of QKD, biased toward the practical side. Essential theoretical tools that have been developed to assess the security of the main experimental platforms are presented (discrete-variable, continuous-variable, and distributed-phase-reference protocols).

Odůvodnění předkladatele:

The review contains most of the knowledge related to the security of practical quantum cryptography collected up to 2008 (it cites 337 references). In particular, it describes in a systematic way the essential theoretical tools that have been developed to assess the security of the main experimental platforms (discrete-variable, continuous-variable, and distributed-phase-reference protocols). This review is one of the outcomes of the European integrated project SECOQC which created and collected a huge amount of know-how in quantum cryptography. At the end of the project, a few people who worked in its Quantum information theory group (including M. Dušek from the Faculty of Science of the Palacky University) were invited to write a comprehensive review on the security of real-world quantum-cryptography devices. Even if the field of quantum cryptography is quickly developing, this work still represents an important compendium of modern methods in practical quantum cryptography. This is evidenced by the growing number of citations every year: 42 in 2010, 77 in 2011, 83 in 2012, 87 in 2013, 24 in January-March 2014.

Odůvodnění panelu:

This comprehensive review article contains most of the knowledge related to the security of practical quantum cryptography collected up to 2008. In particular, it describes in a systematic way the essential theoretical tools that have been developed to as

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Tunable terahertz metamaterials with negative permeability

Němec Hynek, Kužel Petr, Kadlec Filip, Kadlec Christelle

Identifikátor: **RIV/68378271:_____/09:00326761**

Předkladatel výsledku do Pilíře II.:
Fyzikální ústav AV ČR, v. v. i.

Podíl předkladatele na výsledku: **80 %**

Anotace dle RIV:

We demonstrate experimentally and theoretically dielectric metamaterials exhibiting a tunable range of negative effective permeability in the terahertz spectral region (0.2?0.36 THz). Our structures consist of an array of intrinsically nonmagnetic rods made of an incipient ferroelectric SrTiO3 which shows a high tunable permittivity. The magnetic response and its tuning are achieved by a temperature control of the permittivity of SrTiO3, which defines the resonant confinement of the electromagnetic field within the rods.

Odůvodnění předkladatele:

Metamaterials are artificially created composite periodic structures with a unit cell much smaller than the targeted wavelength of the radiation. These materials may exhibit electromagnetic properties not found in nature. By using a suitable combination of composite constituents it is possible to conceive for example an “invisibility cloak” or plates with a negative refractive index. However, these properties can be used in a narrow spectral range. For this reason we proposed and experimentally realized a metamaterial with a tunable range of negative effective permeability in the terahertz spectral range (0.2–0.36 THz). This structure consists of an array of nonmagnetic rods made of an incipient ferroelectric SrTiO3.

Odůvodnění panelu:

This work focuses on the very attractive topic of metamaterials promising a very high future application potential. A metamaterial with a tunable range of negative effective permeability in the terahertz spectral range (0.2–0.36 THz) has been designed a

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Turning solid aluminium transparent by intense soft X-ray photo-ionization

Chalupský Jaromír, Cihelka Jaroslav, Hájková Věra, Juha Libor, Kozlová Michaela

Identifikátor: **RIV/68378271:_____/09:00333937**

Předkladatel výsledku do Pilíře II.:
Fyzikální ústav AV ČR, v. v. i.

Podíl předkladatele na výsledku: **17 %**

Anotace dle RIV:

Saturable absorption is a phenomenon readily seen in the optical and infrared wavelengths. It has never been observed in core-electron transitions owing to the short lifetime of the excited states involved and the high intensities of the soft X-rays needed. We report saturable absorption of an L-shell transition in aluminium using record intensities over 1016Wcm-2 at a photon energy of 92 eV. From a consideration of the relevant timescales,we infer that immediately after theX-rays have passed, the sample is in an exotic state where all of the aluminium atoms have an L-shell hole, and the valence band has approximately a 9 eV temperature, whereas the atoms are still on their crystallographic positions. Subsequently,Auger decay heats the material to thewarm dense matter regime, at around 25 eV temperatures. The method is an ideal candidate to study homogeneous warm dense matter, highly relevant to planetary science, astrophysics and inertial confinement fusion.

Odůvodnění předkladatele:

The experiment performed with a soft-x-ray free-electron laser FLASH (Free-Electron LASer in Hamburg) by a group of scientists of ten countries including a team of five researchers belonging to the Division of High-Power Systems of IP-ASCR, demonstrated a marked increase of transparency for the radiation at high intensities in the soft x-ray spectral region. The experiment consisted in focusing ultra-short pulses generated by the FEL on the surface of a thin Al foil to a focal spot with the diameter of only a few hundreds nanometres. The laser was tuned to a wavelength capable of removing the L-shell electrons of Al to the conduction band. The radiation intensity in the focus was so high (> 1016 W/cm2) that the photons are able to photo-ionize all the atoms in the beam path and the rest of the pulse then can pass through the sample with no interaction whatever. Hence, the number of photons passed through the foil is growing steeply with the radiation intensity and the sample becomes transparent in the soft x-ray region. This is a new laser-matter interaction phenomenon, with a great practical importance for uniform volumetric heating of solids leading to a formation of warm dense matter (WDM), and other potential applications of short-wavelength lasers.

Odůvodnění panelu:

This paper features a study, which shows a marked increase of transparency for the radiation at high intensities in the soft x-ray spectral region. The original experiment consisted in focusing ultra-short pulses generated by a soft-x-ray free-electron la

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Ultralong-range energy transfer by interatomic Coulombic decay in an extreme quantum system

Přemysl Kolorenč

Identifikátor: **RIV/00216208:11320/10:10078923**

Předkladatel výsledku do Pilíře II.:
Univerzita Karlova v Praze Matematicko-fyzikální fakulta

Podíl předkladatele na výsledku: **29 %**

Anotace dle RIV:

When an atom is electronically excited, it relaxes by emitting a photon or an electron. These carry essential information on the electronic structure of their emitter. However, if an atom is embedded in a chemical environment, another ultrafast non-radiative decay process called interatomic Coulombic decay (ICD) can become operative. A key feature of ICD is that the excited atom can transfer its excess energy to its neighbours over large distances. The giant extremely weakly bound helium dimer is a perfect candidate to investigate how far two atoms can exchange energy. We report here that the two helium atoms within the dimer can exchange energy by ICD over distances of more than 45 times their atomic radius. Moreover, we demonstrate that ICD spectroscopy can be used for imaging vibrational wavefunctions of the ionized-excited helium dimer.

Odůvodnění předkladatele:

In the article "Ultralong-range energy transfer by interatomic Coulombic decay in an extreme quantum system" [Nat. Phys. 6, 508 (2010)] we report on the joint experimental and theoretical study of interatomic Coulombic decay (ICD) in helium dimer. Due to its extremely weak bond, the He2 molecule vibrational wave functions spans the range up to 200A with the average bond length being about 52A. This leads to the energy transfer via ICD over distances of more than 45 times the atomic radius, which is the largest distance observed so far. Furthermore, the measured spectrum of emited electrons is strongly influenced by the nuclear dynamics in the dimer. Theoretical analysis shows that the spectrum carries direct image of the nodal structure of the vibrational wave function of the excited dimer. Therefore, the study illustrates the high potential of ICD spectroscopy as an analytical tool.

Odůvodnění panelu:

The paper reports experimental evidence, supported by theoretical analysis, that the two helium atoms within the dimer can exchange energy by interatomic Coulombic decay over very long distances. Furthermore it demonstrates that the interatomic Coulombic

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Universal Oscillations in Counting Statistics

Tomáš Novotný

Identifikátor: **RIV/00216208:11320/09:00206644**

Předkladatel výsledku do Pilíře II.:
Univerzita Karlova v Praze Matematicko-fyzikální fakulta

Podíl předkladatele na výsledku: **22 %**

Anotace dle RIV:

Noise is a result of stochastic processes that originate from quantum or classical sources. Higher-order cumulants of the probability distribution underlying the stochastic events are believed to contain details that characterize the correlations withina given noise source and its interaction with the environment, but they are often difficult to measure. Here we report measurements of the transient cumulants {{nm}} of the number n of passed charges to very high orders (up to m = 15) for electron transport through a quantum dot. For large m, the cumulants display striking oscillations as functions of measurement time with magnitudes that grow factorially with m. Using mathematical properties of high-order derivatives in the complex plane we show that the oscillations of the cumulants in fact constitute a universal phenomenon, appearing as functions of almost any parameter, including time in the transient regime.

Odůvodnění předkladatele:

This work studies the asymptotic behavior of high-order cumulants of the statistical distribution of electron number passing through a circuit in a given time span. We discovered a novel universal mechanism associated with the analytic properties of the cumulant generating function making the cumulants of high order (say above 10) oscillate as functions of essentially any system control parameter. Our findings were experimentally demonstrated by transport through a quantum dot.

Odůvodnění panelu:

This paper reports, on one hand, an interesting experimental investigation of the statistical properties of electron transport through a quantum dot. The so-called cumulants (that involve the expectation values of the passed electrons n to the power m) a

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

A family of zeolites with controlled pore size prepared using a top-down method

Roth, Wieslaw Jerzy ; Chlubná, Pavla ; Zukal, Arnošt ; Čejka, Jiří

Identifikátor: **RIV/61388955:_____/13:00422332**

Předkladatel výsledku do Pilíře II.:
Ústav fyzikální chemie J. Heyrovského AV ČR, v.v.i.

Podíl předkladatele na výsledku: **50 %**

Anotace dle RIV:

The properties of zeolites, and thus their suitability for different applications, are intimately connected with their structures. Synthesizing specific architectures is therefore important, but has remained challenging. Here we report a top-down strategy that involves the disassembly of a parent zeolite, UTL, and its reassembly into two zeolites with targeted topologies, IPC-2 and IPC-4. The three zeolites are closely related as they adopt the same layered structure, and they differ only in how the layers are connected. Choosing different linkers gives rise to different pore sizes, enabling the synthesis of materials with predetermined pore architectures. The structures of the resulting zeolites were characterized by interpreting the X-ray powder-diffraction patterns through models using computational methods; IPC-2 exhibits orthogonal 12-and ten-ring channels, and IPC-4 is a more complex zeolite that comprises orthogonal ten-and eight-ring channels. We describe how this method enable

Odůvodnění předkladatele:

A completely new protocol for targeted synthesis of zeolite has been proposed in this publication and two new zeolite structures (obtained with this protocol) were reported. The protocol denoted ADOR consists of four steps: Assembly – Disassembly – Organization – Reassembly. Zeolites are traditional synthesized via solvo-thermal route using structure direct agent and the procedure is more-or-less based on trial-and-error approach. On the contrary, within the ADOR protocol the structure of new zeolite can be computational predicted, thus, the experimental effort can be focused on the synthesis of those zeolites with desired properties. The critical step of ADOR protocol is the preparation of two-dimensional layers of zeolite that can be subsequently modified and/or organized in variety of ways. However, from a single two-dimensional zeolite, a number of new zeolites can be prepared depending on the topology of the layered zeolites. The structure of new zeolites was determined based on the computational prediction. This study has been published in highly prestige Nature Chemistry journal, and it has got immediate recognition.

Odůvodnění panelu:

It is an excellent pioneering paper with breakthrough outputs published in the best multidisciplinary chemical journal. It presents the highly innovative first approach of reassembly/synthesis of zeolites with target channel system, and showing their pote

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

A family of zeolites with controlled pore size prepared using a top-down method

Petr Nachtigall, Lukáš Grajciar, Miroslav Položij

Identifikátor: **RIV/00216208:11310/13:10134295**

Předkladatel výsledku do Pilíře II.:
Univerzita Karlova v Praze Přírodovědecká fakulta

Podíl předkladatele na výsledku: **50 %**

Anotace dle RIV:

The properties of zeolites, and thus their suitability for different applications, are intimately connected with their structures. Synthesizing specific architectures is therefore important, but has remained challenging. Here we report a top-down strategy that involves the disassembly of a parent zeolite, UTL, and its reassembly into two zeolites with targeted topologies, IPC-2 and IPC-4. The three zeolites are closely related as they adopt the same layered structure, and they differ only in how the layers are connected. Choosing different linkers gives rise to different pore sizes, enabling the synthesis of materials with predetermined pore architectures. The structures of the resulting zeolites were characterized by interpreting the X-ray powder-diffraction patterns through models using computational methods; IPC-2 exhibits orthogonal 12-and ten-ring channels, and IPC-4 is a more complex zeolite that comprises orthogonal ten-and eight-ring channels. We describe how this method enable

Odůvodnění předkladatele:

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Odůvodnění panelu:

It is an excellent pioneering paper with breakthrough outputs published in the best multidisciplinary chemical journal. It presents the highly innovative first approach of reassembly/synthesis of zeolites with target channel system, and showing their pote

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Adsorption of Small Organic Molecules on Graphene

Lazar Petr, Karlický František, Jurečka Petr, Kocman Mikuláš, Otyepková Eva, Šafářová Klára, Otyepka Michal

Identifikátor: **RIV/61989592:15310/13:33147759**

Předkladatel výsledku do Pilíře II.:
Univerzita Palackého v Olomouci Přírodovědecká fakulta

Podíl předkladatele na výsledku: **100 %**

Anotace dle RIV:

We present a combined experimental and theoretical quantification of the adsorption enthalpies of seven organic molecules (acetone, acetonitrile, dichloromethane, ethanol, ethyl acetate, hexane, and toluene) on graphene. Adsorption enthalpies were measured by inverse gas chromatography and ranged from -5.9 kcal/mol for dichloromethane to -13.5 kcal/mol for toluene. The strength of interaction between graphene and the organic molecules was estimated by density functional theory (PBE, B97D, M06-2X, and optB88-vdW), wave function theory (MP2, SCS(MI)-MP2, MP2.5, MP2.X, and CCSD(T)), and empirical calculations (OPLS-AA) using two graphene models: coronene and infinite graphene. Symmetry-adapted perturbation theory calculations indicated that the interactions were governed by London dispersive forces (amounting to similar to 60% of attractive interactions), even for the polar molecules. The results also showed that the adsorption enthalpies were largely controlled by the interaction energy.

Odůvodnění předkladatele:

This is work we quantified the adsorption enthalpies of selected organic molecules to graphene. We showed that the interaction between organic molecules and graphene is governed by London dispersion forces.

Odůvodnění panelu:

The paper presents the first systematic experimental and theoretical study of adsorption enthalpies of a set of organic molecules on graphene, including both the polar and non-polar substances. The +experimental adsorption enthalpies obtained by inverse g

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

An organometallic route to long helicenes

Sehnal, Petr - Stará, Irena G. - Šaman, David - Tichý, Miloš - Míšek, Jiří - Cvačka, Josef - Rulíšek, Lubomír - Chocholoušová, Jana - Vacek, Jaroslav - Starý, Ivo

Identifikátor: **RIV/61388963:_____/09:00330893**

Předkladatel výsledku do Pilíře II.:
Ústav organické chemie a biochemie AV ČR, v. v. i.

Podíl předkladatele na výsledku: **85 %**

Anotace dle RIV:

Here, we report on an organometallic approach to the derivatives of undecacyclic helicene, which is based on intramolecular [2 + 2 + 2] cycloisomerization of aromatic hexaynes under metal catalysis closing 6 new cycles of a helicene backbone in a singleoperation.

Odůvodnění předkladatele:

The role of helicity of small molecules in enantioselective catalysis, molecular recognition, self-assembly, material science, biology and nanoscience is much less understood than that of point-, axial- or planar-chiral molecules. To uncover the envisaged potential of helically chiral 3D polyaromatics represented by iconic helicenes, which are screw-like molecules consisting of mostly ortho-fused benzene rings, we strove for the development of a general synthetic methodology for their preparation. Here, a solution to this long-standing problem is reported that relies on an organometallic route to scarcely explored long helicenes. Their synthesis is based on intramolecular cycloisomerisation of multiple alkynes under metal catalysis to close six new cycles of a backbone in a single operation. The successful preparation of racemic or optically pure undecacyclic helicenes underscored the potential of the newly developed synthetic methodology. It allowed for their detailed characterisation by, for instance, a barrier to helix inversion and self-assembly on a semiconductor surface studied by scanning tunnelling microscopy. This research brought long helical aromatics under the spotlight to initiate further studies on theoretically predicted phenomena such as an electrical magneto-chiral anisotropy effect, current-induced rotation of helical molecules, semiconductive or metallic behaviour of sufficiently long and expanded helicenes, molecular piezoelectricity and spin-selective scattering through helical potentials. This paper published in PNAS (IF 2012: 9.737) in 2009 received so far 52 citations.

Odůvodnění panelu:

This paper reports on the straightforward synthesis of the unique family of helicene derivatives. Authors from the Czech institute play major role in the reported work, as they designed research and wrote the paper, first and corresponding authors are fro

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Atick salivary protein targets cathepsin G and chymase and inhibits host inflammation and platelet aggregation

Chmelař Jindřich - Kopáček Petr - Kopecký Jan - Kotsyfakis Michalis

Identifikátor: **RIV/60077344:_____/11:00358349**

Předkladatel výsledku do Pilíře II.:
Biologické centrum AV ČR, v. v. i.

Podíl předkladatele na výsledku: **39 %**

Anotace dle RIV:

A protein with antiinflammatory and anti-platelet effect was identified. It was named IRS-2 (Ixodes ricinus serpin ? 2). It belongs into the group of serpins ? inhibitors of serine proteases and the mode of action of IRS-2 derives from its inhibitory activity against cathepsin G and mast cell chymase. Antiinflammatory activity was shown using paw edema experiment with mice. IRS-2 inhibited specifically only cathepsin G and thrombin induced platelet aggregation.

Odůvodnění předkladatele:

We revealed that an exogenous salivary protein of Ixodes ricinus, the vector of Lyme disease pathogens in Europe, extensively inhibits edema formation and influx of neutrophils in the inflamed tissue. We named this tick salivary gland secreted effector as I. ricinus serpin-2 (IRS-2), and we show that it primarily inhibits cathepsin G and chymase, while in higher molar excess, it affects thrombin activity as well. The inhibitory specificity was explained using the crystal structure, determined at a resolution of 1.8 angstrom. Moreover, we disclosed the ability of IRS-2 to inhibit cathepsin G-induced and thrombin-induced platelet aggregation. For the first time, an ectoparasite protein is shown to exhibit such pharmacological effects and target specificity. The stringent specificity and biological activities of IRS-2 combined with the knowledge of its structure can be the basis for the development of future pharmaceutical applications.

Odůvodnění panelu:

The paper describes a novel mechanism of vertebrate host modulation for any parasite; which has the profound application in the understanding and foreseeable treatment of the Lyme disease. The work was conducted using the best appropriate concepts and in

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Bambus[6]uril

ŠVEC, Jan, Marek NEČAS a Vladimír ŠINDELÁŘ

Identifikátor: **RIV/00216224:14310/10:00048646**

Předkladatel výsledku do Pilíře II.:
Masarykova univerzita Přírodovědecká fakulta

Podíl předkladatele na výsledku: **100 %**

Anotace dle RIV:

A macrocyclic hexamer, the structure of which is reminiscent of part of the bamboo-plant stem (see picture), was directly prepared by the condensation of a glycoluril derivative and formaldehyde. The macrocycle bound halide anions with high affinity andselectivity.

Odůvodnění předkladatele:

This paper reports on the synthesis of a new class of macrocycles, bambusurils, which are able to bind anions with extraordinary binding strength. Receptors with positive charge are usually required to bind anions. The reason is strong solvation of anion by molecules of solvent. Bambusurils are able to bind anions in their deep cavity based on combination of weak C-H•••anion hydrogen bonding and electroctatic interactions. The original report of bambusuril was followed by number of papers which showed their unprecedented binding strength for some anions, particularly PF6- and ClO4-. Thus, there is a big potential of this compound for sensing and remediation of toxic anions. Editor of Angewandte Chemie also decided to use the cover of the issue to highlight the structure of the discovered compound. The patent in the Czech republic (Patent number: 302710) and European patent (EP2501699 B1) for this work was received. In these documents, the structure of bambusurils is patented as well as methods of their preparations and use.

Odůvodnění panelu:

The paper reports on a novel type of macrocyclic compounds discovered by this group. This discovery has opened completely new possibilities in number of application in supramolecular chemistry because the compounds, known as bambus[n]urils, have many usef

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Deoxygenation of vegetable oils over sulfided Ni, Mo and NiMo catalysts

David Kubička

Identifikátor: **RIV/62243136:_____/10:#0000114**

Předkladatel výsledku do Pilíře II.:
Výzkumný ústav anorganické chemie, a.s.

Podíl předkladatele na výsledku: **80 %**

Anotace dle RIV:

Deoxygenation of vegetable oils has a potential to become an important process for production of biofuels. The present work focuses on investigation of Ni, Mo, and NiMo sulfided catalysts prepared by impregnation in deoxygenation of rapeseed oil at 260?280 8C, 3.5 MPa and 0.25?4 h_1 in a fixed-bed reactor. The activity of the catalysts decreased in the order NiMo/Al2O3 > Mo/Al2O3 > Ni/Al2O3. The catalysts exhibited significantly different product distributions. The bimetallic NiMo catalysts showed higher yields of hydrocarbons than the monometallic catalysts at a given conversion. Apart from the various oxygenated product intermediates, NiMo/Al2O3 yielded a mixture of decarboxylation and hydrodeoxygenation hydrocarbon products while Ni/Al2O3 yielded only decarboxylation hydrocarbon products and Mo/Al2O3 yielded almost exclusively hydrodeoxygenation hydrocarbon products. The effect of Ni/(Ni + Mo) atomic ratio in the range 0.2?0.4 on the activity and selectivity was not significant.

Odůvodnění předkladatele:

The article is focused on the fundamental aspects of a very important industrial topic of catalysts for transformation of renewables into advanced biofuels. The importance of catalyst composition on the mechanism of deoxygenation (hydrodeoxygenation vs. hydrodecarboxylation) that is the decisive factor influencing hydrogen consumption (a key industrial parameter) has been described for the first time. Hence, the article has provided very important information for the scientific community researching catalysts for deoxygenation, a key process for biomass upgrading, as it is evidenced by the significant scientific response. The article has been cited already 97 times (30.6.2014) and it is the 4th most cited article in the journal Applied Catalysis A: General, an essential scientific journal in the field of applied catalysis, among the 556 articles published in the year 2010.

Odůvodnění panelu:

This paper deals with the method how to produce biofuels from vegetable oils by means of their deoxygenation. Biofuels made of vegetable oils are important renewable energy sources which can partially replace fuels based on cruel oil. The paper describes

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Direct polymerase synthesis of reactive aldehyde-functionalized DNA and its conjugation and staining with hydrazines

Raindlová, Veronika - Pohl, Radek - Šanda, Miloslav - Hocek, Michal

Identifikátor: **RIV/61388963:_____/10:00342374**

Předkladatel výsledku do Pilíře II.:
Ústav organické chemie a biochemie AV ČR, v. v. i.

Podíl předkladatele na výsledku: **100 %**

Anotace dle RIV:

Reactive aldehyde-modified DNA was prapered in two steps by cross-coupling reactions of halogenated dNTPs with 4-formylthiophene-2-boronic acid followed by polymerase (PEX or PCR) incorporations of the modified nucleotides to DNA. Aqueous hydrazone-formation was used in conjugation with aryl hydrazines for DNA staining.

Odůvodnění předkladatele:

A novel simple and efficient methodology for attachment of other molecules to DNA (bioconjugation) was developed. It consists in synthesis of DNA bearing very reactive aldehyde groups that can be readily (in one step) linked to diverse other molecules e.g. for studying of molecular mechanism of important biological processes or for labeling of DNA by color or electroactive markers. This methodology is much shorter, simpler and easier than existing methods of preparation of DNA conjugates and thus it has a promising potential for a broad range of applications in interdisciplinary area between chemistry and biology. The methodology is very straightforward and consists of only two steps. The first step is chemical synthesis of aldehyde-modified nucleoside triphosphates and the second one is enzymatic polymerase catalyzed synthesis of DNA from these building blocks. In this way, one can prepare both short sequences containing one or several aldehyde "clips" and very long DNA containing hundreds of such groups. The aldehyde groups readily react with a number of reagents to attach virtually any other molecule. This principle was shown on the formation of colored compounds (hydrazones) used for staining of DNA to yellow or pink color. Later on, this modified DNA was used to to attach important biomolecules (peptides, proteins etc.). This methodology may find a wide range of applications not only in preparation of diverse bioconjugates of DNA but also in material science or nanotechnology where the DNA could serve as an easily programmable and renewable scaffold for attachment of useful chemical molecules of functional groups. The paper was published in the top-tier journal Angewandte Chemie International Edition (IF= 13.7) as a Hot Paper and received already 49 citations.

Odůvodnění panelu:

The authors have developed the first direct and efficient methodology for introduction of an aldehyde functional group to DNA in only two steps. This kind of group (attached through a thiophene moiety) withstands both Suzuki cross-coupling and polymerase

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Does Stacking Restrain the Photodynamics of Individual Nucleobases?

Nachtigallová, Dana - Hobza, Pavel - Lischka, Hans

Identifikátor: **RIV/61388963:_____/10:00346458**

Předkladatel výsledku do Pilíře II.:
Ústav organické chemie a biochemie AV ČR, v. v. i.

Podíl předkladatele na výsledku: **75 %**

Anotace dle RIV:

Nonadiabatic photodynamical simulations of 4-aminopyrimidine (4-APy) used as a model for adenine were performed by embedding it between two stacking methyl-guanine (mGua) molecules to determine the effect of spatial restrictions on the ultrafast photodeactivation mechanism of this nucleobase. During the dynamics the formation of a significant fraction of intrastrand hydrogen bonding from 4-APy to mGua above and below is observed. These findings show that this type of hydrogen bond may play an importantrole for the photodynamics within one DNA strand and that it should be of interest even in irregular segments of double stranded nucleic acids structures. The relaxation mechanism of internal conversion to the ground state is dominated by ring puckering,and an overall elongation of the lifetime by -20% as compared to the isolated 4-APy is computed.

Odůvodnění předkladatele:

Ultrafast relaxation of excited states of naturally occurring nucleobases on the time scale of a few picoseconds is a well-known phenomenon which protects nucleic acids against photodamage. The relaxation mechanism of isolated bases is now well understood. It is generally accepted that they relax into the ground state through nonadiabatic transitions via conical intersections on the crossing of potential energy surfaces of excited and ground states characterized by strongly ring-puckered structures. The excited state behavior of bases embedded in nucleic acids molecules is much more complex. To their photophysical behavior effects caused by embedding of individual bases within nucleic acid molecule need to be treated separately. The effect of sterical constraints on the formation of distorted structures of conical intersections was investigated by means of nonadiabatic photodynamical simulations of 4-aminopyrimidine (4-APy) used as a model for adenine embedded between two stacking methyl-guanine (mGua) molecules. The calculations were performed in the framework of the on-the-fly surface hopping approach which provides a detailed picture of the occurring photophysical processes. A combined quantum mechanical/molecular mechanical is used to account for sterical effects of surrounding stacked bases. The electronic excitation is confined to 4-APy which is treated quantum mechanically at a multi-configurational level and mGua molecules are treated at the MM level. The calculations show that the stacking conformation does not substantially restrain the strong out-of-plane deformations which lead nucleobases to conical intersections. However, a new feature observed during the simulations, the dynamical formation and disappearance of intrastrand hydrogen bonds between stacked bases, may have important implications for the photorelaxation of nucleic acids. In the present case these dynamical hydrogen bonds contribute to a faster decay component.

Odůvodnění panelu:

The paper presents a top-class theoretical study focused on photodynamics of nucleic acids and their components. The study resolves critical issues of the old problem of short excited-state lifetimes of nucleobases. It presents new features of the dynamic

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Effective Purification of Biogas by Condensing-Liquid Membrane

Poloncarzová, Magda - Vejražka, Jiří - Veselý, Václav - Izák, Pavel

Identifikátor: **RIV/67985858:_____/10:00355044**

Předkladatel výsledku do Pilíře II.:
Ústav chemických procesů AV ČR, v. v. i.

Podíl předkladatele na výsledku: **100 %**

Anotace dle RIV:

In summary, a new method for raw biogas purification and carbon dioxide separation by a CLM was developed. The separation is based on the different solubility of components of raw biogas in a very thin, continuously refreshed water layer on/in a hydrophilic porous membrane. The permeation flux of each component of biogas depends on the feed flow rate of the gases and pressure and temperature differences between the upstream and downstream side of the CLM. The selectivity of the CLM increases with a lower feed flow rate. The molar balance based on 43 linear equations confirmed the hight potential of this method to upgrade raw biogas to natural-gas quality. The CLM can also be used under unfavorable conditions in which other polymeric membranes could becontaminated or destroyed by aggressive substances.

Odůvodnění předkladatele:

In times when new alternative energy sources are extensively explored, dr. Izák's team introduced a revolutionary idea of biogas purification using a water condensing membrane. The significant difference in solubility and permeability of methane and of raw biogas impurities (carbon dioxide, hydrogen sulfide, ammonium) in and through a water layer leads to an efficient separation of CO2 from CH4 . Based on this method a pilot plant was designed at the Prague central sewage plant and was sponsored by the ČEZ company. The pilot plant was intended for a scale-up of the process and for testing of the use of spiral wound modules instead of a flat sheet membrane. After 18 months of test runs, the concept proved to be successful. Subsequently, a small full-scale unit with capacity 3 Nm3/h was built by Jinpo Plus Inc. At present, long term stability tests are in progress. A feasibility study is required and will be carried out based on the acquired full-scale data.. The original idea of the separation process was published in Angewandte Chemie International Edition journal with the IF = 13.734 (Impact factor 2012) according to JCR (Journal Citation Report). This journal has the quartile ranking Q1 in the JCR category CHEMISTRY MULTIDISCIPLINARY. This work has been cited 9 times.

Odůvodnění panelu:

The paper presents a new method for raw biogas purification and carbon dioxide separation based on different solubilities of the components in the continuously regenerated “condensing-water-membrane (authors’ original idea). The laboratory testing was fol

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Enantioselectivity of Haloalkane Dehalogenases and its Modulation by Surface Loop Engineering

PROKOP, Zbyněk, Yukari SATO, Jan BREZOVSKÝ, Tomáš MOZGA, Radka CHALOUPKOVÁ, Táňa KOUDELÁKOVÁ, Petr JEŘÁBEK, Veronika ŠTĚPÁNKOVÁ, Yuji NAGATA a Jiří DAMBORSKÝ

Identifikátor: **RIV/00216224:14310/10:00040598**

Předkladatel výsledku do Pilíře II.:
Masarykova univerzita Přírodovědecká fakulta

Podíl předkladatele na výsledku: **70 %**

Anotace dle RIV:

Engineering of the surface loop in haloalkane dehalogenases affects their enantiodiscrimination behavior. The temperature dependence of the enantioselectivity (lnE versus 1/T) of -bromoalkanes by haloalkane dehalogenases is reversed (red data points) bydeletion of the surface loop; the selectivity switches back when an additional single-point mutation is made. This behavior is not observed for -bromoesters.

Odůvodnění předkladatele:

Enzymes are widely used for the synthesis of pharmaceuticals, agrochemicals, and food additives because they can catalyze enantioselective transformations. Understanding the molecular basis of enzyme–substrate interactions that contribute to enantioselectivity is important for constructing selective enzymes by protein engineering. Up to now, emphasis has been on reactions such as lipase- or esterase-based kinetic resolutions, as well as lyase-, aminotransferase- and ketoreductase-mediated conversions. An emerging group of enzymes that is explored for enantioselectivity is dehalogenases. Haloalkane dehalogenases can convert a broad range of halogenated aliphatic substrates to their corresponding alcohols by an SN2 mechanism, and because of the simplicity of the reaction represent a good model system to study the structural basis of reactivity and enantioselectivity. We have shown in this article that haloalkane dehalogenases: 1) can kinetically discriminate between enantiomers of two distinct groups of substrates, alpha-bromoesters and beta-bromoalkanes; 2) have enantioselectivity based on distinct molecular interactions, which can be modified separately by engineering of a surface loop; and 3) can adopt an inverse temperature dependence of enantioselectivity for beta-bromoalkanes, but not alpha-bromoesters, by mutating this surface loop and a flanking residue. This study contributes towards understanding of the molecular basis and thermodynamics of the enantioselectivity of enzymes, and opens up new possibilities for constructing enantioselective biocatalysts by protein engineering. See the list of reviews and bibliometrics indicators in the attachement!

Odůvodnění panelu:

The result presents a breakthrough study focused on rational construction of enantioselective biocatalysts by protein engineering. It was published in one of the leading multidisciplinary chemistry journals and has attracted quite a large number of citati

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Feasibility and constraints of particle targeting using the antigen – antibody interaction

Tokárová V.; Pittermannová A.; Štěpánek F.

Identifikátor: **RIV/68378050:____/13:00423266**

Předkladatel výsledku do Pilíře II.:
Ústav molekulární genetiky AV ČR, v. v. i.

Podíl předkladatele na výsledku: **60 %**

Anotace dle RIV:

This work is concerned with the surface modification of fluorescent silica nanoparticles by a monoclonal antibody (M75) and the specific bioadhesion of such particles to surfaces containing the PG domain of carbonic anhydrase IX (CA IX), which is a trans-membrane protein specifically expressed on the surfaces of several tumor cell lines. The adhesion strength of antibody-bearing silica nanoparticles to antigen- bearing surfaces was investigated under laminar flow conditions in a microfluidic cell and compared to the adhesion of unmodified silica nanoparticles and nanoparticles coupled with an unspecific antibody. Adhesion to cancer cells using flow cytometry was also investigated and in all cases the adhesion strength of M75-modified nanoparticles wassignificantly stronger than for the unmodified or unspecific nanoparticles, up to several orders of magnitude in some cases. The specific modification of nano- and microparticles by an antibody-like protein therefore appears to be a feasi

Odůvodnění předkladatele:

The paper describes – for the first time – the synthesis of fluorescent mesoporous silica nanoparticles with covalently coupled monoclonal antibody M75 that specifically binds to the PG domain of a tumour-associated antigen carbonic anhydrase IX, which is one of only a few truly specific markers for cancer cells known to date. The uniqueness and significance of the work stems from the fact that the ability of the nanoparticles to selectively adhere to the target antigen has been demonstrated and quantified under a variety of scenarios, including ELISA-like test (static conditions), laminar flow in a microfluidic device at increasing flow rates (shear rates comparable to those prevailing in the vasculature of solid tumors), and adhesion to live cancer cells (HT-29 line) in a suspension culture, detected by flow cytometry at a range of concentrations. The work proves that the use of the antibody M75 is suitable for achieving specific nanoparticle adhesion to the cancer cells (as opposed to non-specific adhesion to a negative reference), which opens the possibility for future diagnostic or therapeutic applications of such specifically engineered nanoparticles. The excellence of the work is demonstrated not only by the quality of the journal, but also by the fact that it has lead to a significant follow-up research funding for in vivo testing and Magnetic Resonance Imaging, and one of the authors (A. Pittermannova) has won the national round of a competition for the best Diploma thesis as well as the French Government Scholarship for PhD under joint supervision. Nanoscale is a top-ranking journal in the field MATERIALS SCIENCE, MULTIDISCIPLINARY and PHYSICS, APPLIED (rank no. 19 of 241, and 13 of 128). 19 citing articles without self-citations of anyone of co-authors.

Odůvodnění panelu:

The paper describes the developed original procedure of preparation of hybrid nanomaterials composed of silica nanoparticles and monoclonal antibody. The adhesion strength of antibody bearing silica nanoparticles to antigen-bearing surfaces including canc

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Gold-Gold Cooperation in the Addition of Methanol to Alkynes

Jana Roithová, Štěpánka Janková, Lucie Jašíková, Jiří Váňa, Simona Hybelbauerová

Identifikátor: **RIV/00216208:11310/12:10128776**

Předkladatel výsledku do Pilíře II.:
Univerzita Karlova v Praze Přírodovědecká fakulta

Podíl předkladatele na výsledku: **100 %**

Anotace dle RIV:

The present "gold-rush" in chemistry started in the nineties with a report of a gold-catalyzed addition of methanol to alkynes, which shook the conception of gold as an inert metal. Here, we present a mechanism of this reaction and demonstrate that actually two gold cations in cooperation activate the C-C triple bond and mediate the methanol addition, which results directly in formation of a diaurated intermediate. This reaction intermediate was detected by electrospray ionization mass spectrometry, labeling and infrared multiphoton dissociation spectroscopy, which clearly revealed the addition of the methoxy group to the C-C triple bond. The kinetics of the reaction was determined from NMR experiments. The experimental results are complemented by theoretical calculations, which provide an overall picture of the reaction mechanism.

Odůvodnění předkladatele:

Gold-catalyzed addition of alcohols to the C-C triple bonds of alkynes was subject of the initial paper of Teles et al. in Angewandte Chemie (1998, 37, 1415), which triggered the “gold rush” in catalysis in that gold complexes were first shown to be potent catalysts. Subsequently, the whole area of gold homogenous catalysis developed in various directions with great conceptual and synthetic value (e.g. Hashmi 2006, 45, 7896 or Fürstner 2007, 46, 3410). Alcohol addition to alkynes represents a central step in most of the nowadays developed cascade reactions catalyzed by gold. Hence, the knowledge of the mechanism is of principle importance and certainly of very broad interest. In this article, the reaction between methanol and 1-phenylpropyne catalyzed by (PMe3)AuCl/AgSbF6 using state-of-the-art experimental and theoretical techniques have been investigated. We have identified gem-diaurated reaction intermediates using electrospray ionization mass spectrometry. Using a mixture of labeled and unlabeled solvents we have unequivocally shown that the diaurated intermediates are formed in the solution and determined the half-life of the intermediates in the solution in order of minutes. The structure of the intermediate was characterized by measuring its gas-phase infrared multiphoton dissociation spectrum. The kinetics of the reaction was determined by NMR experiments. Finally, the overall picture of the reaction mechanism was complemented by theoretical calculations. All data are consistent with a dual activation mechanism, in which gold-activated alkyne reacts with gold methanolate, which leads to the formation of gem-diaurated intermediates. A related concept was suggested by Hashmi et al. for cycloisomerization reactions of polyunsaturated hydrocarbons catalyzed by gold(I) complexes (ACIE 2012, 51, 4456) and meanwhile was established for a whole array of gold-catalyzed reactions.

Odůvodnění panelu:

The catalysis over gold is a hot topic in the both homogeneous organic synthesis by Au(I) complexes and solid-gas redox reactions over atomic and nano-dispersed Au species. The paper elucidated the complex reaction pathway identifying a set of Au-bonded i

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Graphene Fluoride: A Stable Stoichiometric Graphene Derivative and its Chemical Conversion to Graphene

Karlický František, Zbořil Radek, Šafářová Klára, Jančík Dalibor, Otyepka Michal

Identifikátor: **RIV/61989592:15310/10:10215835**

Předkladatel výsledku do Pilíře II.:
Univerzita Palackého v Olomouci Přírodovědecká fakulta

Podíl předkladatele na výsledku: **67 %**

Anotace dle RIV:

Stoichoimetric graphene fluoride monolayers are obtained in a single step by the liquid-phase exfoliation of graphite fluoride with sulfolane. Comparative quantum mechanical calculations reveal that graphene fluoride is the most thermodynamically stableof five studied hypothetical graphene derivatives; graphane, graphene fluoride, bromide, chloride, and iodide. The graphene fluoride is transformed into graphene via graphene iodide, a spontaneously decomposing intermediate. The calculated bandgaps of graphene halides vary from zero for graphene bromide to 3.1 eV for graphene fluoride. It is possible to design the electronic properties of such two-dimensional crystals.

Odůvodnění předkladatele:

In this work we discovered fluorographene (graphene fluoride) as the first stoichiometric 2D derivative of graphene and the world's thinnest insulator. We provided characterization of this new 2D material and we calculated electronic properties of other graphene halides. We also showed that fluorographene can be chemically transformed to graphene. This work has opened the doors for the preparation of a new class of graphene derivatives - graphene halides.

Odůvodnění panelu:

This is an excellent paper dealing with a hot topic in graphene chemistry. It combines theoretical and experimental approach in a synergic way. The work pioneered a new strategy of controlled chemical modification of graphene, which in an important contri

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Hemoglobin digestion in blood-feeding ticks: mapping of multipeptidase pathway by functional proteomics

Horn, Martin - Nussbaumerová, Martina - Šanda, Miloslav - Kovářová, Zuzana - Srba, Jindřich - Mareš, Michael

Identifikátor: **RIV/61388963:_____/09:00333131**

Předkladatel výsledku do Pilíře II.:
Ústav organické chemie a biochemie AV ČR, v. v. i.

Podíl předkladatele na výsledku: **90 %**

Anotace dle RIV:

Hemoglobin digestion is an essential process for blood-feeding parasites. We deconvoluted the hemoglobinolytic cascade in the tick Ixodes ricinus, a vector of Lyme disease and tick-borne encephalitis. A network of digestive peptidases was demonstrated through imaging with specific activity-based probes and activity profiling. Selective inhibitors were applied to dissect the roles of the individual peptidases and determine the peptidase-specific cleavage map of the hemoglobin molecule. Because of their central function in nutrition of the parasite, the identified enzymes are potential targets to developing novel anti-tick vaccines that limit parasite survival and disease transmission.

Odůvodnění předkladatele:

Ticks are vectors for a number of viral and bacterial diseases in humans and domestic animals. To survive and reproduce, ticks feed on host blood and digest hemoglobin. This critical process is still poorly understood. Here, we investigate Ixodes ricinus, a vector of Lyme disease and tick-borne encephalitis, as a model hard tick. Our work fills the gap in tick biology and provides biochemical insight into the mechanism of hemoglobin peptidolysis in the tick gut. Using functional proteomic and biochemical approaches we deconvoluted the intracellular hemoglobinolytic cascade to identify a suite of gut peptidases that operate in an ordered pathway to complete the hydrolysis of hemoglobin. The network of acidic peptidases induced upon blood feeding was demonstrated through imaging with specific activity-based probes and activity profiling with peptidic substrates and inhibitors. Selective inhibitors were applied to dissect the roles of the individual peptidases and to determine the cleavage map of the hemoglobin molecule. Because of their central function in nutrition of the parasite, the identified enzymes are potential targets to developing novel anti-tick vaccines to limit parasite survival and transmission of associated diseases. Such new candidate antigens are increasingly in demand to combat the spread of tick-borne diseases.

Odůvodnění panelu:

This is an excellent report on the mechanism of hemoglobin peptidolysis in the tick gut. Ticks are important ectoparasites that transmit a wide range of infectious agents, causing diseases in humans and domestic animals. The obtained results possess a gre

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Implications for the active form of human insulin based on the structural convergence of highly active hormone analogues

Jiráček, Jiří - Žáková, Lenka - Antolíková, Emília

Identifikátor: **RIV/61388963:____/10:00342433**

Předkladatel výsledku do Pilíře II.:
Ústav organické chemie a biochemie AV ČR, v. v. i.

Podíl předkladatele na výsledku: **70 %**

Anotace dle RIV:

Here, we present the design and analysis of highly active (200?500%) insulin analogues that are truncated at residue 26 of the B-chain (B26). They show a structural convergence in the form of a new (beta)-turn at B24-B26. We propose that the key elementin insulin?s transition, from an inactive to an active state, may be the formation of the (beta)-turn at B24-B26 associated with a trans to cis isomerisation at the B25-B26 peptide bond.

Odůvodnění předkladatele:

Insulin is a key protein hormone that regulates blood glucose levels and, thus, has widespread impact on lipid and protein metabolism. Insulin resistance or failure to synthesize insulin de novo leads to diabetes mellitus, which is considered as an epidemic of 21st century. In 2011, at least 360 million people worldwide had diabetes and this number is expected to rise to 550 million by 2030. Insulin action is manifested through binding of this hormone to the specific membrane receptor. Despite substantial effort of many laboratories, the structure of the insulin-receptor complex was not known until 2013 and our knowledge about structural behavior of insulin was based upon inactive, storage-like states. However, it is widely acknowledged that insulin must undergo structural changes upon binding to the receptor. We prepared a series of highly active insulin analogs with modifications at the B26 position. X-ray structural analysis revealed their unique 3-D structures. The main feature of these new insulin structures is a ?-turn at the C-terminus of the B-chain of insulin (B26-turn). The resultant conformational changes unmask previously buried amino acids that are implicated in receptor binding. Based on the structural convergence and high binding affinities of new analogs possessing B26-turn, we postulated that the structures of these new insulins may represent the active form of the hormone. Our results represented a milestone in the study of insulin interaction with the receptor. Modified insulins resembling the receptor-bound form of the hormone may initiate the development of new insulin analogs or insulin mimetics for nasal, pulmonal or oral treatment of diabetes. The modified insulins developed in this study were used for the determination of the first structure of the insulin-receptor complex published in 2013 and co-authored by our IOCB team (Menting et al., Nature 493,241–245, 2013).

Odůvodnění panelu:

This is an excellent report on revealing the insulin transition from inactive to active form via conformational changes. The authors presented novel highly active insulin analogues and gave rational implications for design of novel antidiabetic drugs.

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Lucifensin, the long-sought antimicrobial factor of medicinal maggots of the blowfly Lucilia sericata

Čeřovský, Václav - Žďárek, Jan - Fučík, Vladimír - Monincová, Lenka - Voburka, Zdeněk

Identifikátor: **RIV/61388963:_____/10:00342382**

Předkladatel výsledku do Pilíře II.:
Ústav organické chemie a biochemie AV ČR, v. v. i.

Podíl předkladatele na výsledku: **90 %**

Anotace dle RIV:

A novel homolog of insect defensin designated lucifensin (Lucilia defensin) was purified from the extracts of various tissues of the green bottle fly (Lucilia sericata) larvae and from their excretions/secretions. The primary sequence of this peptide of40 residues and three intramolecular disulfide bridges was determined by ESI-QTOF mass spectrometry and Edman degradation. It is proposed that lucifensin is that long-sought larger molecular weight antimicrobial factor of the Lucilia sericata excretions/secretions supposed to be effective against pathogenic elements of the wound microbial flora during the medicinal process known as maggot therapy.

Odůvodnění předkladatele:

The discovery of novel insect defensin named lucifensin is a breakthrough in the understanding the fundamentals of the medicinal process known as maggot (larval) therapy. The application of sterile larvae of the blowfly Lucilia sericata to an infected non-healing wound results in the removal of necrotic tissue, disinfection, rapid elimination of infecting microorganisms resistant to traditional antibiotics and enhancement of the healing process. Larval therapy is the salvage therapy in cases where surgery or other treatments fail to stop the progressive destruction of tissue which in particular results in foot amputation of diabetic patients with foot ulcers. Since the introduction of maggot therapy into clinical practice in the 1930s, researchers began to investigate the underlying mechanisms which may be responsible for some of the beneficial effects of maggot therapy. Many attempts in several laboratories have been made during many years to isolate and identify in the excretions/secretions of the larvae antimicrobial agents responsible for suppressing the infection. That happened in our laboratory in 2009 when we succeeded, as the first one, to identify antimicrobial peptide of larval immune system and named it lucifensin. We purified this peptide from the extracts of various tissues (gut, salivary glands, fat body and hemolymph) of the larvae and from their excretions/secretions using ultrafiltration and high performance liquid chromatography. Its primary sequence of 40 amino acid residues and three intramolecular disulfide bridges was determined by mass spectrometry and by Edman degradation.We assume that lucifensin is the key antimicrobial component that protects the maggots when they are exposed to the highly infectious environment of a wound during the therapy. We also believe that lucifensin is one of the crucial disinfectants of the wound produced by the maggots which contributes to the healing process.

Odůvodnění panelu:

This is an excellent pilot study on extraction and identification of peptide that is most probably responsible for antimicrobial effect of Lucilia sericata and its healing potential of complicated wounds. This pilot study has many potential applications a

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Nanosecond Time-Dependent Stokes Shift at the Tunnel Mouth of Haloalkane Dehalogenases

Sýkora, Jan ; Olžyńska, Agnieszka ; Hof, Martin

Identifikátor: **RIV/61388955:_____/09:00333807**

Předkladatel výsledku do Pilíře II.:
Ústav fyzikální chemie J. Heyrovského AV ČR, v.v.i.

Podíl předkladatele na výsledku: **50 %**

Anotace dle RIV:

The tunnel mouths are evolutionally the most variable regions in the structures of haloalkane dehalogenases originating from different bacterial species, suggesting their importance for adaptation of enzymes to various substrates. We decided to monitor the dynamics of this particular region by means of time-resolved fluorescence spectroscopy and molecular dynamic simulations. To label the enzyme specifically, we adapted a novel procedure that utilizes a coumarin dye containing a halide-hydrocarbon linker, which serves as a substrate for enzymatic reaction. The procedure leads to a coumarin dye covalently attached and specifically located in the tunnel mouth of the enzyme. In this manner, we stained two haloalkane dehalogenase mutants, DbjA-H280F and DhaA-H272F.

Odůvodnění předkladatele:

For the first time we demonstrate how time-dependent fluorescence shifts of a fluorescent reporter molecule can be used for monitoring hydration and dynamics close to the active site of enzymes, more specifically of haloalkane dehalogenases. To label the enzyme specifically, we adapted a novel procedure that utilizes a coumarin dye containing a halide-hydrocarbon linker, which serves as a substrate for enzymatic reaction. The measurements of time-resolved fluorescence anisotropy, acrylamide quenching, and time-resolved emission spectra reveal differences in polarity, accessibility and mobility of the dye and its microenvironment between different haloalkane dehalogenases mutants. The obtained experimental data are consistent with results obtained by molecular dynamics calculations and correlate with the anatomy of the tunnel mouths. The same scientific groups recently used this new method for investigating the importance of dynamics and hydration on enzymatic catalysis and rational protein design. In this follow-up paper (Nature Chemical Biology, 2014, 10, 428–430) we show for the first time how dynamics and hydration are crucial for the enantioselectivity of such enzyme class. This finding can be classified as the discovery of a new phenomenon.

Odůvodnění panelu:

This excellent paper in a top journal (JACS) introduced novel methodology enabling for the first time to monitor hydration and dynamics of the enzyme active site micro-environment. It provides an insight into processes which decisively control the dynamic

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Novel Synthesis of the TiO2(B) Multilayer Templated Films

Procházka, Jan ; Kavan, Ladislav ; Zukalová, Markéta ; Frank, Otakar ; Kalbáč, Martin ; Zukal, Arnošt

Identifikátor: **RIV/61388955:_____/09:00323619**

Předkladatel výsledku do Pilíře II.:
Ústav fyzikální chemie J. Heyrovského AV ČR, v.v.i.

Podíl předkladatele na výsledku: **90 %**

Anotace dle RIV:

TiO2(B) mesoporous thin films were grown in two steps on the F-doped SnO2 conductive glass substrates. In the first step, small amount of H3PO4, corresponding to 0.15-0.375 wt % P on TiO2 basis, was introduced into concentrated HCl which was subsequentlyused for hydrolysis of titanium ethoxide. The hydrolyzed colloidal TiO2 suspension was further mixed with a 1-butanol solution of the amphiphilic triblock copolymer Pluronic P123. The obtained precursor mixture was used for dip coating of FTO substrates. To achieve over 1 .mu.m thick films, dip coating (followed by a thermal treatment at 350 C/2h) was repeated several times to produce multilayer films. The films consisted of amorphous TiO2 with small amounts of anatase and TiO2(B). The amorphous part was converted into the TiO2(B) in a simple firing step at 500-550 C. The formation of TiO2(B) phase was accompanied by a significant increase of the film thickness.

Odůvodnění předkladatele:

A collaboration of the Department of Electrochemical Materials in J. Heyrovský Institute of Physical Chemistry (JP, LK, MZ, OF, MK) with the Department of Synthesis and Catalysis of the same institute (AZ), Institute of Inorganic Chemistry, Řež near Prague (MK), ESRF Grenoble (DC) and EPF-Lausanne (MG) led to discovery that a metastable monoclinic form of titanium dioxide, TiO2(B) could be grown in multilayer thin films by employing a novel synthetic protocol based on amphiphilic triblock copolymer templating and phosphorus doping. The material shows unusual (non-fibrous) morphology in mesoporous framework. Needles of TiO2(B) mostly 4 × 9 nm2 in size are organized in the walls around the mesopores. The films exhibit unique electrochemical and photoelectrochemical properties, which are applicable in high-rate Li-ion batteries, electrochromic displays and dye-sensitized solar cells.

Odůvodnění panelu:

The work explored possibilities of modifying the surface of electrocatalytic titania mesoporous thin film materials to enhance selective oxygen evolution in presence of chlorides. The novel strategy for selectivity control of oxide electrocatalysis presen

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Overcharging in Biological Systems: Reversal of Electrophoretic Mobility of Aqueous Polyaspartate by Multivalent Cations

Anna Kubíčková, Tomáš Křížek, Pavel Coufal

Identifikátor: **RIV/00216208:11310/12:10124385**

Předkladatel výsledku do Pilíře II.:
Univerzita Karlova v Praze Přírodovědecká fakulta

Podíl předkladatele na výsledku: **50 %**

Anotace dle RIV:

Charge reversal as an extreme case of charge compensation is directly observed by capillary electrophoresis for a negatively charged peptide in aqueous solutions of trivalent cations. Atomistic and coarse-grained simulations provide molecular interpretation of this effect showing that it is largely of electrostatic origin with a minor contribution of chemical specificity of the salt ions.

Odůvodnění předkladatele:

Behavior of peptides and proteins in vitro and in vivo depends on the electric charge on their surfaces. The surface charge of a protein is not only influenced by pH but also by ions present in the solution that can, to a certain extent, compensate charge of amino acid residues. In this work, we studied the effect of mono-, di- and trivalent cations on the electrophoretic mobility of tetra-aspartate peptide using capillary electrophoresis and molecular dynamics simulations based on coarse-grained and atomistic models. Electrophoretic measurements showed that the compensation of the peptide charge becomes stronger with increasing valency of cations. In the case of trivalent lanthanum cation, overcharging manifested by reversed electrophoretic mobility was observed. The experimental results and the coarse-grained simulations were in a very good agreement suggesting that electrostatic interactions play primary role in the charge compensation. However, some chemical specificity was detected with both, capillary electrophoresis and atomistic simulations indicating that chemical selectivity effects have to be taken into account to obtain quantitative predictions. This was the first time when the overcharging effect was observed in a biologically relevant system simple enough for quantitatively accurate modelling to be performed, which allowed deeper insight into molecular mechanism of the effect. The relevance of this work to other researches is evident from 10 citations within just two years from its publication. This work is a result of collaboration between the Charles University in Prague and Institute of Organic Chemistry and Biochemistry, Academy of Sciences of the Czech Republic.

Odůvodnění panelu:

This is an interesting study of the electrical properties of peptides in salt solutions on the border between physics and biology, combining experimental electrophoretic measurements with model computations. It is novel in that it describes for the first

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Oxygen Superbases as Polar Binding Pockets in Nonpolar Solvents

Lucie Ducháčková, Aneta Kadlčíková, Martin Kotora, Jana Roithová

Identifikátor: **RIV/00216208:11310/10:10062507**

Předkladatel výsledku do Pilíře II.:
Univerzita Karlova v Praze Přírodovědecká fakulta

Podíl předkladatele na výsledku: **100 %**

Anotace dle RIV:

A novel class of chiral superbases derived from the 2,2 '-bipyridyl-N,N-dioxide skeleton are presented. Combined experimental and theoretical data reveal that their proton affinities are on the order of 1050 kJ mol(-1), with protonation occurring at theoxygen atoms in a chelating manner. In the free bases, the oxygen atoms form a strongly polar binding site hidden in a hydrophobic envelope formed by the hydrocarbon backbone of the superbases. This chiral molecular structure can entrap polar intermediates or polarized transition structures and stabilize them in nonpolar solvents. Specifically, this mode of catalysis is shown for the coupling of benzaldehyde and allyltrichlorosilane.

Odůvodnění předkladatele:

One of the major aims in chemistry is to influence a chemical reaction in order to obtain the required products at the best possible yield. One of the tools is catalysis. A new class of catalysts bases on 2,2‘-bipyridyl N,N‘-dioxide skeleton was developed in the group of Prof. Kotora at the Faculty of Science of the Charles University in Prague. It is assumed that the catalysts act as bases, hence they bind to protons or other positively charged species or groups. Based on the investigation of the properties of the catalysts, we have found that they belong to extremely basic compounds, so-called superbases. Most of the known superbases are derived from nitrogen-containing compounds, where nitrogen serves as the binding site for a proton. Our catalysts are first experimentally studied oxygen superbases (i.e. proton is bound to oxygen). Investigation of mechanisms of reactions, which are catalyzed by these superbases, brought surprising results. Oxygen atoms of the catalysts do not bind directly to an electrophilic site of a reactant. Instead the catalyst acts as a sort of a minienzyme, which contains a structurally well defined, highly polar binding site for a substrate and at the same time has a hydrophobic envelope. Thus, in nonpolar solvents polar reactants tend to hide inside the polar pockets of the catalysts, which firstly brings the reactants together and secondly influences their mutual interaction. The result is a selective reaction, which leads to the required products with high yields.

Odůvodnění panelu:

This is a highly inventive paper combining both experimental and theoretical approach to revealing a mechanism of an important asymmetric reaction. The discovery on novel oxygen superbases might contribute to understanding an important part of catalysis w

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Rad52 SUMOylation affects the efficiency of the DNA repair

ALTMANNOVÁ, Veronika, Peter KOLESÁR, Radka CHALOUPKOVÁ, Jiří DAMBORSKÝ a Lumír KREJČÍ

Identifikátor: **RIV/00216224:14310/10:00043447**

Předkladatel výsledku do Pilíře II.:
Masarykova univerzita Přírodovědecká fakulta

Podíl předkladatele na výsledku: **90 %**

Anotace dle RIV:

Homologous recombination (HR) plays a vital role in DNA metabolic processes including meiosis, DNA repair, DNA replication, and rDNA homeostasis. HR defects can lead to pathological outcomes, including genetic diseases and cancer. Recent studies suggestthat the post-translational modification by the small ubiquitin-like modifier (SUMO) protein plays an important role in mitotic and meiotic recombination. However, the precise role of SUMOylation during recombination is still unclear. Here, we characterize the effect of SUMOylation on the biochemical properties of the Saccharomyces cerevisiae recombination mediator protein Rad52. Interestingly, Rad52 SUMOylation is enhanced by ssDNA, and we show that SUMOylation of Rad52 also inhibits its DNA binding and annealing activities.

Odůvodnění předkladatele:

The paper by Altmannova et al. focuses on the role of Rad52 sumoylation in DNA repair. It has been known that many proteins participating in DNA repair can be post-translationally modified by SUMO protein. However, the role of sumoylation in DNA repair and its effect on the function of modified proteins was very poorly understood. In this study, we used a multidisciplinary approach to study the sumoylation of a crucial Saccharomyces cerevisiae recombination mediator Rad52 protein. We have established several in vitro methods in our lab at Masaryk University in Brno (in vitro sumoylation assay, electrophoretic mobility shift assay, single-strand annealing assay) which allowed us to analyze Rad52 sumoylation from biochemical point of view. Using above mentioned assays we demonstrated that sumoylation inhibits the DNA binding and strand annealing activities of Rad52 protein. These data obtained by our lab provided a unique mechanistic information regarding the role of sumoylation in the regulation of the biochemical activities of Rad52. Our results highlighted the importance of sumoylation in homologous recombination and brought an essential knowledge for the initial characterization of the role of sumoylation in DNA repair. The biochemical study of Rad52 sumoylation was further supported by the in vivo data from our collaborators abroad (Dr. Xiaolan Zhao, Memorial Sloan-Kettering Cancer Center, New York, USA; Dr. Michael Lisby, University of Copenhagen, Denmark). Their work confirmed that sumoylation of Rad52 regulates the recombination events in the cells and provide a quality control mechanism to direct homologous recombination pathway choice depending on substrate types and the chromosomal environment. In addition, see the attachement!

Odůvodnění panelu:

The paper reports on the unique data on the role of sumoylation in the regulation of the biochemical activities of Rad52 in homologous recombination. The results of the paper demonstrated for the first time that SUMOylation, in conjunction with other Rad5

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Rational Design of Chemical Ligands for Selective Mitochondrial Targeting

Rimpelová, S.; Bříza, T.; Záruba, K.; Kejik, Z.; Ruml, T.; Král, V.

Identifikátor: **RIV/00216208:11110/13:10189210**

Předkladatel výsledku do Pilíře II.:
Univerzita Karlova v Praze 1. lékařská fakulta

Podíl předkladatele na výsledku: **65 %**

Anotace dle RIV:

The rational design of molecules with selective intracellular targeting is a great challenge for contemporary chemistry and life sciences. Here, we demonstrate a rational approach to development of compartment-specific fluorescent dyes from the ?-aryl substituted pentamethine family. These novel dyes exhibit an extraordinary affinity and selectivity for cardiolipin in inner mitochondrial membrane and possess excellent photostability, fluorescent properties, and low phototoxicity. Selective imaging of live and fixed mitochondria was achieved in various cell lines using nanomolar concentrations of these dyes. Their high localization specificity and low toxicity enables study of morphological changes, structural complexity, and dynamics of mitochondria playing a pivotal role in many pathological diseases. These far-red emitting dyes could also serve in a variety of biomedical applications.

Odůvodnění předkladatele:

Specific intracellular targeting by small molecules represents modern approach for diagnosis and targeted therapy of various diseases. The significance of our research revealed absolutely novel group of fluorescent compounds based on pentamethinium salts selectively interacting with cardiolipin. Their preference for this phospholipid, exclusively found only in the inner membrane of mitochondria, resulted in selective intracellular localization in these organelles (Bioconjugate Chem, 2013). Thus, we have invented fully new, very specific fluorescent mitochondrial probes based on pentamethinium salts, which, in contrast to the commercially available ones, have higher photostability, selectivity, lower cytotoxicity and their synthesis is cost-effective. These probes, applicable for live cells, have remarkable potential and will serve for the study of mechanism of mitochondrial dysfunction, for in vivo imaging, diagnostics of neurodegenerative diseases and some of them also for therapy. Moreover, these probes are of significant potential for the commercial market. Bioconjugate Chemistry is a top-ranking journal in the field CHEMISTRY, ORGANIC (rank no. 9 of 57).

Odůvodnění panelu:

With the clear objective of developing chemical probes for diagnosis and therapy for a targeted phospolipid receptor, a marker of neurodegenerative diseases, the group of 9 scientists conceived and synthesized a series of fluorescent molecules. Subsequ

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Redesigning Dehalogenase Access Tunnels as a Strategy for Degrading an Anthropogenic Substrate

PAVLOVÁ, Martina, Martin KLVAŇA, Radka CHALOUPKOVÁ, Michal OTYEPKA a Jiří DAMBORSKÝ

Identifikátor: **RIV/00216224:14310/09:00028563**

Předkladatel výsledku do Pilíře II.:
Masarykova univerzita Přírodovědecká fakulta

Podíl předkladatele na výsledku: **67 %**

Anotace dle RIV:

Engineering enzymes to degrade anthropogenic compounds efficiently is challenging. We obtained Rhodococcus rhodochrous haloalkane dehalogenase mutants with up to 32-fold higher activity than wild type toward the toxic, recalcitrant anthropogenic compound1,2,3-trichloropropane (TCP) using a new strategy. We identified key residues in access tunnels connecting the buried active site with bulk solvent by rational design and randomized them by directed evolution. The most active mutant has large aromatic residues at two out of three randomized positions and two positions modified by site-directed mutagenesis. These changes apparently enhance activity with TCP by decreasing accessibility of the active site for water molecules, thereby promoting activated complex formation. Kinetic analyses confirmed that the mutations improved carbon-halogen bond cleavage and shifted the rate-limiting step to the release of products.

Odůvodnění předkladatele:

This article describes a novel strategy of protein engineering. Traditional concept for engineering activity of enzymes is to focus mutagenesis to the active site. We have shown that mutagenesis of access tunnels is another very efficient way of constructing proteins with improved catalytic activity. The advantage of this approach is that access tunnels can be efficiently identified by computer modelling and their mutagenesis results in higher number of active variants than obtained by mutagenesis of the active site. The concept is demonstrate with the Rhodococcus rhodochrous haloalkane dehalogenase DhaA degrading toxic, recalcitrant, anthropogenic compound 1,2,3-trichloropropane. Haloalkane dehalogenase mutants were obtained with up to 32-fold higher activity than wild type toward 1,2,3-trichloropropane. We identified key residues in access tunnels connecting the buried active site with bulk solvent by rational design and randomized them by directed evolution. The most active mutant had large aromatic residues at two out of three randomized positions and two positions modified by site-directed mutagenesis. These changes apparently enhanced activity with TCP by decreasing accessibility of the active site for water molecules, thereby promoting activated complex formation. Another very strong point of this article is that the effect of mutagenesis on enzyme active was mechanistically revealed by transient kinetic experiments and by analysis of kinetic isotope effects. Kinetic analyses confirmed that the mutations improved carbon-halogen bond cleavage and shifted the rate-limiting step to the release of products. Engineering access tunnels by combining computer-assisted protein design with directed evolution may be a valuable strategy for refining catalytic properties of enzymes with buried active sites. See the list of reviews and bibliometrics indicators in the attachement!

Odůvodnění panelu:

The paper is a very nice example of clever combination of computational, spectroscopic and molecular biology methods to characterize and identify the key amino acid residues responsible for a particular enzyme function. The paper provides important inform

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Search for a Small Chromophore with Efficient Singlet Fission: Biradicaloid Heterocycles

Akdag, Akin - Havlas, Zdeněk- Michl, Josef

Identifikátor: **RIV/61388963:_____/12:00384068**

Předkladatel výsledku do Pilíře II.:
Ústav organické chemie a biochemie AV ČR, v. v. i.

Podíl předkladatele na výsledku: **80 %**

Anotace dle RIV:

Of the five small biradicaloid heterocycles whose S-1, S-2, T-1, and T-2 adiabatic excitation energies were examined by the CASPT2/ANO-L-VTZP method, two have been found to meet the state energy criterion for efficient e singlet fission and are recommended to the attention of synthetic chemists and photophysicists.

Odůvodnění předkladatele:

Recent intense interest in singlet fission (SF) is motivated by its potential utility in solar cell applications. SF is an often fast process in which a singlet excited chromophore and its ground-state neighbor share energy to produce a pair of triplet excited species. The process is spin-allowed, because the two triplets are initially coupled into an overall singlet. Its detailed mechanism is not understood well. Theoretical investigations are hampered by the fact that only a handful of molecules are currently known to undergo SF with a triplet yield near 200% and all are too large for really accurate calculations on dimers or higher oligomers. The best calculations published so far still necessarily involve many approximations. Typical SF chromophores contain ~20 atoms from the first full row of the periodic table in the monomer and it is difficult to reproduce the experimental order of excited states correctly even in the monomer, let alone the dimer. A reasonably accurate rendition of the potential energy surfaces would be important before molecular dynamics can be examined seriously. It would be useful to find a much smaller yet highly efficient SF chromophore, say with up to 10 first full row atoms, and this is our present aim. A search for structures that will produce efficient SF can be based on known principles. Presently, we focus on chromophore (monomer) choice, although we recognize the crucial importance of a later optimization of the mode of coupling of the chromophores into a dimer, higher aggregate, or a solid, without which no SF could take place. Of the five small biradicaloid heterocycles whose S1, S2, T1, and T2 adiabatic excitation energies were examined by the CASPT2/ANO-L-VTZP method, two have been found to meet the state energy criterion for efficient singlet fission and are recommended to the attention of synthetic chemists and photophysicists.

Odůvodnění panelu:

The paper offers a new look on certain class of molecules that are potential candidates for singlet fission. It is a key theoretical study that navigates the reader through various possibilities that may either promote or prevent efficient this process. B

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Spectroscopic Detection of DNA Quadruplexes by Vibrational Circular Dichroism

Andrushchenko, Valery - Bouř, Petr

Identifikátor: **RIV/61388963:_____/11:00367519**

Předkladatel výsledku do Pilíře II.:
Ústav organické chemie a biochemie AV ČR, v. v. i.

Podíl předkladatele na výsledku: **80 %**

Anotace dle RIV:

On the basis of DFT computations VCD spectral quadruplet pattern could be modeled and identified with experimental data obtained for model octanucleotide and G-complex. The method provided a good agreement and helps to make spectroscopic detections of the DNA forms more reliable.

Odůvodnění předkladatele:

The study extends application potential of the vibrational circular dichroism (VCD) to nucleic acids. VCD and other optical spectroscopic methods are promoted by many researchers as they are cheaper and more flexible than classical methods of determination of molecular structure, such as x-ray diffraction. In certain cases, VCD provides information that cannot be obtained by other ways. Technical advances and the possibility to model the spectra from the first principles contributed to the commercial success of the spectrometers, being sold from 1997. However, precise quantum-chemical computations were restricted to small molecules. To overcome this limit, we devised a tensor transfer method, i.e. vibrational properties are calculated for smaller fragments, and transferred back to the studied system. Even with this tool, DNA molecule was challenging because of its size, flexibility, and interactions with the solvent. The four-stranded G-quadruplex motif of DNA was chosen as a test to improve the simulation methodology. This molecule is a frequent form of guanine-rich nucleic acids that plays important roles in biology, medicine, and nanotechnology. Especially for applications in biology, it is desirable to detect it easily by non-invasive spectroscopic methods. The transfer techniques were combined with molecular dynamics and quantum chemical modeling. The results well reproduced experimental spectra obtained within collaboration with the University of Calgary. The quadruplex DNA arrangement could thus be unambiguously assigned, and several IR and VCD bands related to local structural motifs. The combination of the spectroscopic techniques with multi-scale simulations proved extremely viable for providing extended information about nucleic acids' conformations and their dynamics.

Odůvodnění panelu:

This excellent paper explores solution conformations of the d(G)8 and 5´-dGMP systems by means of infrared and vibrational circular dichroism (VCD) spectroscopies. On the basis of DFT computations VCD spectral quadruplex pattern could be modeled and ident

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Structural Basis for Inhibition of Cathepsin B Drug Target from the Human Blood Fluke, Schistosoma mansoni

Jílková, Adéla - Řezáčová, Pavlína - Lepšík, Martin - Horn, Martin - Váchová, Jana - Fanfrlík, Jindřich - Brynda, Jiří - Mareš, Michael

Identifikátor: **RIV/61388963:_____/11:00365166**

Předkladatel výsledku do Pilíře II.:
Ústav organické chemie a biochemie AV ČR, v. v. i.

Podíl předkladatele na výsledku: **90 %**

Anotace dle RIV:

We determined three crystal structures of Schistosoma mansoni cathepsin B1 (SmCB1) in complex with peptidomimetic inhibitors. A panel of vinyl sulfone inhibitors was screened in vitro with SmCB1 and in a schistosomula assay; severity of phenotype inducedin the parasite correlated with enzyme inhibition. Substrate specificity of SmCB1 was analyzed using synthetic peptides and the natural substrate, hemoglobin.

Odůvodnění předkladatele:

Schistosomiasis (bilharzia) is a chronic infectious disease caused by blood flukes of the genus Schistosoma. It is a global health problem as these helminth parasites infect over 200 million people in tropical and subtropical areas. Treatment and control of schistosomiasis now relies on just one drug, and there is pressure to identify new anti-schistosomal chemotherapeutics. Adult schistosomes live in the cardiovascular system, and host blood proteins are a primary source of nutrients. Cathepsin B1 (SmCB1) is a critical proteolytic enzyme involved in protein digestion in the parasite gut, and it has been validated as a therapeutic target. Here, we determined the first crystallographic structure of SmCB1 and structurally characterized SmCB1 complexes with three peptidomimetic inhibitors. A comprehensive biochemical and computational analysis provided insight into the relationships among structure, enzymatic activity and inhibitor specificity of SmCB1. Furthermore, we directly demonstrated that the peptidomimetic inhibitors of SmCB1 are toxic to schistosomes, and that the suppression of parasites induced by the inhibitors correlates with the in vitro inhibition of SmCB1. Our results provide the necessary basis for the rational design of specific SmCB1 inhibitors towards the development of novel anti-schistosomal drugs.

Odůvodnění panelu:

This excellent report described the first crystallographic structure of SmCB1 (a critical proteolytic enzyme involved in protein digestion in the Schistosoma gut) and structurally characterized SmCB1 complexes with inhibitors. The therapy of schistosomia

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Subcellular homeostasis of phytohormone auxin is mediated by the ER-localized PIN5 transporter

Skůpa Petr, Hoyerová Klára, Křeček Pavel, Petrášek Jan, Dobrev Petre, Rolčík Jakub, Seifertová Daniela, Zažímalová Eva

Identifikátor: **RIV/61389030:_____/09:00335970**

Předkladatel výsledku do Pilíře II.:
Ústav experimentální botaniky AV ČR, v. v. i.

Podíl předkladatele na výsledku: **20 %**

Anotace dle RIV:

Auxin is signalling molecule which mediates spatial and temporal coordination of plant growth and development via formation of auxin gradients?. These gradients result from metabolic processes and the active directional transmembrane transport of auxin,which is catalyzed by auxin efflux carriers belonging to the PIN protein family. Investigation of atypical member of the family - AtPIN5 revealed its localization on the membranes of endoplasmic reticulum. The overexpression of the protein results in thestriking change in the profile of auxin metabolites. These data show the so far unknown mechanism governing the availability of the key growth regulator in plant cells.

Odůvodnění předkladatele:

The plant signalling molecule auxin provides positional information in a variety of developmental processes by means of its differential distribution (gradients) within plant tissues(1). Thus, cellular auxin levels often determine the developmental output of auxin signalling. Conceptually, transmembrane transport and metabolic processes regulate the steady-state levels of auxin in any given cell(2,3). In particular, PIN auxin-efflux-carrier-mediated, directional transport between cells is crucial for generating auxin gradients(2,4,5). Here we show that Arabidopsis thaliana PIN5, an atypical member of the PIN gene family, encodes a functional auxin transporter that is required for auxin-mediated development. PIN5 does not have a direct role in cell-to-cell transport but regulates intracellular auxin homeostasis and metabolism. PIN5 localizes, unlike other characterized plasma membrane PIN proteins, to endoplasmic reticulum (ER), presumably mediating auxin flow from the cytosol to the lumen of the ER. The ER localization of other PIN5-like transporters (including the moss PIN) indicates that the diversification of PIN protein functions in mediating auxin homeostasis at the ER, and cell-to-cell auxin transport at the plasma membrane, represent an ancient event during the evolution of land plants. The result was published in prestigious journal NATURE (IF=38.6) and since 2009 was at least 124 times cited.

Odůvodnění panelu:

The result presents a ground-breaking study of auxin-mediated signaling paths in plants. It was published in one of the most prestigious scientific journals and has received plenty of citations. This highly interesting study of a broad scientific importan

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Tailoring the Selectivity for Electrocatalytic Oxygen Evolution on Ruthenium Oxides by Zinc Substitution

Petrykin, Valery ; Macounová, Kateřina ; Krtil, Petr

Identifikátor: **RIV/61388955:_____/10:00345022**

Předkladatel výsledku do Pilíře II.:
Ústav fyzikální chemie J. Heyrovského AV ČR, v.v.i.

Podíl předkladatele na výsledku: **100 %**

Anotace dle RIV:

Versatile control of the selectivity of an oxide electrocatalyst in the oxygen- and chlorineevolution reactions was demonstrated by Zn substitution in RuO2 (see picture: O red, Cl green, Zn blue, Ru white). The incorporation of Zn into the rutile structure alters the cation sequence along the [001] direction and modifies the structure of the active sites for both gas-evolution processes.

Odůvodnění předkladatele:

A novel strategy for selectivity control of oxide electrocatalysis based on the rational design has been developed and demonstrated on the ruthenia based electrocatalysts for oxygen and chlorine evolution reactions. The strategy explored the knowledge of theoretically identified active site(s) for oxygen and chlorine evolution to modify the surface for selective oxygen evolution in presence of chlorides. The theory confines the chlorine evolution to μ-peroxo bridges between penta-coordinated cationic surface sites of RuO2. These chlorine evolution active sites were selectively suppressed by substitution of Ru with Zn. Zn-rich clusters conforming to an ilmenite structural model disrupt the cationic stacking necessary for chlorine evolution while maintaining the oxygen evolution activity of the surface. The approach is not restricted to oxides and be generally applicable to optimize complex electrocatalytic materials. The results of the study were published in highly impacted journal - Angewandte Chemistry International Edition.

Odůvodnění panelu:

The work reports on a novel strategy for selectivity control of electroctrocatalyis based on ruthenium oxides for oxygen and chlorine evolution reactions. The novel electrocatalytic material has the chlorine evolution active sites selectively suppressed b

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Tetrapyrrole Synthesis of Photosynthetic Chromerids Is Likely Homologous to the Unusual Pathway of Apicomplexan Parasites

Kořený Luděk - Oborník Miroslav

Identifikátor: **RIV/60077344:_____/11:00367760**

Předkladatel výsledku do Pilíře II.:
Biologické centrum AV ČR, v. v. i.

Podíl předkladatele na výsledku: **25 %**

Anotace dle RIV:

Most photosynthetic eukaryotes synthesize both heme and chlorophyll via a common tetrapyrrole biosynthetic pathway starting from glutamate. This pathway was derived mainly from cyanobacterial predecessor of the plastid and differs from the heme synthesisof the plastid-lacking eukaryotes. Here, we show that the coral-associated alveolate Chromera velia, the closest known photosynthetic relative to Apicomplexa, possesses a tetrapyrrole pathway that is homologous to the unusual pathway of apicomplexan parasites. We also demonstrate that, unlike other eukaryotic phototrophs, Chromera synthesizes chlorophyll from glycine and succinyl-CoA rather than glutamate. Our data shed light on the evolution of the heme biosynthesis in parasitic Apicomplexa and photosynthesis-related biochemical processes in their ancestors.

Odůvodnění předkladatele:

Most photosynthetic eukaryotes synthesize both heme and chlorophyll via a common tetrapyrrole biosynthetic pathway starting from glutamate. This pathway was derived mainly from cyanobacterial predecessor of the plastid and differs from the heme synthesis of the plastid-lacking eukaryotes. Here, we show that the coral-associated alveolate Chromera velia, the closest known photosynthetic relative to Apicomplexa, possesses a tetrapyrrole pathway that is homologous to the unusual pathway of apicomplexan parasites. We also demonstrate that, unlike other eukaryotic phototrophs, Chromera synthesizes chlorophyll from glycine and succinyl-CoA rather than glutamate. Our data shed light on the evolution of the heme biosynthesis in parasitic Apicomplexa and photosynthesis-related biochemical processes in their ancestors.

Odůvodnění panelu:

An excellent report on a tetrapyrrole pathway in the coral-associated alveolate Chromera velia bearing homology to the unusual pathway of apicomplexan parasites. The authors demonstrated that, unlike other eukaryotic phototrophs, Chromera could synthesize

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Transient and Switchable (Triethylsilyl)ethynyl Protection of DNA against Cleavage by Restriction Endonucleases

Kielkowski, Pavel - Macíčková-Cahová, Hana - Pohl, Radek - Hocek, Michal

Identifikátor: **RIV/61388963:_____/11:00364215**

Předkladatel výsledku do Pilíře II.:
Ústav organické chemie a biochemie AV ČR, v. v. i.

Podíl předkladatele na výsledku: **100 %**

Anotace dle RIV:

The first transient chemical protection of DNA against RE cleavage was developed. (Triethylsilyl)ethynyl-modified 7-deaza-dATP is readily incorporated to DNA by primer extension or PCR using KOD XL polymerase. The silylethynyl-protected DNA resists the cleavage by restriction endonucleases (REs). After treatment with NH3, the deprotected DNA is fully cleavable by the REs.

Odůvodnění předkladatele:

This paper reports on the first transient chemical protection of DNA against enzymatic cleavage. A very facile and straightforward two-step synthesis of the protected DNA was developed based on the synthesis of silyl-protected nucleoside triphosphate followed by enzymatic incorporation to DNA by polymerase. Using PCR, any desired length and sequence of DNA decorated by the bulky protecting groups in the major groove can be prepared. This protected DNA is resistant to cleavage by the restriction endonucleases even if it contains the recognition sequence for the particular enzyme. When this DNA is treated with ammonia, all bulky silyl groups are cleaved off and the resulting DNA modified by small acetylene groups is then recognized and cleaved by the enzymes. Switching of the cleavage is useful in molecular biology for manipulations of large DNA stretches where the recognition sequence might be present is several copies. Using PCR, any desired length and sequence of DNA decorated by the bulky protecting groups in the major groove can be prepared. This protected DNA is resistant to cleavage by the restriction endonucleases even if it contains the recognition sequence for the particular enzyme. When this DNA is treated with ammonia, all bulky silyl groups are cleaved off and the resulting DNA modified by small acetylene groups is then recognized and cleaved by the enzymes. It was the very first report on switchable protection of DNA from cleavage and in general also from specific interactions with a protein. Later on, it was followed by protection-strategy for gene cloning and expression and by photocaged DNA suitable for activation in vivo. The paper was published in the top-tier journal Angewandte Chemie International Edition (IF= 13.7).

Odůvodnění panelu:

A very modern paper, describing design and synthesis of transient and switchable (Triethylsilyl)ethynyl DNA nucleotides. One of the numerous possible applications of the protected nucleotides includes protection of specific DNA regions against restriction

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Two-Dimensional Electronic Spectroscopy Reveals Ultrafast Energy Diffusion in Chlorosomes

Jakub Dostál, Tomáš Mančal, Jakub Pšenčík

Identifikátor: **RIV/00216208:11320/12:10128532**

Předkladatel výsledku do Pilíře II.:
Univerzita Karlova v Praze Matematicko-fyzikální fakulta

Podíl předkladatele na výsledku: **60 %**

Anotace dle RIV:

Chlorosomes are light-harvesting antennae that enable exceptionally efficient light energy capture and excitation transfer. They are found in certain photosynthetic bacteria, some of which live in extremely low-light environments. In this work, chlorosomes from the green sulfur bacterium Chlorobaculum tepidum were studied by coherent electronic two-dimensional (2D) spectroscopy. Previously uncharacterized ultrafast energy transfer dynamics were followed, appearing as evolution of the 2D spectral line-shape during the first 200 fs after excitation. Observed initial energy flow through the chlorosome is well explained by effective exciton diffusion on a sub-100 fs time scale, which assures efficiency and robustness of the process. The ultrafast incoherent diffusion-like behavior of the excitons points to a disordered energy landscape in the chlorosome, which leads to a rapid loss of excitonic coherences between its structural subunits. This disorder prevents observation of excitonic cohe

Odůvodnění předkladatele:

The chlorosomes from the green sulfur bacterium Chlorobaculum tepidum were studied by coherent electronic two-dimensional spectroscopy. Previously unknown ultrafast spectral evolution within the first 200 fs was resolved and characterized. Agreement between simulated and experimental spectra allowed an assignment of the ultrafast initial component to exciton diffusion in a disordered energetic landscape of the chlorosome. It was concluded that due to the rapid disorder-induced loss of coherence between its structural subunits the chlorosome cannot function as a coherent light-harvester.

Odůvodnění panelu:

An excellent paper in a top journal (JACS) explores initial excitation evolution in chlorosomes on a sub-100 fs time scale. Excitation dynamics monitored as spectral changes in the 2D spectra are explained by proposing a model of effective diffusion-like

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Two-photon polarization microscopy reveals protein structure and function

Lazar Josef; Bondar Alexey

Identifikátor: **RIV/67179843:_____/11:00371057**

Předkladatel výsledku do Pilíře II.:
Centrum výzkumu globální změny AV ČR, v. v. i.

Podíl předkladatele na výsledku: **33 %**

Anotace dle RIV:

Membrane proteins are a large, diverse group of proteins, serving a multitude of cellular functions. They are difficult to study because of their requirement of a lipid membrane for function. Here we show that two-photon polarization microscopy can takeadvantage of the cell membrane requirement to yield insights into membrane protein structure and function, in living cells and organisms. The technique allows sensitive imaging of G-protein activation, changes in intracellular calcium concentration and other processes, and is not limited to membrane proteins. Conveniently, many suitable probes for two-photon polarization microscopy already exist.

Odůvodnění předkladatele:

Research result brief description: A new kind of optical microscope will allow visualizing many processes inside living cells that have, until now, been impossible to observe. The new technology builds on an advanced type of an optical microscope called a two-photon microscope. In a two-photon microscope, the biological sample is being illuminated by a powerful infrared laser in a way that allows three-dimensional localization of fluorescent molecules. Fluorescent molecules are often used for visualization of otherwise colorless biological molecules. The current improvement lies in modifying the properties of the laser beam so that the light waves alternately oscillate in various directions. This modification allows using a two-photon microscope not only to visualize where the fluorescent molecules are, but also how they are oriented. It shows that orientation of a fluorescent label attached to particular protein can be used to deduct information about structure of the protein molecules, in living cells and tissues. Since the structure of protein molecules often does not stay constant, but changes when a protein molecule is carrying out a particular task inside a cell, the new kind of microscope allows detecting whether a particular molecular process is taking place. Publication in prestigious journal Nature Methods with IF: 23.565 (According to the Journal Citation Reports of WoS - median IF of the journal Subject Category CE – Biochemistry is IF: 2,399). According to the WoS and SCOPUS databases it has been cited since its publication in period from 2011 till June 2014 13 times (WoS) respectively 11 times (SCOPUS). The outcome of this research became basis for further research and it has been also transferred to contracted research activities of CVGZ with private partners e.g. from USA and other countries as well. According to the Registry of Information about Results (RIV) the research result of CVGZ share was evaluated in 2012 by 132,117 RIV points.

Odůvodnění panelu:

The result presents an innovative study in imaging techniques of biomolecules. Its ground breaking novelty lies in the exploitation of anisotropic optical properties of fluorescent biomolecules, which lays foundations to a new two-photon polarization micr

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Water Adsorption on Coordinatively Unsaturated Sites in CuBTC MOF

Lukáš Grajciar, Petr Nachtigall

Identifikátor: **RIV/00216208:11310/10:10057383**

Předkladatel výsledku do Pilíře II.:
Univerzita Karlova v Praze Přírodovědecká fakulta

Podíl předkladatele na výsledku: **67 %**

Anotace dle RIV:

We report a theoretical study of water adsorption on coordinatively unsaturated sites (cus's) in a metal-organic framework (MOF) compound CuBTC. The reliability of the density functional theory (DFT) based methods and dispersion-corrected DFT-D schemes for the description of cus sites was investigated with respect to the accurate references CCSD(T)/CBS data. The accuracy of both DFT and DFT-D methods was found to be insufficient. The proposed DFT/CC correction scheme gave the results in excellent agreement with the reference CCSD(T)/CBS data DFT/CC calculations performed for the periodic CuBTC model gave RCu-OH2 = 2.19 angstrom and -Delta H-ads = 49 kJ mol(-1) both in very good agreement with available experimental data. The interaction of the first water molecule with the paddle-wheel unit is about 5 kJ mol(-1) stronger than the interaction of the second water molecule with the same-paddle-wheel unit.

Odůvodnění předkladatele:

Accurate theoretical description of properties of coordinatively unsaturated transition metal sites in metal organic frameworks (MOF) represents a challenge for computational chemists. Rather complex structures of MOFs requires the use of periodic models with large unit cell and in the same time the open-shell electronic structure of metal sites in many MOFs requires the use of accurate post-Hartree-Fock method. A new method denoted DFT/CC has been proposed and adopted for the description of MOFs. This method keeps the high accuracy of coupled cluster method while it can be applied on the periodic systems with large unit cell. The application of the method on the description of water interaction with CuBTC MOF brought the results in very good agreement with available experimental data. The significance of this paper is mostly in the fact that it has shown for the first time that even very complicated and computationally problematic MOFs can be accurately described at the ab initio level. The performance of commonly used force fields and commonly used exchange-correlation functionals has been also reviewed and rather poor performance of these methods for CuBTC were analyzed. The method has been applied later for other MOFs and adsorbates that can be documented by high number of citations (58 so far) and it was also used for the generation of new force fields. Paper is based solely on the collaboration of two Czech institutions (CUNI and AS CR). Corresponding author (PN) is from CUNI.

Odůvodnění panelu:

Metal organic frameworks are new structurally defined and stable porous materials showing high future potential in the size-, shape- and enantio-selective and redox catalysis, gas processing, sensors and other applications. The paper presents a precise st

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

A “crown of thorns” is an inducible defense that protects Daphnia against an ancient predator

Adam Petrusek

Identifikátor: **RIV/00216208:11310/09:10001161**

Předkladatel výsledku do Pilíře II.:
Univerzita Karlova v Praze Přírodovědecká fakulta

Podíl předkladatele na výsledku: **33 %**

Anotace dle RIV:

The crown of thorns, a conspicuous morphological feature among water fleas of the Daphnia atkinsoni species complex (Crustacea: Cladocera), is considered to represent a species-specific trait. However, our study, initiated by the analysis of sequence variation in 2 mitochondrial genes, shows that this feature is phenotypically plastic and is induced by chemical cues released by Triops cancriformis, the tadpole shrimp (Notostraca).

Odůvodnění předkladatele:

The study combines field data, phylogenetic analyses and laboratory experiments with induction of phenotypically plastic traits and predator-prey interactions to reveal function and factors responsible for formation of an unusual morphological trait, the “crown of thorns”, of some Daphnia water fleas. We revealed that it is a defense against key predators of temporary water bodies, the tadpole shrimps (Notostraca), which did not morphologically change for more than 200 million years. Our work is unusual by combination of numerous methodological approaches and complex analysis of the problem within a single publication: starting with discovery of phenotypic plasticity of the trait thanks to molecular methods (within a framework of a DNA barcoding study), followed up by formulation of a hypothesis about its function thanks to deep knowledge of ecology of the study species, experimental induction of the trait by predator (tadpole shrimp Triops) kairomomes, and finally confirmation of the protective function of the crown of thorns by predation experiments. A photograph accompanying the paper was printed on a PNAS cover page. The paper influenced further work on antipredator inducible traits in Daphnia, particularly by stimulating further research on Triops-Daphnia magna interactions, a model that turned out particularly useful for genomic and proteomic analyses. The study is a result of a close collaboration of Adam Petrusek from the Charles University in Prague (who initiated the study and formulated the key hypothesis based on his field experience and DNA barcoding results, performed all genetic analyses, and run a pilot induction experiments), and Christian Laforsch (responsible for experimental work and scanning electron microphotography). Both authors contributed equally, and the decision who becomes first and who corresponding author was decided by flipping a coin. Other German co-authors provided partial support for some aspects of the study.

Odůvodnění panelu:

Some adaptations are so specific that it is suggesting their unique evolutionary origin. However, the publication showed it is not the case of an antipredator trait in Daphnia, the “crown of thorns”. The publication used modern methods of molecular phylog

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

A common red algal origin of the apicomplexan, dinoflagellate, and heterokont plastids

Oborník Miroslav - Lukeš Julius

Identifikátor: **RIV/60077344:_____/10:00347277**

Předkladatel výsledku do Pilíře II.:
Biologické centrum AV ČR, v. v. i.

Podíl předkladatele na výsledku: **29 %**

Anotace dle RIV:

Here we describe the complete plastid genome sequences and plastid-associated data from two independent photosynthetic lineages represented by Chromera velia and an undescribed alga CCMP3155 that we show are closely related to apicomplexans. These plastids contain a suite of features retained in either apicomplexan (four plastid membranes, the ribosomal superoperon, conserved gene order) or dinoflagellate plastids (form II Rubisco acquired by horizontal transfer, transcript polyuridylylation, thylakoidsstacked in triplets) and encode a full collective complement of their reduced gene sets. Together with whole plastid genome phylogenies, these characteristics provide multiple lines of evidence that the extant plastids of apicomplexans and dinoflagellates were inherited by linear descent from a common red algal endosymbiont. Our phylogenetic analyses also support their close relationship to plastids of heterokont algae, indicating they all derive from the same endosymbiosis.

Odůvodnění předkladatele:

The discovery of a nonphotosynthetic plastid in malaria and other apicomplexan parasites has sparked a contentious debate about its evolutionary origin. Molecular data have led to conflicting conclusions supporting either its green algal origin or red algal origin, perhaps in common with the plastid of related dinoflagellates. This distinction is critical to our understanding of apicomplexan evolution and the evolutionary history of endosymbiosis and photosynthesis; however, the two plastids are nearly impossible to compare due to their nonoverlapping information content. Here we describe the complete plastid genome sequences and plastid-associated data from two independent photosynthetic lineages represented by Chromera velia and an undescribed alga CCMP3155 that we show are closely related to apicomplexans. Our phylogenetic analyses also support their close relationship to plastids of heterokont algae, indicating they all derive from the same endosymbiosis. Altogether, these findings support a relatively simple path of linear descent for the evolution of photosynthesis in a large proportion of algae and emphasize plastid loss in several lineages.

Odůvodnění panelu:

Apicomplexan include some of the most dangerous parasites as Plasmodium (malaria) and with some other related taxa belong to a group hosting secondary acquired plastid of eukaryotic cell origin - Chromalveolata. Using new genomic data this report contribu

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

A complex role for FGF-2 in self renewal, survival, and adhesion of human embryonic stem cells

EISELLEOVÁ, Lívia, Kamil MATULKA, Vítězslav KŘÍŽ, Michaela KUNOVÁ, Zuzana SCHMIDTOVÁ, Jakub NERADIL, Boris TICHÝ, Dana DVOŘÁKOVÁ, Šárka POSPÍŠILOVÁ, Aleš HAMPL a Petr DVOŘÁK

Identifikátor: **RIV/00216224:14110/09:00028586**

Předkladatel výsledku do Pilíře II.:
Masarykova univerzita Lékařská fakulta

Podíl předkladatele na výsledku: **100 %**

Anotace dle RIV:

The transcription program that is responsible for the pluripotency of human ESCs (hESCs) is believed to be comaintained by exogenous fibroblast growth factor-2 (FGF-2), which activates FGF receptors (FGFRs) and stimulates the mitogen-activated protein kinase (MAPK) pathway. This mechanism is further complicated by intracrine FGF signals.Here we show that, in undifferentiated hESCs, exogenous FGF-2 and inhibition of autocrine FGF signaling stimulated the expression of stem cell genes while suppressing cell death and apoptosis genes. Thus, exogenous FGF-2 reinforced the pluripotency maintenance program of intracrine FGF-2 signaling. Consistent with this hypothesis, expression of endogenous FGF-2 decreased during hESC differentiation and FGF-2 knockdown-induced hESC differentiation. In addition, FGF-2 signaling via FGFR2 activated MAPK kinase/extracellular signal-regulated kinase and AKT kinases, protected hESC from stress-induced cell death, and increased hESC adhesion and cloning effici

Odůvodnění předkladatele:

This study showed for the first time that one of the most potent member of the growth factor family, fibroblast growth factor 2 (FGF-2, basic FGF), acts as an intrinsic regulator of human embryonic stem cells (hESCs) self-renewal and survival. It was discovered and described in detail that FGF-2 plays a complex multilevel role in the maintenance of hESC pluripotency. While intracrine FGF-2 signaling directly maintains pluripotency gene expression, the exogenous recombinant hFGF-2 supplementation of hESC culture media primarily contributes indirectly to the maintenance of hESC pluripotency by promoting cell adhesion and survival. This stimulation of self-renewal, cell survival, and adhesion by exogenous and endogenous FGF-2 then synergizes to maintain the undifferentiated growth of hESCs, which is the key feature for stem cells and important parameter for their use in cell replacement therapies. Moreover, such action for FGF-2 may also apply to other growth factor regulators of stem cell pluripotency and represents a new approach to the research of the maintenance of the undifferentiated growth of stem cells in vitro. Scientometric evaluation: • IF factor (2009): 7.747 • times cited: 65 • high visibility journals citing this work: PLOS ONE (10x); STEM CELLS (6x); STEM CELLS AND DEVELOPMENT (4x)

Odůvodnění panelu:

This publication determines the complexity of the regulation of human embryonic stem cells by FGF-2: FGF2 in exogenous form protects the cells from the cell death. On the other hand, expression of the endogenous FGF-2 decreased during stem cell different

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

A global assessment of invasive plant impacts on resident species, communities and ecosystems: the interaction of impact measures, invading species' traits and environment

Pyšek Petr, Jarošík Vojtěch, Pergl Jan, Hejda Martin

Identifikátor: **RIV/67985939:_____/12:00381951**

Předkladatel výsledku do Pilíře II.:
Botanický ústav AV ČR, v. v. i.

Podíl předkladatele na výsledku: **60 %**

Anotace dle RIV:

Based on 287 publications that addressed the impact of 167 invasive plant species, we present the first global overview of frequencies of significant and non-significant ecological impacts and their directions on 15 outcomes related to the responses of resident populations, species, communities and ecosystems. Invasive plants exert consistent significant impacts on some outcomes, whereas for outcomes at the community level, such as species richness, diversity and soil resources, the significance of impacts is determined by interactions between species traits and the biome invaded. One of the clearest signals in this analysis is that invasive plants are far more likely to cause significant impacts on species richness on islands rather than mainland. There is no universal measure of impact and the pattern observed depends on the ecological measure examined. Some species traits may provide a means to predict impact, regardless of the particular habitat and geographical region invaded.

Odůvodnění předkladatele:

Invasive species pose risk to native biodiversity worldwide; to cope with the consequences of plant invasions we need to know which species are likely to cause profound changes in ecosystems of invaded areas. We conducted the first global overview of how often and under which circumstances plant invasions cause significant impacts on resident species, communities and ecosystems. The study based on 287 publications that addressed the impact of 167 invasive plant species showed that invasive plants exert consistent significant impacts on some measured outcomes, whereas for others, such as species richness, diversity and soil resources, the significance of impacts is determined by interactions between species traits and the biome invaded. Invasive plants are far more likely to cause significant impacts on species richness on islands rather than mainland. Species with certain biological traits, however, cause significant impacts regardless of the type of habitat or geographical region invaded. The study is the first global analysis of ecological impacts of invasive plants, and by relying on the most comprehensive database to date and considering impacts at various levels of biological organization, invading species' traits, and invaded ecosystems, it made it possible to disentagle the complexity of the context dependency of impacts. By using a pioneering statistical approach for this kind of data, data mining based on vote counting rather than traditional metaanalysis, it provided a locally relevant information to managers and means to predict impact of invasive species. The study was published in Global Change Biology (IF 6.910), a leading ecological journal focusing on phenomena associated with global change. Within two years since publication the paper achieved 99 citations on Google Scholar and 47 on Web of Science which illustrates that it has received much attention of the research community.

Odůvodnění panelu:

A major review of 287 publications and over 1500 case-studies, revealing many trends and impacts of invasives on resident species, especilly on islands. Important for our further understanding of biological invasions and climate change.

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

A mouse speciation gene encodes a meiotic histone H3 methyltransferase

Ondřej Mihola, Zdeněk Trachtulec, Čestmír Vlček, Jiří Forejt

Identifikátor: **RIV/68378050:____/09:00318335**

Předkladatel výsledku do Pilíře II.:
Ústav molekulární genetiky AV ČR, v. v. i.

Podíl předkladatele na výsledku: **84 %**

Anotace dle RIV:

Speciation genes restrict gene flow between the incipient species and related taxa. Three decades ago, we mapped a mammalian speciation gene, hybrid sterility 1 (Hst1), in the intersubspecific hybrids of house mouse. Here, we identify this gene as Prdm9,encoding a histone H3 lysine 4 trimethyltransferase. We rescued infertility in male hybrids with bacterial artificial chromosomes carrying Prdm9 from a strain with the ?fertility Hst1f allele. Sterile hybrids display down-regulated microrchidia 2B (Morc2b) and fail to compartmentalize gH2AX into the pachynema sex (XY) body. These defects, seen also in Prdm9-null mutants, are rescued by the Prdm9 transgene. Identification of a vertebrate hybrid sterility gene reveals a role for epigenetics in speciationand opens a window to a hybrid sterility gene network.

Odůvodnění předkladatele:

The paper reports the discovery of the first hybrid sterility gene in vertebrates. The Prdm9 gene constrains a free flow of genes and free mixing of genomes between two closely related subspecies of house mouse. Using the mouse as a model organism and Prdm9 as a model hybrid sterility gene has opnened new molecular approaches to one of the key mechanisms of speciation. The paper was subject of several commentaries, in particular in Nature and Science (Mullard, A. The genes that drive speciation, published online 11 December 2008 | Nature | doi:10.1038/news.2008.1297. Willis, J.H. Origin of Species in Overdrive. Science Perspective GENETICS, Science 16 January 2009: 350-351). According to Web of Science, the paper received 130 citations by June 27, 2014. One year later, three independent groups uncovered another role of Prdm9 gene, as a major gene controlling meiotic recombination hotspots in mice and humans. Identification of Prdm9 as the first mammalian hybrid sterility gene initiated several informal collaborative projects with laboratories in France, United States, and Great Britain.

Odůvodnění panelu:

This is an excellent paper and the result of mapping the mouse Hybrid sterility gene Hst1 in the Prdm9 locus. This finding will allow for search of downstream epigenetically controlled genes participating in the Hst1 gene network.

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Active and total microbial communities in forest soil are largely different and highly stratified during decomposition

Baldrian, Petr; Kolařík, Miroslav; Štursová, Martina; Valášková, Vendula; Větrovský, Tomáš; Žifčáková, Lucia; Šnajdr, Jaroslav; Voříšková, Jana

Identifikátor: **RIV/61388971:_____/12:00388136**

Předkladatel výsledku do Pilíře II.:
Mikrobiologický ústav AV ČR, v. v. i.

Podíl předkladatele na výsledku: **73 %**

Anotace dle RIV:

Soils of coniferous forest ecosystems are important for the global carbon cycle, and the identification of active microbial decomposers is essential for understanding organic matter transformation in these ecosystems. By the independent analysis of DNA and RNA, whole communities of bacteria and fungi and its active members were compared in topsoil of a Picea abies forest during a period of organic matter decomposition. Fungi quantitatively dominate the microbial community in the litter horizon, while the organic horizon shows comparable amount of fungal and bacterial biomasses. Active microbial populations obtained by RNA analysis exhibit similar diversity as DNA-derived populations, but significantly differ in the composition of microbial taxa. Several highly active taxa, especially fungal ones, show low abundance or even absence in the DNA pool. Bacteria and especially fungi are often distinctly associated with a particular soil horizon. Fungal communities are less even than bacteria

Odůvodnění předkladatele:

Soils of coniferous forest ecosystems are important for the global carbon cycle, and the identification of active microbial decomposers is essential for understanding organic matter transformation in these ecosystems. By the independent analysis of DNA and RNA, whole communities of bacteria and fungi and its active members were compared in topsoil of a Picea abies forest during a period of organic matter decomposition. Fungi quantitatively dominate the microbial community in the litter horizon, while the organic horizon shows comparable amount of fungal and bacterial biomasses. Active microbial populations obtained by RNA analysis exhibit similar diversity as DNA-derived populations, but significantly differ in the composition of microbial taxa. Several highly active taxa, especially fungal ones, show low abundance or even absence in the DNA pool. Bacteria and especially fungi are often distinctly associated with a particular soil horizon. Fungal communities are less even than bacterial ones and show higher relative abundances of dominant species. While dominant bacterial species are distributed across the studied ecosystem, distribution of dominant fungi is often spatially restricted as they are only recovered at some locations. The sequences of cbhI gene encoding for cellobiohydrolase (exocellulase), an essential enzyme for cellulose decomposition, were compared in soil metagenome and metatranscriptome and assigned to their producers. Litter horizon exhibits higher diversity and higher proportion of expressed sequences than organic horizon. Cellulose decomposition is mediated by highly diverse fungal populations largely distinct between soil horizons. The results indicate that low-abundance species make an important contribution to decomposition processes in soils.

Odůvodnění panelu:

First of all, this paper, written by a large team of Czech authors, has been published in one the best journal dealing with microbial communities and processes. The authors have adequately used updated methodologies based on metagenomics and metatranscrip

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Autonomous regulation of the insect gut by circadian genes acting downstream of juvenile hormone signaling

Bajgar Adam - Jindra Marek - Doležel David

Identifikátor: **RIV/60077344:_____/13:00397218**

Předkladatel výsledku do Pilíře II.:
Biologické centrum AV ČR, v. v. i.

Podíl předkladatele na výsledku: **67 %**

Anotace dle RIV:

In temperate regions, the shortening day length informs many insect species to prepare for winter by inducing diapause. The adult diapause of the linden bug, Pyrrhocoris apterus, involves a reproductive arrest accompanied by energy storage, reduction ofmetabolic needs, and preparation to withstand low temperatures. By contrast, nondiapause animals direct nutrient energy to muscle activity and reproduction. The photoperiod-dependent switch from diapause to reproduction is systemically transmitted throughout the organism by juvenile hormone (JH). Here, we show that, at the organ-autonomous level of the insect gut, the decision between reproduction and diapause relies on an interaction between JH signaling and circadian clock genes acting independently of the daily cycle. The JH receptor Methoprene-tolerant and the circadian proteins Clock and Cycle are all required in the gut to activate the Par domain protein 1 gene during reproduction and to simultaneously suppress a mammalian-type cr

Odůvodnění předkladatele:

Although day-length (photoperiod) measurement is widespread in animals, the actual mechanims of this so called photoperiodic clock and its connection to diapause regulation is elusive. The main reason is that classical genetic models are not seasonal. Therefore we took advantage of robust diapause response in the linden bug, Pyrrhocoris apterus, and introduced several molecular biology techniques to this organism.The adult diapause of the linden bug, Pyrrhocoris apterus, involves a reproductive arrest accompanied by energy storage, reduction of metabolic needs, and preparation to withstand low temperatures. By contrast, nondiapause animals direct nutrient energy to muscle activity and reproduction. The photoperiod-dependent switch from diapause to reproduction is systemically transmitted throughout the organism by juvenile hormone (JH). Here, we show that, at the organ-autonomous level of the insect gut, the decision between reproduction and diapause relies on an interaction between JH signaling and circadian clock genes acting independently of the daily cycle. The JH receptor Methoprene-tolerant and the circadian proteins Clock and Cycle are all required in the gut to activate the Par domain protein 1 gene during reproduction and to simultaneously suppress a mammalian-type cryptochrome 2 gene that promotes the diapause program. A nonperiodic, organ-autonomous feedback between Par domain protein 1 and Cryptochrome 2 then orchestrates expression of downstream genes that mark the diapause vs. reproductive states of the gut. These results show that hormonal signaling through Methoprene-tolerant and circadian proteins controls gut-specific gene activity that is independent of circadian oscillations but differs between reproductive and diapausing animals.This publication is the first outcome of our successful establishment of P. apterus as a new emerging model organism for genetic research in insect physiology and developmental biology.

Odůvodnění panelu:

An excellent paper showing that at the organ-autonomous level of the insect gut, the decision between reproduction and diapause relies on an interaction between JH signaling and circadian clock genes acting independently of the daily cycle.

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Bordetella Adenylate Cyclase Toxin Mobilizes Its beta(2) Integrin Receptor into Lipid Rafts to Accomplish Translocation across Target Cell Membrane in Two Steps

Bumba, Ladislav; Mašín, Jiří; Šebo, Peter

Identifikátor: **RIV/61388971:_____/10:00352882**

Předkladatel výsledku do Pilíře II.:
Mikrobiologický ústav AV ČR, v. v. i.

Podíl předkladatele na výsledku: **75 %**

Anotace dle RIV:

The adenylate cyclase toxin (CyaA) of pathogenic Bordetellae eliminates the first line of host innate immune defense. It penetrates myeloid phagocytes, such as neutrophils, macrophage or dendritic cells, and subverts their signaling by catalyzing an extremely rapid conversion of intracellular ATP to the key signaling molecule cAMP. This efficiently inhibits the oxidative burst and complement- mediated opsonophagocytic killing of bacteria, thus enabling the pathogen to colonize host airways. We show thattranslocation of CyaA into phagocyte cytosol occurs in two steps. The toxin first binds the integrin CD11b/CD18 and inserts into phagocyte membrane to mediate influx of calcium ions into cells. This promotes relocation of the toxin-receptor complex intospecific lipid microdomains within cell membrane called rafts

Odůvodnění předkladatele:

Bordetella adenylate cyclase toxin (CyaA) binds the ?M?2 integrin (CD11b/CD18, Mac-1, or CR3) of myeloid phagocytes and delivers into their cytosol an adenylate cyclase (AC) enzyme that converts ATP into the key signaling molecule cAMP. We show that penetration of the AC domain across cell membrane proceeds in two steps. It starts by membrane insertion of a toxin ‘translocation intermediate’, which can be ‘locked’ in the membrane by the 3D1 antibody blocking AC domain translocation. Insertion of the ‘intermediate’ permeabilizes cells for influx of extracellular calcium ions and thus activates calpain-mediated cleavage of the talin tether. Recruitment of the integrin-CyaA complex into lipid rafts follows and the cholesterol-rich lipid environment promotes translocation of the AC domain across cell membrane. AC translocation into cells was inhibited upon raft disruption by cholesterol depletion, or when CyaA mobilization into rafts was blocked by inhibition of talin processing. Furthermore, CyaA mutants unable to mobilize calcium into cells failed to relocate into lipid rafts, and failed to translocate the AC domain across cell membrane, unless rescued by Ca2+ influx promoted in trans by ionomycin or another CyaA protein. Hence, by mobilizing calcium ions into phagocytes, the ‘translocation intermediate’ promotes toxin piggybacking on integrin into lipid rafts and enables AC enzyme delivery into host cytosol.

Odůvodnění panelu:

This study demonstrated a novel mechanism of pathogen invasion into the phagocytes. Understanding this mechanism may help in fighting it.

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Calcium Influx Rescues Adenylate Cyclase-Hemolysin from Rapid Cell Membrane Removal and Enables Phagocyte Permeabilization by Toxin Pores

Fišer, Radovan; Mašín, Jiří; Bumba, Ladislav; Pospíšilová, Eva; Basler, Marek; Sadílková, Lenka; Adkins, Irena; Kamanová, Jana; Osička, Radim; Šebo, Peter

Identifikátor: **RIV/61388971:____/12:00377230**

Předkladatel výsledku do Pilíře II.:
Mikrobiologický ústav AV ČR, v. v. i.

Podíl předkladatele na výsledku: **71 %**

Anotace dle RIV:

Bordetella adenylate cyclase toxin-hemolysin (CyaA) penetrates the cytoplasmic membrane of phagocytes and employs two distinct conformers to exert its multiple activities. One conformer forms cation-selective pores that permeabilize phagocyte membrane for efflux of cytosolic potassium. The other conformer conducts extracellular calcium ions across cytoplasmic membrane of cells, relocates into lipid rafts, translocates the adenylate cyclase enzyme (AC) domain into cells and converts cytosolic ATP to cAMP. We show that the calcium-conducting activity of CyaA controls the path and kinetics of endocytic removal of toxin pores from phagocyte membrane. The enzymatically inactive but calcium-conducting CyaA-AC(-) toxoid was endocytosed via a clathrin-dependent pathway

Odůvodnění předkladatele:

Bordetella adenylate cyclase toxin-hemolysin (CyaA) penetrates the cytoplasmic membrane of phagocytes and employs two distinct conformers to exert its multiple activities. One conformer forms cation-selective pores that permeabilize phagocyte membrane for efflux of cytosolic potassium. The other conformer conducts extracellular calcium ions across cytoplasmic membrane of cells, relocates into lipid rafts, translocates the adenylate cyclase enzyme (AC) domain into cells and converts cytosolic ATP to cAMP. We show that the calcium-conducting activity of CyaA controls the path and kinetics of endocytic removal of toxin pores from phagocyte membrane. The enzymatically inactive but calcium-conducting CyaA-AC? toxoid was endocytosed via a clathrin-dependent pathway. In contrast, a doubly mutated (E570K+E581P) toxoid, unable to conduct Ca?? into cells, was rapidly internalized by membrane macropinocytosis, unless rescued by Ca?? influx promoted in trans by ionomycin or intact toxoid. Moreover, a fully pore-forming CyaA-?AC hemolysin failed to permeabilize phagocytes, unless endocytic removal of its pores from cell membrane was decelerated through Ca?? influx promoted by molecules locked in a Ca??-conducting conformation by the 3D1 antibody. Inhibition of endocytosis also enabled the native B. pertussis-produced CyaA to induce lysis of J774A.1 macrophages at concentrations starting from 100 ng/ml. Hence, by mediating calcium influx into cells, the translocating conformer of CyaA controls the removal of bystander toxin pores from phagocyte membrane. This triggers a positive feedback loop of exacerbated cell permeabilization, where the efflux of cellular potassium yields further decreased toxin pore removal from cell membrane and this further enhances cell permeabilization and potassium efflux.

Odůvodnění panelu:

The paper demonstrates an excellent research on the role of calcium in the toxin control of phagocytes. The paper shows that the capacity of adenylate cyclase toxin-hemolysin (CyaA) to permeabilize phagocytes depends on its ability to mediate influx of ex

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Cascades of convergent evolution: The corresponding evolutionary histories of euglenozoans and dinoflagellates

Julius Lukeš

Identifikátor: **RIV/60076658:12310/09:00010581**

Předkladatel výsledku do Pilíře II.:
Jihočeská univerzita v Českých Budějovicích Přírodovědecká fakulta

Podíl předkladatele na výsledku: **25 %**

Anotace dle RIV:

The majority of eukaryotic diversity is hidden in protists, yet our current knowledge of processes and structures in the eukaryotic cell is almost exclusively derived from multicellular organisms. The increasing sensitivity of molecular methods and growing interest in microeukaryotes has only recently demonstrated that many features so far considered to be universal for eukaryotes actually exist in strikingly different versions. In other words, during their long evolutionary histories, protists have solved general biological problems in many more ways than previously appreciated. Interestingly, some groups have broken more rules than others, and the Euglenozoa and the Alveolata stand out in this respect. A review of the numerous odd features in these 2groups allows us to draw attention to the high level of convergent evolution in protists, which perhaps reflects the limits that certain features can be altered. Moreover, the appearance of one deviation in an ancestor can constrain the

Odůvodnění předkladatele:

The majority of eukaryotic diversity is hidden in protists, yet our current knowledge of processes and structures in the eukaryotic cell is almost exclusively derived from multicellular organisms. The increasing sensitivity of molecular methods and growing interest in microeukaryotes has only recently demonstrated that many features so far considered to be universal for eukaryotes actually exist in strikingly different versions. In other words, during their long evolutionary histories, protists have solved general biological problems in many more ways than previously appreciated. Interestingly, some groups have broken more rules than others, and the Euglenozoa and the Alveolata stand out in this respect. A review of the numerous odd features in these 2 groups allows us to draw attention to the high level of convergent evolution in protists, which perhaps reflects the limits that certain features can be altered. Moreover, the appearance of one deviation in an ancestor can constrain the set of possible downstream deviations in its descendents, so features that might be independent functionally, can still be evolutionarily linked. What functional advantage may be conferred by the excessive complexity of euglenozoan and alveolate gene expression, organellar genome structure, and RNA editing and processing has been thoroughly debated, but we suggest these are more likely the products of constructive neutral evolution, and as such do not necessarily confer any selective advantage at all.

Odůvodnění panelu:

Despite the fact that this result is a review paper, and not an experimental one, it constitutes an important landmark in the field of evolution, with an attention paid on two groups of protists. Evolutionary histories of protists are much less known than

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Cell Differentiation within a Yeast Colony: Metabolic and Regulatory Parallels with a Tumor-Affected Organism

Michal Čáp, Luděk Štěpánek, Karel Harant, Zdena Palková

Identifikátor: **RIV/00216208:11310/12:10120765**

Předkladatel výsledku do Pilíře II.:
Univerzita Karlova v Praze Přírodovědecká fakulta

Podíl předkladatele na výsledku: **75 %**

Anotace dle RIV:

Nutrient sensing and metabolic reprogramming are crucial for metazoan cell aging and tumor growth. Here, we identify metabolic and regulatory parallels between a layered, multicellular yeast colony and a tumor-affected organism. During development, a yeast colony stratifies into U and L cells occupying the upper and lower colony regions, respectively. U cells activate a unique metabolism controlled by the glutamine-induced TOR pathway, amino acid sensing systems (SPS and Gcn4p) and signaling from mitochondria with lowered respiration. These systems jointly modulate U cell physiology, which adapts to nutrient limitations and utilize the nutrients released from L cells. Stress-resistant U cells share metabolic pathways and other similar characteristics with tumor cells, including the ability to proliferate. L cells behave similarly to stressed and starving cells, which activate degradative mechanisms to provide nutrients to U cells. Our data suggest a nutrient flow between both cell type

Odůvodnění předkladatele:

The paper shows that ageing multicellular yeast colonies formed by laboratory strains differentiate and form two prominent cell types that are specifically localized within the colony structure and have specific metabolism and functions. The work provided evidence that cells localized in upper colony regions (U cells) exhibit features commonly seen in mammalian solid tumor cells. U cells are generally resistant to stress and have high survival rates; they decrease respiration and activate aerobic glycolysis and some other metabolic pathways important for biomass generation. U cells also have high glutamine levels, export ammonia and have active autophagy. U cells seem to benefit from amino acids (and maybe other metabolites) released by cells localized in lower colonial regions (L cells), which resemble normal, non-proliferative mammalian cells that rely on mitochondrial oxidative phosphorylation. L cells, although located near the nutritive agar, exhibit signs of starvation and stress as well as a gradual decrease in biomass. These cells seem to activate different hydrolytic mechanisms such as proteasomes. The nutrient flow observed between U and L cells in colonies resembles the glutamine-NH4+ cycle and the Cori cycle between mammalian solid tumor tissues and other organs. These findings suggest an existence of conserved metabolic program that allows exploiting of nutrients released by particular cells within multicelular colony and metazoan organisms. Understanding of cellular metabolism and regulations within yeast colonies thus could contribute to uncovering of new aspects of tumor biology.

Odůvodnění panelu:

Based on original observation of cellular differentiation within ageing yeast colony of cells, the metabolic status of surface vs. internal cell types is analysed. Surprising similarity to tumor cells metabolic differentiation is discovered and indicates

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Conversion of the chill susceptible fruit fly larva (Drosophila melanogaster) to a freeze tolerant organism

Košťál Vladimír - Šimek Petr - Zahradníčková Helena - Cimlová Jana

Identifikátor: **RIV/60077344:_____/12:00375752**

Předkladatel výsledku do Pilíře II.:
Biologické centrum AV ČR, v. v. i.

Podíl předkladatele na výsledku: **78 %**

Anotace dle RIV:

This paper shows that mechanisms of freeze-tolerance studied by us previously in subarctic fly Chymomyza costata can be applied to a fruit fly of tropical origin with a weak innate capacity to tolerate even mild chilling. We found that surprisingly simple laboratory manipulations can change the chill susceptible insect to the freeze-tolerant one. Larvae of Drosophila melanogaster can then survive at subzero temperatures when approximately 50% of their body water turns to ice crystals. To achieve this goal, synergy of two fundamental prerequisites is required: (a) shutdown of larval development, including all the chill sensitive processes linked to it, by exposing larvae to low but above-lethal temperatures (quiescence), and (b) incorporating the free amino acid proline in tissues by feeding larvae a proline-augmented diet (cryopreservation).

Odůvodnění předkladatele:

This paper reports on discovery of simple laboratory method that allows survival of larvae of the fruit fly, Drosophila melanogaster in partially frozen state. This is the first report in scientific literature describing successful artificial transformation of a complex tropical animal organism, with high innate sensitivity to low temperatures, into a freeze tolerant organism that survives at sub-zero temperatures after conversion of approximately half of its body water into ice. The study contains hints of mechanistic explanation of the observed phenomenon including shutdown of developmental processes in quiescence and cryopreservation by high concentrations of proline in tissues.

Odůvodnění panelu:

The article provides evidence that a complex metazoan organism with tropical origin and high sensitivity to low temperature can be converted to a freeze tolerant organism and survive after conversion of approximately half of its body water into ice at sub

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Cyclosporine A-loaded and stem cell-seeded electrospun nanofibers for cell-based therapy and local immunosuppression

Vladimír Holáň, Milada Chudíčková, Peter Trošan, Eliška Svobodová, Magdaléna Krulová

Identifikátor: **RIV/00216208:11310/11:10104091**

Předkladatel výsledku do Pilíře II.:
Univerzita Karlova v Praze Přírodovědecká fakulta

Podíl předkladatele na výsledku: **23 %**

Anotace dle RIV:

The authors described preparation and construction of a novel form of nanofiber scaffold which is loaded with immunosuppressive drug cyclosporin A (CsA). The incorporation of CsA did not influence the diameter, shape, porosity or uniformity of the nanofibers. This scaffold has an optimal kinetic of drug release and can serve for a local immunosuppression of immune reactions. The covering of skin allografts with CsA-loaded nanofibers significantly attenuated the expression of the genes for the proinflammatory cytokines. The CsA-containing nanofibers can be seeded with stem cells and thus can be used for cell transfer in regenerative medicine. The results suggest that CsA-loaded electrospun nanofibers prepared from the biodegradable polymer poly(L-lacticacid) can serve as effective drug carriers for the local/topical suppression of an inflammatory reaction and simultaneously as scaffolds for cell transfer for tissue repair and regeneration.

Odůvodnění předkladatele:

This research was conducted in close cooperation between Faculty of Science, institutions of Academy of Sciences and company Elmarco. Using selected polymers synthesized at the Institute of Macromolecular Chemistry nanofibers were obtained by original needless electrospinning technology in Elmarco. For the first time nanofibers containing 10% of weight of Cyclosporine A (CsA) were prepared. These CsA-loaded nanofibers were extensively characterized and kinetics of CsA release was described. We showed that incorporation of CsA into nanofibers did not influence the pharmacological activity of this immunosuppressive drug. Experiments performed at Faculty of Science confirmed that CsA released from nanofibers significantly inhibited proliferation of activated T cells and suppressed production of T cell cytokines. After application of CsA-loaded nanofibers on damaged ocular surface or wounded skin local inflammatory reaction was significantly inhibited and grafted allogeneic cells were protected from immune rejection. Furthermore we showed that different stem cells grew on CsA-loaded nanofibers comparably as on drug-free nanofibers or plastic surfaces. We showed that CsA-loaded nanofibers can serve simultaneously as drug carriers and scaffolds for stem cell transplantation with high potential for therapeutic purposes. CsA released from nanofibers can protect grafted cells from immune rejection and thus support their engraftment. Recently these CsA-loaded nanofibers were used to protect alkali injured eyes from inflammatory reactions, and for transplantation of stem cells on ocular surface or skin wounds.

Odůvodnění panelu:

The article describes an original approach of loading of immunosupressive drug Cyclosporin A on nanofibers. This approach has broad potential applications in medicine and represents, therefore, an excellent example of basic research with practical and com

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Cytokinins modulate auxin-induced organogenesis in plants via regulation of the auxin efflux

PERNISOVÁ, Markéta, Petr KLÍMA, Jakub HORÁK, Martina VÁLKOVÁ, Jiří MALBECK, Pavel REICHMAN, Jaroslava DUBOVÁ, Jiří FRIML, Eva ZAŽÍMALOVÁ a Jan HEJÁTKO

Identifikátor: **RIV/00216224:14310/09:00035261**

Předkladatel výsledku do Pilíře II.:
Masarykova univerzita Přírodovědecká fakulta

Podíl předkladatele na výsledku: **80 %**

Anotace dle RIV:

Auxin and cytokinin (CK) are important regulators of the developmental fate of pluripotent plant cells. The molecular nature of their interactions is largely unknown. Here we show that CK modulates auxin-induced organogenesis (AIO) via regulation of efflux-dependent, intercellular auxin distribution. Auxin, but not CK, is capable to trigger organogenesis in hypocotyl explants. AOI is accompanied with endogenous CKs production and tissue-specific activation of CK signalling. CK affects differential auxindistribution and the CK-mediated modulation of organogenesis is simulated by inhibition of polar auxin transport. CK reduces auxin efflux from cultured tobacco cells and regulates expression of auxin efflux carriers from the PIN family in hypocotyl explants. Endogenous CK levels influence PIN transcription and are necessary to maintain intercellular auxin distribution in planta.

Odůvodnění předkladatele:

This paper completed research efforts of the team headed by Jan Hejatko at Department of Experimental Biology, Faculty of Science, Masaryk University focused on molecular mechanisms of plant organogenesis driven by phytohormones. In this paper, the authors propose a new model in which auxin acts as a trigger of the organogenic processes, whose output is modulated by the endogenously produced cytikinins. An important underlying mechanism is based on the effects of cytokinins on auxin distribution via regulation of expression of auxin efflux carriers. This type of regulation represents a thus far unidentified mechanism for well-known CK-auxin interactions during plant development. This traditional (52 years) and highly respected journal in scientific community with current impact factor 9.737 is ranked 4 in 56 journals on multidisciplinary sciences. The percentil in the subject area is 2.28. Current number of citation of this article is 70 according to the Web of Science database. Significance of the article is well documented by the fact that the Editorial board selected one of its microphotographs for the cover of the March issue of PNAS (number 9) in 2009 (see http://www.pnas.org/content/106/9.cover-expansion).

Odůvodnění panelu:

This work uncovers important molecular mechanism behind well known reciprocal regulatory relationship between auxin and cytokinins in plant organogenesis. Auxin response is modulated by endogenous cytokinins via effect on the gene expression of auxin tran

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Disentangling the role of environmental and human pressures on biological invasions across Europe.

Vojtěch Jarošík

Identifikátor: **RIV/00216208:11310/10:10080758**

Předkladatel výsledku do Pilíře II.:
Univerzita Karlova v Praze Přírodovědecká fakulta

Podíl předkladatele na výsledku: **10 %**

Anotace dle RIV:

The importance of biogeographic, climatic, economic, and demographic factors as drivers of biological invasions is increasingly being realized but as yet there is no consensus regarding their relative importance. Whereas little may be done to mitigate the effects of geography and climate on invasions, a wider range of options may exist to moderate the impacts of economic and demographic drivers. Here we use the most recent data available from Europe to partition between macroecological, economic, and demographic variables the variation in alien species richness of bryophytes, fungi, vascular plants, terrestrial insects, aquatic invertebrates, fish, amphibians, reptiles, birds, and mammals. Only national wealth and human population density were statistically significant predictors in the majority of models when analyzed jointly with climate, geography, and land cover.

Odůvodnění předkladatele:

The importance of biogeographic, climatic, economic, and demographic factors as drivers of biological invasions that can disrupt ecosystems and cause severe ecological or agricultural damage, is increasingly being realized but as yet there was no consensus regarding their relative importance. This paper, based on the occurrence of invasive species from a wide range of taxonomic groups (fungi, plants, invertebrates, vertebrates) in terrestrial and aquatic habitats of 55 European regions, is the first to show that economic and demographic factors are key drivers across a range of invasive taxa and that these factors are more important than regional differences in geography and climate. Next to human population density, the most important factor determining how many species of invasive plants and animals a country will harbour is the long-standing national wealth. This is because mechanisms of species invasion are often associated with human-induced disturbances that create landscapes suitable for invasions, and with international trade. The economic and demographic variables reflect the intensity of human activities and integrate the effect of factors that directly determine the outcome of invasion such as propagule pressure, pathways of introduction, eutrophication, and the intensity of anthropogenic disturbance. The study concluded that other possible factors, such as climate, geography or land cover, were less significant than population density and wealth, and that those secondary causes may have been overestimated in previous studies.

Odůvodnění panelu:

The paper presents for the first time a rigorous quantitative analysis that biological invasions are driven preferably by economic and demographic factors in invaded regions. This conclusion is supported by the fact that various taxonomic groups and geogr

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Do photobionts infuence the ecology of lichens? A case study of environmental preferences in symbiotic green alga Asterochloris (Trebouxiophyceae)

Ondřej Peksa, Pavel Škaloud

Identifikátor: **RIV/00216208:11310/11:10105545**

Předkladatel výsledku do Pilíře II.:
Univerzita Karlova v Praze Přírodovědecká fakulta

Podíl předkladatele na výsledku: **100 %**

Anotace dle RIV:

We examined the putative environmental requirements in lichenized alga Asterochloris, and search for the existence of ecological guilds in Asterochloris-associating lichens. Therefore, the presence of phylogenetic signal in several environmental traits was tested. The photobionts from ombrophobic and ombrophilic lichens were clustered in completely distinct clades. Moreover, two photobiont taxa were obviously differentiated based on their substrate and climatic preferences. Our study, thus reveals thatthe photobiont, generally the subsidiary member of the symbiotic lichen association, could exhibit clear preferences for environmental factors. These algal preferences may limit the ecological niches available to lichens and lead to the existence of specific lichen guilds.

Odůvodnění předkladatele:

A lichen is a fungus that obtains nutrients from algae growing inside of it - a symbiotic association that benefits the fungus, but not necessarily the algae. It the past, biologists thought that it was the fungal partner who determined where the lichen grew, since it is the fungus that makes up most of the body of the lichen. However, this study in Molecular Ecology adds to the growing body of evidence that, it may actually be the algae who hold the reins. In this study, the authors suggested a relationship between algal habitat requirements and lichen adaptation in the granular lichen genus Lepraria. The elegance of this study was the test of the theory of ecological photobiont guilds using a sterile green algal lichen eliminating the possibility of algal switching (algal transfer among fungal partners) by ascospore dispersal and thallus re-establishment. Interestingly, the most closely related algae were not the ones found living in the same species of lichen. Instead, algae from different lichen species living in similar habitats were more closely related to each other. For example, algae from lichens living in locations exposed to the rain and sun were more closely related to each other than they were to algae from lichens living in sheltered humid environments. Therefore, different algal species had preferences for different environments. If a fungal partner wants to live in a particular environment, it has to ally itself with an alga that also wants to live in that environment. If the fungus attempts to grow somewhere that the alga doesn't like, the alga will probably die, taking the fungus along with it. To figure what causes a lichen to live where it does, the most pertinent question may be: "Who's your alga?" Along with its publication, the paper has been highlighted in Molecular Ecology Perspective paper (Piercey-Normore & Deduke 2011). In addition, according to Web of Science, this paper has been cited 22 times since its publication in 2011.

Odůvodnění panelu:

Lichens – symbiotic consortia of algae and fungi – are known to be able to inhabit very extreme habitats. This report contributes arguments for algal partner being decisive for successful lichen establishment in a particular environment.

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Dominant Renin Gene Mutations Associated with Early-Onset Hyperuricemia, Anemia, and Chronic Kidney Failure

Martina Živná, Helena Hůlková, Kateřina Hodaňová, Petr Vyleťal, Marie Kalbáčová, Veronika Barešová, Jakub Sikora, Jan Živný, Robert Ivánek, Viktor Stránecký, Milan Elleder, Stanislav Kmoch

Identifikátor: **RIV/00216208:11110/09:3906**

Předkladatel výsledku do Pilíře II.:
Univerzita Karlova v Praze 1. lékařská fakulta

Podíl předkladatele na výsledku: **71 %**

Anotace dle RIV:

The article describes dominant renin gene mutations as a cause of Early-Onset Hyperuricemia, Anemia, and Chronic Kidney Failure.

Odůvodnění předkladatele:

Authors are systematically studying genetic, molecular, cellular and pathological underpinnings of autosomal dominant interstitial kidney diseases. This refers to a group of conditions characterized by autosomal dominant inheritance, a bland urinary sediment with minimal blood and protein, pathologic changes of tubular and interstitial fibrosis, and slowly progressive chronic kidney disease requiring later in life dialysis and kidney transplantation. In this work autors identified and characterized in several patients and families disease causing mutations in gene encoding renin. Renin is one of the critical proteins in blood pressure regulation. Currently there are several drugs targeting renin and renin-angiotensin systém in patients with hypertension. In medical litereature therefore can be found more then 25.000 articles dealing with renin. Dominant mutations identified in this article are first of this kind described in patients with chronic kidney disease so far. Knowledge of disease causing mutations allows us now to diagnose and distinguish these conditions, help to identify potential kidney donors in families and enable precise clinical and pathophysiologic characterisation of individual genetic lesions. Knowledge of pathophysiology will help to identify cure for these conditions and reveal mechanisms how variants in renin gene contribute to chronic kidney disease in general population. The clinical status of patients with renin mutations is similar to patients receiving renin and ACE inhibitors. This work therefore also reveals basic mechanisms side effects of these drugs.

Odůvodnění panelu:

An extensive research paper driven by the Czech group of researchers. Authors systematically studied genetic, molecular, cellular and pathological underpinnings of autosomal dominant interstitial kidney diseases. Disease causing mutations in gene encoding

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Dominant Renin Gene Mutations Associated with Early-Onset Hyperuricemia, Anemia, and Chronic Kidney Failure

Hůlková Helena, Sikora Jakub, Elleder Milan, Kmoch Stanislav

Identifikátor: **RIV/00064165:_____/09:3906**

Předkladatel výsledku do Pilíře II.:
Všeobecná fakultní nemocnice v Praze (nerozlišená součást)

Podíl předkladatele na výsledku: **71 %**

Anotace dle RIV:

The article describes dominant renin gene mutations as a cause of Early-Onset Hyperuricemia, Anemia, and Chronic Kidney Failure.

Odůvodnění předkladatele:

Authors are systematically studying genetic, molecular, cellular and pathological underpinnings of autosomal dominant interstitial kidney diseases. This refers to a group of conditions characterized by autosomal dominant inheritance, a bland urinary sediment with minimal blood and protein, pathologic changes of tubular and interstitial fibrosis, and slowly progressive chronic kidney disease requiring later in life dialysis and kidney transplantation. In this work autors identified and characterized in several patients and families disease causing mutations in gene encoding renin. Renin is one of the critical proteins in blood pressure regulation. Currently there are several drugs targeting renin and renin-angiotensin systém in patients with hypertension. In medical litereature therefore can be found more then 25.000 articles dealing with renin. Dominant mutations identified in this article are first of this kind described in patients with chronic kidney disease so far. Knowledge of disease causing mutations allows us now to diagnose and distinguish these conditions, help to identify potential kidney donors in families and enable precise clinical and pathophysiologic characterisation of individual genetic lesions. Knowledge of pathophysiology will help to identify cure for these conditions and reveal mechanisms how variants in renin gene contribute to chronic kidney disease in general population. The clinical status of patients with renin mutations is similar to patients receiving renin and ACE inhibitors. This work therefore also reveals basic mechanisms side effects of these drugs.

Odůvodnění panelu:

An extensive research paper driven by the Czech group of researchers. Authors systematically studied genetic, molecular, cellular and pathological underpinnings of autosomal dominant interstitial kidney diseases. Disease causing mutations in gene encoding

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

dsRNA expression in the mouse elicits RNAi in oocytes and low adenosine deamination in somatic cells

Jana Nejepínská, Radek Malík, Matyáš Flemr, Petr Svoboda

Identifikátor: **RIV/68378050:_____/12:00371756**

Předkladatel výsledku do Pilíře II.:
Ústav molekulární genetiky AV ČR, v. v. i.

Podíl předkladatele na výsledku: **80 %**

Anotace dle RIV:

Double-stranded RNA (dsRNA) can enter sequence-specific RNA interference (RNAi), sequence-independent interferon (IFN) response and editing by adenosine deaminases pathways. To study the fate of dsRNA in vivo, we used transgenic mice ubiquitously expressing from a promoter an mRNA with a long hairpin. The expressed dsRNA did not cause any developmental defects nor activated the IFN response, which was inducible only at high expression levels in cultured cells. dsRNA was poorly processed into siRNAs in somatic cells while robust RNAi effects were found in oocytes, suggesting that somatic cells lack some factor(s) facilitating siRNA biogenesis. Expressed dsRNA did not cause transcriptional silencing in trans. Analysis of RNA editing revealed an edited small fraction of long dsRNA. RNA editing did not prevent cytoplasmic localization nor processing into siRNAs. Thus, a long dsRNA structure is well tolerated in mammalian cells and is mainly causing a robust RNAi response in oocytes.

Odůvodnění předkladatele:

This may become a key paper in double-stranded RNA (dsRNA) and RNA interference (RNAi) research in mammals. It directly challenged the general notion of dsRNA toxicity in somatic cells by demonstrating tolerance to expressed dsRNA in a transgenic mouse model. It result provides the first animal model ubiquitously expressing dsRNA in its cells and the first combined analysis of dsRNA effects in vivo. In contrast to the common belief that delivery of dsRNA into mammalian somatic cells must cause apoptosis, it was shown that dsRNA expression is well tolerated in mammalian somatic cells and does not trigger the interferon response. Furthermore, dsRNA was subjected to mild adenosine deamination and did not efficiently enter the RNAi pathway – with one remarkable exception, which was the oocyte. These results clearly demonstrated that mouse oocytes a privileged cell type efficiently feeding dsRNA into the RNAi pathway, which consequently lead to discovery of a unique, oocyte-specific isoform of Dicer, the enzyme processing dsRNA in RNAi. This article was published in a very good journal (Nucleic Acid Research, IF 2012 = 8.278) and has been cited 12x, so far.

Odůvodnění panelu:

An excellent study on differential outcome of the double strand RNA in oocytes and somatic cells.

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Egg size and offspring quality: a meta-analysis in birds

Krist Miloš

Identifikátor: **RIV/61989592:15310/11:33119838**

Předkladatel výsledku do Pilíře II.:
Univerzita Palackého v Olomouci Přírodovědecká fakulta

Podíl předkladatele na výsledku: **100 %**

Anotace dle RIV:

Parents affect offspring fitness by propagule size and quality, selection of oviposition site, quality of incubation, feeding of dependent young, and their defence against predators and parasites. Despite many case studies on each of these topics, this knowledge has not been rigorously integrated into individual parental care traits for any taxon. Consequently, we lack a comprehensive, quantitative assessment of how parental care modifies offspring phenotypes. This meta-analysis of 283 studies with 1805correlations between egg size and offspring quality in birds is intended to fill this gap. The large sample size enabled testing of how the magnitude of the relationship between egg size and offspring quality depends on a number of variables. Egg size was positively related to nearly all studied offspring traits across all stages of the offspring life cycle. Not surprisingly, the relationship was strongest at hatching but persisted until the post-fledging stage. Morphological traits wer

Odůvodnění předkladatele:

Hundreds of studies tested how parental care, including size of eggs, affects offspring quality. However, the results of primary studies are often contradictory which calls for some integration of this rich bulk of data. One way is the meta-analysis of all published studies. This was the aim of the present paper that is consequently one of the largest meta-analyses conducted in the field of ecology until present. The large amount of primary studies included in this meta-analysis enabled, for the first time, to answer some old questions: (1) Which traits are most affected by the size of eggs and which are relatively insensitive to this early maternal effect? (2) Does egg size affect offspring performance only in short- or also in long-term? (3) How differences in experimental techniques influence the strength of the relationship between egg size and offspring quality? In addition to resolving some long-term controversies, this study also suggests avenues for further research. More attention should be paid to these topics: (1) Effects of early environment on offspring fecundity and survival as adult. (2) Context-dependency might explain some of the variation in the strength of maternal effects. (3) Novel experimental and/or statistical techniques should be adopted to disentangle direct genetic, prenatal and postnatal maternal effects on offspring fitness.

Odůvodnění panelu:

Egg size is often believed to be one of the crucial determinants of chick survival in birds. However, evidence for this claim is based on many local- and taxon-specific studies and generalizing these results is problematic. The publication collected enorm

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Epigenetic silencing of the oncogenic miR-17-92 cluster during PU.1-directed macrophage differentiation

Vít Pospíšil, Karina Vargová, Juraj Kokavec, Filipp Geirgievich Savvulidi, Emanuel Nečas, Tomáš Stopka

Identifikátor: **RIV/00216208:11110/11:8965**

Předkladatel výsledku do Pilíře II.:
Univerzita Karlova v Praze 1. lékařská fakulta

Podíl předkladatele na výsledku: **79 %**

Anotace dle RIV:

The oncogenic cluster miR-17-92 encodes seven related microRNAs that regulate cell proliferation, apoptosis and development. Expression of miR-17-92 cluster is decreased upon cell differentiation. Here, we report a novel mechanism of the regulation of miR-17-92 cluster. Using transgenic PU.1(-/-) myeloid progenitors we show that upon macrophage differentiation, the transcription factor PU.1 induces the secondary determinant Egr2 which, in turn, directly represses miR-17-92 expression by recruiting histone demethylase Jarid1b leading to histone H3 lysine K4 demethylation within the CpG island at the miR-17-92 promoter. Conversely, Egr2 itself is targeted by miR-17-92, indicating existence of mutual regulatory relationship between miR-17-92 and Egr2. Furthermore, restoring EGR2 levels in primary acute myeloid leukaemia blasts expressing elevated levels of miR-17-92 and low levels of PU.1 and EGR2 leads to downregulation of miR-17-92 and restored expression of its targets p21CIP1 and BIM. We propose that upon macrophage differentiation PU.1 represses the miR-17-92 cluster promoter by an Egr-2/Jarid1b-mediated H3K4 demethylation mechanism whose deregulation may contribute to leukaemic states.0

Odůvodnění předkladatele:

The paper (J imp, IF 10.124) describes a new mechanism of gene regulation during differentiation of hematopoietic stem cells. During this differentiation is important sequential switching on and off of a specific subset of genes from ~ 20,000 genes contained in the cell nucleus. Basic factors that control gene expression are transcription factors that by binding to the regulatory regions of the gene allow annealing of RNA polymerase II and the subsequent transcription of the gene into the messenger RNA and "gene expression". In the last decade, however, it was discovered a completely new mechanism of regulation of gene expression by non-coding ribonucleic acids termed microRNAs that negatively regulate gene expression at post-transcriptional level (i.e., after the gene is transcribed into messenger RNA), and are often deregulated in malignancies. Our publications demonstrated, using sophisticated gene-modified cell line, that for the successful differentiation of hematopoietic stem cells and progenitors is necessary to turn off specific groups oncogenic microRNAs, miR-17-92. This shutdown is implemented by a mechanism involving epigenetic changes in chromatin structure of miR-17-92 gene by "pro-differentiation" transcription factors PU.1 and EGR2. On the other hand, work of V. Pospisil et al. shows that the relationship of EGR2 and miR-17-92 is mutual and 17-92 has the ability to inhibit transcription factor EGR2. In accordance with this, newly described mechanism, artificial in vitro overproduction of miR-17-92 leads to block of differentiation and maturation of blood cells, thus namely to the process which is part of leukemic hematopoiesis. Among the transcription factor EGR2 and miR-17-92 does exist a double negative feedback regulatory loop, wherein EGR2 inhibits miR-17-92 in differentiating cells, and in turn, miR 17-92 negatively regulates EGR2 in proliferating progenitor cells...

Odůvodnění panelu:

The study shows that a specific pro-differentiation transcription factor is necessary for shutdown of a specific group of mciroRNA in order to initiate succesful differentaition of hematopoetic cells and progenitors. The regulation mechanism is quite com

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Epigenetic silencing of the oncogenic miR-17-92 cluster during PU.1-directed macrophage differentiation

Jonášová Anna, Stopka Tomáš

Identifikátor: **RIV/00064165:_____/11:8965**

Předkladatel výsledku do Pilíře II.:
Všeobecná fakultní nemocnice v Praze (nerozlišená součást)

Podíl předkladatele na výsledku: **79 %**

Anotace dle RIV:

The oncogenic cluster miR-17-92 encodes seven related microRNAs that regulate cell proliferation, apoptosis and development. Expression of miR-17-92 cluster is decreased upon cell differentiation. Here, we report a novel mechanism of the regulation of miR-17-92 cluster. Using transgenic PU.1(-/-) myeloid progenitors we show that upon macrophage differentiation, the transcription factor PU.1 induces the secondary determinant Egr2 which, in turn, directly represses miR-17-92 expression by recruiting histone demethylase Jarid1b leading to histone H3 lysine K4 demethylation within the CpG island at the miR-17-92 promoter. Conversely, Egr2 itself is targeted by miR-17-92, indicating existence of mutual regulatory relationship between miR-17-92 and Egr2. Furthermore, restoring EGR2 levels in primary acute myeloid leukaemia blasts expressing elevated levels of miR-17-92 and low levels of PU.1 and EGR2 leads to downregulation of miR-17-92 and restored expression of its targets p21CIP1 and BIM. We propose that upon macrophage differentiation PU.1 represses the miR-17-92 cluster promoter by an Egr-2/Jarid1b-mediated H3K4 demethylation mechanism whose deregulation may contribute to leukaemic states.0

Odůvodnění předkladatele:

The paper (J imp, IF 10.124) describes a new mechanism of gene regulation during differentiation of hematopoietic stem cells. During this differentiation is important sequential switching on and off of a specific subset of genes from ~ 20,000 genes contained in the cell nucleus. Basic factors that control gene expression are transcription factors that by binding to the regulatory regions of the gene allow annealing of RNA polymerase II and the subsequent transcription of the gene into the messenger RNA and "gene expression". In the last decade, however, it was discovered a completely new mechanism of regulation of gene expression by non-coding ribonucleic acids termed microRNAs that negatively regulate gene expression at post-transcriptional level (i.e., after the gene is transcribed into messenger RNA), and are often deregulated in malignancies. Our publications demonstrated, using sophisticated gene-modified cell line, that for the successful differentiation of hematopoietic stem cells and progenitors is necessary to turn off specific groups oncogenic microRNAs, miR-17-92. This shutdown is implemented by a mechanism involving epigenetic changes in chromatin structure of miR-17-92 gene by "pro-differentiation" transcription factors PU.1 and EGR2. On the other hand, work of V. Pospisil et al. shows that the relationship of EGR2 and miR-17-92 is mutual and 17-92 has the ability to inhibit transcription factor EGR2. In accordance with this, newly described mechanism, artificial in vitro overproduction of miR-17-92 leads to block of differentiation and maturation of blood cells, thus namely to the process which is part of leukemic hematopoiesis. Among the transcription factor EGR2 and miR-17-92 does exist a double negative feedback regulatory loop, wherein EGR2 inhibits miR-17-92 in differentiating cells, and in turn, miR 17-92 negatively regulates EGR2 in proliferating progenitor cells...

Odůvodnění panelu:

The study shows that a specific pro-differentiation transcription factor is necessary for shutdown of a specific group of mciroRNA in order to initiate succesful differentaition of hematopoetic cells and progenitors. The regulation mechanism is quite com

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Fast diploidization in close mesopolyploid relatives of Arabidopsis

MANDÁKOVÁ, Terezie a Martin LYSÁK

Identifikátor: **RIV/00216224:14310/10:00040640**

Předkladatel výsledku do Pilíře II.:
Masarykova univerzita Přírodovědecká fakulta

Podíl předkladatele na výsledku: **57 %**

Anotace dle RIV:

Mesopolyploid whole-genome duplication (WGD) was revealed in the ancestry of Australian Brassicaceae species with diploid-like chromosome numbers (n = 4 to 6). Our results underline the significance of multiple rounds of WGD in the angiosperm genome evolution and demonstrate that chromosome number per se is not a reliable indicator of ploidy level.

Odůvodnění předkladatele:

In this study for the first time comparative chromosome painting was used to reconstruct genome structure in cryptic allopolyploid species. It was shown that species with diploid-like chromosome numbers as low as n=4, 5 and 6 are in fact several million years old allopolyploids. Furthermore, the study reveals the extent and mechanisms of genome diploidization by revealing most chromosome rearrangements associated with the decrease in chromosome number. In this study a new term „mesopolyploidy“ was coined. This terminology was then used by the scientific community in a number of recent papers. The paper was published in The Plant Cell, the major journal in the field of Plant sciences (IF 9,3 in 2009).

Odůvodnění panelu:

The most comprehensive cytogenetic study on close relatives of the model species A. thaliana. The results reshaped our former views on the evolutionary history of the study systems by documenting complex evolutionary trajectories (allopolyploid origin) of

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Human Embryonic Stem Cells Are Capable of Executing G1/S Checkpoint Activation

BÁRTA, Tomáš, Vladimír VINARSKÝ, Zuzana HOLUBCOVÁ, Dáša DOLEŽALOVÁ, Jan VERNER, Šárka POSPÍŠILOVÁ, Petr DVOŘÁK a Aleš HAMPL

Identifikátor: **RIV/00216224:14110/10:00067228**

Předkladatel výsledku do Pilíře II.:
Masarykova univerzita Lékařská fakulta

Podíl předkladatele na výsledku: **50 %**

Anotace dle RIV:

Embryonic stem cells progress very rapidly through the cell cycle, allowing limited time for cell cycle regulatory circuits that typically function in somatic cells. Mechanisms that inhibit cell cycle progression upon DNA damage are of particular importance, as their malfunction may contribute to the genetic instability observed in human embryonic stem cells (hESCs). In this study, we exposed undifferentiated hESCs to DNA-damaging ultraviolet radiation-C range (UVC) light and examined their progressionthrough the G1/S transition. We show that hESCs irradiated in G1 phase undergo cell cycle arrest before DNA synthesis and exhibit decreased cyclin-dependent kinase two (CDK2) activity. We also show that the phosphatase Cdc25A, which directly activates CDK2, is downregulated in irradiated hESCs through the action of the checkpoint kinases Chk1 and/or Chk2. Importantly, the classical effector of the p53-mediated pathway, protein p21, is not a regulator of G1/S progression in hESCs.

Odůvodnění předkladatele:

Pluripotent stem cells of embryonic origin have emerged as a promising tool for many biomedical applications including cell replacement therapy. However, a growing body of evidence indicates that propagation of human embryonic stem (hES) cells in culture results in the accumulation of genomic alterations to their genome. The genome integrity of hES cells is indeed of the paramount importance, since any mutation in their genome limits their awaited clinical application. Several studies suggest that DNA damage pathways are not in hES cells operational, therefore hES cells acquire mutations to their genome, which significantly contributes to general genome instability. This study focuses on determining the presence and functionality of crucial DNA damage and checkpoint signaling pathways. The article demonstrates that hES cells are capable to react to DNA damage by very rapid and rather unexpected mechanism. The typical signaling pathway p53-p21 leading to trigger cell cycle checkpoint in the presence of DNA damage is switched off. Instead, hES cells use more rapid mechanism mediated by phosphorylation and subsequent rapid degradation of Cdc25A - the crucial cell cycle driving molecule, which leads to checkpoint activation followed by DNA repair. Overall, this study is the first one to demonstrate that hES cells are capable of active reaction against damage to their genetic complement, so that it significantly contributes to setting grounds to their application in clinical medicine. This article was also highlighted on Stem Cells portal (http://www.stemcellsportal.com/) – the online information hub for stem cells community, providing an interactive up-to-minute platform covering the latest research in the stem cells field (the copy of the web article is attached to this report). For more information about the impact, please see the attachement.

Odůvodnění panelu:

This is a research showing that human embryonic stem cells are capable to delay entering the S-phase with unprepared DNA after UVC insult by turning off the pathway leading to generation of the cell cycle checkpoint, leading to active reaction against the

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Human embryonic stem cells suffer from centrosomal amplification

HOLUBCOVÁ, Zuzana, Pavel MATULA, Miroslava SEDLÁČKOVÁ, Vladimír VINARSKÝ, Dáša DOLEŽALOVÁ, Tomáš BÁRTA, Petr DVOŘÁK a Aleš HAMPL

Identifikátor: **RIV/00216224:14110/11:00051844**

Předkladatel výsledku do Pilíře II.:
Masarykova univerzita Lékařská fakulta

Podíl předkladatele na výsledku: **60 %**

Anotace dle RIV:

Propagation of human embryonic stem cells (hESCs) in culture tends to alter karyotype, potentially limiting the prospective use of these cells in patients. The chromosomal instability of some malignancies is considered to be driven, at least in part, bycentrosomal overamplification, perturbing balanced chromosome segregation. Here, we report, for the first time, that very high percentage of cultured hESCs has supernumerary centrosomes during mitosis. Supernumerary centrosomes were strictly associated with an undifferentiated hESC state and progressively disappeared on prolonged propagation in culture. Improved attachment to culture substratum and inhibition of CDK2 and Aurora A (key regulators of centrosomal metabolism) diminished the frequency of multicentrosomal mitoses. Thus, both attenuated cell attachment and deregulation of machinery controlling centrosome number contribute to centrosomal overamplification in hESCs.

Odůvodnění předkladatele:

Human embryonic stem (hES) cells hold enormous promise for regenerative medicine as a cellular source for cell/organ replacement in many disorders. However, their use in clinical medicine is threatened by various karyotypic changes, which ES cells acquire during in vitro propagation. This study demonstrates that one of the sources of karyotypic changes is the abnormal amplification of centrosomes. Centrosome is a key organelle required for normal bipolar division. Several studies in cancer cells have linked centrosomal amplification to chromosomal instability. This study also shows that the amplification is caused by CDK2 pathway, opening the door for possible targets modulating CDK2 activity and thus decreasing the centrosomal amplification during in vitro propagation of hES cells. Overall, this study revealed the phenomenon that contributes to genomic instability of hES cells and as such represents the possible target for intervention to improve safety of this medically attractive cell type. Article was published in the leading journal for stem cell research – Stem Cells, and it was already cited 10 times by renowned researchers in the field, for example Dr. Nissim Benvenisty, in the top journals such as Nature Reviews Cancer and Journal of Cell Biology. This article was also highlighted on Stem Cells portal (http://www.stemcellsportal.com/) – the online information hub for stem cells community, providing an interactive up-to-minute platform covering the latest research in the stem cells field (the copy of the web article is attached to this report). Scientometric evaluation: • IF factor (2011): 7.871 • times cited: 10 • high visibility journals citing this work: STEM CELLS (2x); JOURNAL OF CELL BIOLOGY (1x); JOURNAL OF CELLULAR AND MOLECULAR MEDICINE (1x)

Odůvodnění panelu:

Human embryonic stem cells hold enormous promise for regenerative medicine as a cellular source for cell/organ regeneration or replacement in many disorders. The article reports a new phenomenon that contributes to genomic instability of the embryonic ste

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Hyperprolinemic larvae of the drosophilid fly, Chymomyza costata, survive cryopreservation in liquid nitrogen

Košťál Vladimír - Zahradníčková Helena - Šimek Petr

Identifikátor: **RIV/60077344:_____/11:00362689**

Předkladatel výsledku do Pilíře II.:
Biologické centrum AV ČR, v. v. i.

Podíl předkladatele na výsledku: **83 %**

Anotace dle RIV:

The larva of the drosophilid fly, Chymomyza costata, is probably the most complex metazoan organism that can survive submergence in liquid nitrogen (-196 C) in a fully hydrated state. We examined the associations between the physiological and biochemicalparameters of differently acclimated larvae and their freeze tolerance. Profiling of 61 different metabolites identified proline as a prominent compound whose concentration increased from 20 to 147 mM during diapause transition and subsequent cold acclimation. This study provides direct evidence for the essential role of proline in high freeze tolerance. Differential scanning calorimetry analysis suggested that high proline levels, in combination with a relatively low content of osmotically active water and freeze dehydration, increased the propensity of the remaining unfrozen water to undergo a glass-like transition (vitrification) and thus facilitated the prevention of cryoinjury.

Odůvodnění předkladatele:

This paper reports on unique phenomenon of survival at temperature of liquid nitrogen (-196 C) in fully hydrated larvae of the fly, C. costata, which is the most complex organism known to have such capacity. The study provides direct evidence for the essential roles of diapause, cold acclimation and of high levels of free amino acid L-proline in high freeze tolerance. The propensity of larval body fluids to undergo glass-like transition (vitrification) increases with increasing concentrations of proline. Results are important for research communities working in the fields of animal stress responses, environmental adaptations, cryogenics and cryopreservation.

Odůvodnění panelu:

Important paper reporting a very unique phenomenon. An outstanding study on the effects of high proline concentration for cryoprotection.

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Industrial melanism in British peppered moths has a singular and recent mutational origin

Dalíková Martina - Marec František

Identifikátor: **RIV/60077344:_____/11:00359766**

Předkladatel výsledku do Pilíře II.:
Biologické centrum AV ČR, v. v. i.

Podíl předkladatele na výsledku: **29 %**

Anotace dle RIV:

The rapid spread of a novel black form (known as carbonaria) of the peppered moth Biston betularia in 19th-century Britain is a textbook example of how an altered environment may produce morphological adaptation through genetic change. However, the underlying genetic basis of the difference between the wild-type (light-colored) and carbonaria forms has remained unknown. We have genetically mapped the carbonaria morph to a 200-kilobase region orthologous to a segment of silkworm chromosome 17 and show that there is only one core sequence variant associated with the carbonaria morph, carrying a signature of recent strong selection. The carbonaria region coincides with major wing-patterning loci in other lepidopteran systems, suggesting the existence of basal color-patterning regulators in this region.

Odůvodnění předkladatele:

During the Industrial Revolution in 19th-century Britain, melanic forms occurred in a number of moth species with cryptic coloration, blending in with the pale trees and lichens. The dark-colored moths, alighting on soot-covered tree trunks in heavily polluted industrial regions, were less likely to be eaten by avian predators, and their number had risen noticeably, a phenomenon which has come to be known as industrial melanism. The rapid spread of a novel black form (known as carbonaria) of the peppered moth Biston betularia has made this species a textbook example of how an altered environment may produce morphological adaptation through genetic change. However, the underlying genetic basis of the difference between the wild-type (light-colored, typica) and carbonaria forms has remained unknown. Only detail mapping of the peppered moth genome has made a breakthrough in the origin and genetic basis of carbonaria mutation. Our colleagues from University of Liperpool identified polymorphic molecular markers closely linked to carbonaria locus and by DNA analysis of population samples and museum specimens of both the typica and carbonaria forms showed a common origin of all British carbonaria specimens. They also assigned the carbanaria locus to a linkage group orthologous to Bombyx mori chromosome 17. In our laboratory, we identified a homologous chromosome 17 of B. betularia and localized the carbonaria gene by fluorescence in situ hybridization (FISH) with probes prepared from bacterial artificial chromosome clones (BACs) of the B. betularia BAC library. The results thus demonstrate that the carbonaria morph was seeded by a single recent mutation, which is controlled by a new yet unknown melanisation gene that maps to a small region of chromosome 17. The region coincides with major wing-patterning loci in other lepidopteran systems, suggesting the existence of basal color-patterning regulators in this region.

Odůvodnění panelu:

The paper identifies molecular basis of the textbook phenomenon which is well-known to every student of population genetics. It shows that the morphological adaptation (carbonaria form) occurred via single genetic change which is in accord with theoretica

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Knockdown of proteins involved in iron metabolism limits tick reproduction and development

Hajdušek Ondřej - Sojka Daniel - Kopáček Petr - Burešová Veronika - Franta Zdeněk - Šauman Ivo

Identifikátor: **RIV/60077344:_____/09:00327046**

Předkladatel výsledku do Pilíře II.:
Biologické centrum AV ČR, v. v. i.

Podíl předkladatele na výsledku: **75 %**

Anotace dle RIV:

We have characterized a new secreted ferritin (Fer2) and an iron regulatory protein (IRP1) from the hard tick, Ixodes ricinus, and have demonstrated their relationship to a previously described tick intracellular ferritin (Fer1). Using RNA interference,we have proved that Fer2 plays a role as a transporter of non-heme iron from the tick gut to the periheral tissues. Knockdown of Fer2 dramatically impairs the ability of ticks to feed, thus making Fer2 a promising candidate for development of an efficient anti-tick vaccine.

Odůvodnění předkladatele:

A new secreted ferritin (FER2) and an iron regulatory protein (IRP1) from the sheep tick, Ixodes ricinus, were characterised and their relationship to a previously described tick intracellular ferritin (FER1) have been demonstrated. By using RNA interference-mediated gene silencing in the tick, it was shown that synthesis of FER1, but not of FER2, is subject to IRP1-mediated translational control. Further, it was found that depletion of FER2 from the tick plasma leads to a loss of FER1 expression in the salivary glands and ovaries that normally follows blood ingestion. Silencing of the fer1, fer2, and irp1 genes by RNAi has an adverse impact on hatching rate and decreases postbloodmeal weight in tick females. Importantly, knockdown of fer2 dramatically impairs the ability of ticks to feed, thus making FER2 a promising candidate for development of an efficient anti-tick vaccine. Considering the fact that ticks are among the most important vectors of a wide range of human and animal diseases, new data on the mechanism of iron metabolism in ticks that may lead to the development of such a vaccine are very important.

Odůvodnění panelu:

The article describes fundamental findings on metabolism and biology of ticks. The newly described protein ferritin 2 represents a promising candidate for the development of anti-tick vaccines. An excellent example of basic research leading to practical a

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Mitochondrial ATP synthase deficiency due to a mutation in the ATP5E gene for the F1 e subunit

Havlíčková, Vendula - Kaplanová, Vilma - Ješina, Pavel - Pecinová, Alena - Nůsková, Hana - Houštěk, Josef (corresponding author)

Identifikátor: **RIV/67985823:_____/10:00355559**

Předkladatel výsledku do Pilíře II.:
Fyziologický ústav AV ČR, v. v. i.

Podíl předkladatele na výsledku: **95 %**

Anotace dle RIV:

Mutation in ATP5E gene has been found to cause isolated deficiency of ATP synthase resulting in a novel type of human mitochondrial disease with peripheral neuropathy. Mutated subunit epsilon does not influence biochemical function of ATP synthase complex but inhibits its biogenesis and assembly. This is the first case of mitochondrial disease due to mutation in nuclear encoded subunit of ATP synthase

Odůvodnění předkladatele:

Inborn defects of ATP synthase, the key enzyme of cellular ATP production represent the most severe and untreatable human mitochondrial diseases. In this study mutation in ATP5E gene affecting conserved N-terminal Tyr12 of subunit epsilon has been found to cause isolated deficiency of ATP synthase resulting in a novel type of human mitochondrial disease with peripheral neuropathy. Mutated subunit epsilon did not influence biochemical function of ATP synthase complex but strongly inhibited its biogenesis and assembly. This is the first case of mitochondrial disease due to mutation in nuclear encoded subunit of ATP synthase. Times Cited: 24 in Web of Science Core Collection Impact Factor (2012) - HUMAN MOLECULAR GENETICS : 7,692

Odůvodnění panelu:

The paper includes detailed genetic analysis of mitochondrial deficiency in an extremely rare metabolic disorder and represents the first case of mitochondrial disease due to mutation in nuclear encoded subunit of ATP synthase. The results indicate an ess

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Modified TWINSPAN classification in which the hierarchy respects cluster heterogeneity

ROLEČEK, Jan, Lubomír TICHÝ, David ZELENÝ a Milan CHYTRÝ

Identifikátor: **RIV/00216224:14310/09:00028700**

Předkladatel výsledku do Pilíře II.:
Masarykova univerzita Přírodovědecká fakulta

Podíl předkladatele na výsledku: **100 %**

Anotace dle RIV:

Aim To propose a modification of the TWINSPAN algorithm that enables production of divisive classifications that better respect the structure of the data. Methods The proposed modification combines the classical TWINSPAN algorithm with analysis of heterogeneity of the clusters prior to each division. Four different heterogeneity measures are involved: Whittaker's beta, total inertia, average S circle divide rensen dissimilarity and average Jaccard dissimilarity. Their performance was evaluated using empirical vegetation datasets with different numbers of plots and different levels of heterogeneity. Results While the classical TWINSPAN algorithm divides each cluster coming from the previous division step, the modified algorithm divides only the most heterogeneous cluster in each step. The four tested heterogeneity measures may produce identical or very similar results.

Odůvodnění předkladatele:

This paper proposed a new modification of the TWINSPAN algorithm, which has been widely used for classification of species-by-plot matrices in community ecology since 1979, however, it had some disadvantages that were removed by this new modification. At the same time, we developed a software application to run the modified TWINSPAN and included it in the freeware program JUICE. The modified algorithm immediately received broad acceptance in the international community of ecologists, especially vegetation scientists, and renewed interest in the TWINSPAN method. It has been used in many community classification studies from various countries. By June 2014 this paper received 45 citations on Web of Science, which is 4.9 times more than the journal expected citations and 5.8 times more than the expected citations in the subject area, with percentile in the subject area 2.39, according to the InCites evaluation methodology. The number of citations per year has increased recently (14 in 2012, 16 in 2013). The number of citations on Google Scholar is 81, indicating a widespread use also in unpublished documents such as theses and a number of new citations that are not yet included in the Web of Sciences.

Odůvodnění panelu:

A landmark paper in vegetation ecology that introduces new analytical tools for the classification of vegetation. The upgraded software with new functionalities has been widely used at international level and become a standard in vegetation studies both i

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Molecular analysis of the amphioxus frontal eye unravels the evolutionary origin of the retina and pigment cells of the vertebrate eye

Pavel Vopálenský, Jiří Pergner, Michaela Liegertová, Zbyněk Kozmik

Identifikátor: **RIV/68378050:_____/12:00387851**

Předkladatel výsledku do Pilíře II.:
Ústav molekulární genetiky AV ČR, v. v. i.

Podíl předkladatele na výsledku: **80 %**

Anotace dle RIV:

The origin of vertebrate eyes is still enigmatic. The "frontal eye" of amphioxus, our most primitive chordate relative, has long been recognized as a candidate precursor to the vertebrate eyes. However, the amphioxus frontal eye is composed of simple ciliated cells, unlike vertebrate rods and cones, which display more elaborate, surface-extended cilia. So far, the only evidence that the frontal eye indeed might be sensitive to light has been the presence of a ciliated putative sensory cell in the closevicinity of dark pigment cells. We set out to characterize the cell types of the amphioxus frontal eye molecularly, to test their possible relatedness to the cell types of vertebrate eyes. We show that the cells of the frontal eye specifically coexpressa combination of transcription factors and opsins typical of the vertebrate eye photoreceptors and an inhibitory Gi-type alpha subunit of the G protein, indicating an off-responding phototransductory cascade. Furthermore, the pigmented ce

Odůvodnění předkladatele:

Animal eyes are morphologicaly diverse. To interpret the relationship of diverse types of animal eyes remains a challenge and poses an interesting problem for the field of evolutionary biology. Charles Darwin in his book Origin of species acknowledged problems in his evolutionary theory, one with his inability to explain the origin of vertebrate eyes by a step-wise process of evolution. It turns out that this is partly due to the fact that there are only few extant species in the lineage leading to vertebrates. One of them, amphioxus, our most primitive chordate relative, posseses a candidate precursor to the vertebrate eyes, the so called frontal eye. We set out to characterize the cell types of the amphioxus frontal eye molecularly, to test their possible relatedness to the cell types of vertebrate eyes. We show that the cells of the frontal eye specifically coexpress a combination of transcription factors and opsins typical of the vertebrate eye photoreceptors and an inhibitory Gi-type alpha subunit of the G protein, indicating an off-responding phototransductory cascade. Furthermore, the pigmented cells match the retinal pigmented epithelium in melanin content and regulatory signature. Finally, we reveal axonal projections of the frontal eye that resemble the basic photosensory-motor circuit of the vertebrate forebrain. These data provide an evidence that amphioxus frontal eye represents the most primitive version of the present-day eyes of vertebrates.

Odůvodnění panelu:

Combining traditional embryology and molecular biology studying gene expression in evolving structures is a cutting edge research area today.

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Mutations in DNAJC5, Encoding Cysteine-String Protein Alpha, Cause Autosomal-Dominant Adult-Onset Neuronal Ceroid Lipofuscinosis

Lenka Nosková, Viktor Stránecký, Hana Hartmannová, Anna Přistoupilová, Veronika Barešová, Robert Ivánek, Helena Hůlková, Milan Elleder, Stanislav Kmoch

Identifikátor: **RIV/00216208:11110/11:9874**

Předkladatel výsledku do Pilíře II.:
Univerzita Karlova v Praze 1. lékařská fakulta

Podíl předkladatele na výsledku: **50 %**

Anotace dle RIV:

Autosomal-dominant adult-onset neuronal ceroid lipofuscinosis (ANCL) is characterized by accumulation of autofluorescent storage material in neural tissues and neurodegeneration and has an age of onset in the third decade of life or later. The genetic and molecular basis of the disease has remained unknown for many years. We carried out linkage mapping, gene-expression analysis, exome sequencing, and candidate-gene sequencing in affected individuals from 20 families and/or individuals with simplex cases; we identified in five individuals one of two disease-causing mutations, c.346_348delCTC and c.344T>G, in DNAJC5 encoding cysteine-string protein alpha (CSP alpha). These mutations-causing a deletion, p.Leu116del, and an amino acid exchange, p.Leu115Arg, respectively-are located within the cysteine-string domain of the protein and affect both palmitoylation-dependent sorting and the amount of CSP alpha in neuronal cells. The resulting depletion of functional CSP alpha might cause in parallel the presynaptic dysfunction and the progressive neurodegeneration observed in affected individuals and lysosomal accumulation of misfolded and proteolysis-resistant proteins in the form of characteristic ceroid deposits in neurons. Our work represents an important step in the genetic dissection of a genetically heterogeneous group of ANCLs. It also confirms a neuroprotective role for CSP alpha in humans and demonstrates the need for detailed investigation of CSP alpha in the neuronal ceroid lipofuscinoses and other neurodegenerative diseases presenting with neuronal protein aggregation.0

Odůvodnění předkladatele:

Autosomal dominant neuronal ceroid lipofuscinosis –Kufs disease belongs to a broad genetically heterogeneous group of adult neuronal ceroid lipofuscinosis – severe brain diseases. This condition has been described by Hugo Kufs, German pathologist in 1925. It is chaeracterized by deposition in neuronal cells of proteino-lipid structures – ceroid lipofuscine, which leads to their gradual dysfunction and destruction. Since 1925 the literature described several dozens of affected families. Genetic and molecular underpinnings of this condition however remained for many years unknown. In this work authors performed extensive clinical, genetic, biochemical, molecular biological, genomic and histopathological study in 20 affected families and identified causal mutations in a gene DNAJC5. DNAJC5 encodes cystein-string protein alpha (CSP-alpha) which plays a critical role in neurotramission and protein folding in neurons. Authors demonstrated how identified mutations affect CSPalpha biology and how protein absence may leads to clinical features of Kufs disease. This work thereofere contributes to current knowledge on neuronal ceroid lipofuscinosis and document neroprotective role of CSP-alpha in human.

Odůvodnění panelu:

An excellent paper in highly respected journal (The American Journal of Human Genetics, current IF 10.987), in which the Czech-led team of authors performed extensive clinical, genetic, biochemical, molecular biological, genomic and histopathological stud

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Mutations in DNAJC5, Encoding Cysteine-String Protein Alpha, Cause Autosomal-Dominant Adult-Onset Neuronal Ceroid Lipofuscinosis

Hůlková Helena, Jahnová Helena, Elleder Milan, Kmoch Stanislav

Identifikátor: **RIV/00064165:_____/11:9874**

Předkladatel výsledku do Pilíře II.:
Všeobecná fakultní nemocnice v Praze (nerozlišená součást)

Podíl předkladatele na výsledku: **50 %**

Anotace dle RIV:

Autosomal-dominant adult-onset neuronal ceroid lipofuscinosis (ANCL) is characterized by accumulation of autofluorescent storage material in neural tissues and neurodegeneration and has an age of onset in the third decade of life or later. The genetic and molecular basis of the disease has remained unknown for many years. We carried out linkage mapping, gene-expression analysis, exome sequencing, and candidate-gene sequencing in affected individuals from 20 families and/or individuals with simplex cases; we identified in five individuals one of two disease-causing mutations, c.346_348delCTC and c.344T>G, in DNAJC5 encoding cysteine-string protein alpha (CSP alpha). These mutations-causing a deletion, p.Leu116del, and an amino acid exchange, p.Leu115Arg, respectively-are located within the cysteine-string domain of the protein and affect both palmitoylation-dependent sorting and the amount of CSP alpha in neuronal cells. The resulting depletion of functional CSP alpha might cause in parallel the presynaptic dysfunction and the progressive neurodegeneration observed in affected individuals and lysosomal accumulation of misfolded and proteolysis-resistant proteins in the form of characteristic ceroid deposits in neurons. Our work represents an important step in the genetic dissection of a genetically heterogeneous group of ANCLs. It also confirms a neuroprotective role for CSP alpha in humans and demonstrates the need for detailed investigation of CSP alpha in the neuronal ceroid lipofuscinoses and other neurodegenerative diseases presenting with neuronal protein aggregation.0

Odůvodnění předkladatele:

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Odůvodnění panelu:

An excellent paper in highly respected journal (The American Journal of Human Genetics, current IF 10.987), in which the Czech-led team of authors performed extensive clinical, genetic, biochemical, molecular biological, genomic and histopathological stud

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Neo-sex chromosomes and adaptive potential in tortricid pests

Nguyen Petr - Sýkorová Miroslava - Šíchová Jindra - Kůta Václav - Dalíková Martina - Čapková Frydrychová Radmila - Marec František

Identifikátor: **RIV/60077344:_____/13:00392047**

Předkladatel výsledku do Pilíře II.:
Biologické centrum AV ČR, v. v. i.

Podíl předkladatele na výsledku: **56 %**

Anotace dle RIV:

Changes in genome architecture often have a significant effect on ecological specialization and speciation. This effect may be further enhanced by involvement of sex chromosomes playing a disproportionate role in reproductive isolation. We have physically mapped the Z chromosome of the major pome fruit pest, the codling moth, Cydia pomonella (Tortricidae), and show that it arose by fusion between an ancestral Z chromosome and an autosome corresponding to chromosome 15 in the Bombyx mori reference genome. We further show that the fusion originated in a common ancestor of the main tortricid subfamilies, Olethreutinae and Tortricinae. The Z?autosome fusion brought two major genes conferring insecticide resistance and clusters of genes involved in detoxification of plant secondary metabolites under sex-linked inheritance. We suggest that this fusion significantly increased the adaptive potential of tortricid moths and thus contributed to their radiation and subsequent speciation.

Odůvodnění předkladatele:

We performed comparative physical mapping of the Z sex chromosome in the codling moth, Cydia pomonella (Lepidoptera: Torticidae), which is the key pest of pome fruits and walnuts in temperate regions of the world and is now resistant to a plethora of commonly used insecticides. We found that the Z chromosome of this species is a neo-Z chromosome that arose by a fusion between an ancestral Z sex chromosome and an autosome corresponding to chromosome 15 in the silkworm (Bombyx mori) reference genome. We further showed that the fusion originated in a common ancestor of the main tortricid subfamilies, Olethreutinae and Tortricinae.The Z chromosome-autosome fusion brought two major genes conferring insecticide resistance under sex-linked inheritance, which may have had a significant impact on their fixation rate due to female hemizygosity. Overall, we showed three insecticide resistance genes to be Z-linked in the codling moth in addition to the recently reported Z-linked codling moth granulovirus resistance gene. This is of great interest since these tortricid subfamilies include almost 700 economically important pests. Furthermore, the fusion transferred clusters of genes involved in detoxification of plant secondary metabolites onto the Z chromosome, which is known to be disproportionately involved in reproductive isolation. We suggest that this fusion represents a key evolutionary innovation, which significantly increased the adaptive potential of tortricid moths and thus contributed to their radiation and subsequent speciation.Our findings will contribute to the management of tortricid pests and allow new perspectives on the role of neo-sex chromosomes in speciation of phytophagous insects. Thus, our study is of considerable interest to scientists involved in fundamental as well as applied entomological research and also to a more general scientific readership interested in novel aspects of chromosomal evolution leading to speciation.

Odůvodnění panelu:

The paper is a brilliant analysis of chromosomal evolution in economically important pest species. It shows an important link between genome structure evolution and speciation (formation of new species) and the findings will contribute to the management o

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Neo-sex chromosomes and adaptive potential in tortricid pests

Petr Nguyen, Miroslava Sýkorová, Jindra Šíchová, Martina Dalíková, František Marec

Identifikátor: **RIV/60076658:12310/13:43885341**

Předkladatel výsledku do Pilíře II.:
Jihočeská univerzita v Českých Budějovicích Přírodovědecká fakulta

Podíl předkladatele na výsledku: **56 %**

Anotace dle RIV:

Changes in genome architecture often have a significant effect on ecological specialization and speciation. This effect may be further enhanced by involvement of sex chromosomes playing a disproportionate role in reproductive isolation. We have physically mapped the Z chromosome of the major pome fruit pest, the codling moth, Cydia pomonella (Tortricidae), and show that it arose by fusion between an ancestral Z chromosome and an autosome corresponding to chromosome 15 in the Bombyx mori reference genome. We further show that the fusion originated in a common ancestor of the main tortricid subfamilies, Olethreutinae and Tortricinae. The Z?autosome fusion brought two major genes conferring insecticide resistance and clusters of genes involved in detoxification of plant secondary metabolites under sex-linked inheritance. We suggest that this fusion significantly increased the adaptive potential of tortricid moths and thus contributed to their radiation and subsequent speciation.

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Odůvodnění panelu:

The paper is a brilliant analysis of chromosomal evolution in economically important pest species. It shows an important link between genome structure evolution and speciation (formation of new species) and the findings will contribute to the management o

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Patterning by heritage in mouse molar row development

Procházka, Jan; Churavá, Svatava; Rothová, Michaela; Peterka, Miroslav; Peterková, Renata

Identifikátor: **RIV/68378041:_____/10:00347389**

Předkladatel výsledku do Pilíře II.:
Ústav experimentální medicíny AV ČR, v. v. i.

Podíl předkladatele na výsledku: **40 %**

Anotace dle RIV:

It is known from paleontology studies that two premolars have been lost during mouse evolution. During mouse mandible development, two bud-like structures transiently form that may represent rudimentary precursors of the lost premolars. This study highlights how rudiments of lost structures can stay integrated and participate in morphogenesis of functional organs and help in understanding their evolution, as Darwin suspected long ago.

Odůvodnění předkladatele:

It is known from paleontology studies that two premolars have been lost during mouse evolution. During mouse mandible development, two bud-like structures transiently form that may represent rudimentary precursors of the lost premolars. However, the interpretation of these structures and their significance for mouse molar development are highly controversial because of a lack of molecular data. Here, we searched for typical tooth signaling centers in these two bud-like structures, and followed their fate using molecular markers, 3D reconstructions, and lineage tracing in vitro. Transient signaling centers were indeed found to be located at the tips of both the anterior and posterior rudimentary buds. These centers expressed a similar set of molecular markers as the "primary enamel knot" (pEK), the signaling center of the first molar (M1). These two transient signaling centers were sequentially patterned before and anterior to the M1 pEK. We also determined the dynamics of the M1 pEK, which, slightly later during development, spread up to the field formerly occupied by the posterior transient signaling center. It can be concluded that two rudimentary tooth buds initiate the sequential development of the mouse molars and these have previously been mistaken for early stages of M1 development. Although neither rudiment progresses to form an adult tooth, the posterior one merges with the adjacent M1, which may explain the anterior enlargement of the M1 during mouse family evolution. This study highlights how rudiments of lost structures can stay integrated and participate in morphogenesis of functional organs and help in understanding their evolution, as Darwin suspected long ago.

Odůvodnění panelu:

This study reports fundamental progress in research of evolutionary pathways during patterning of vertebrate eye, studied in the amphioxus model. It opens new perspectives in respective research area.

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Planting intensity, residence time, and species traits determine invasion success of alien woody species

Petr Pyšek, Martin Křivánek, Vojtěch Jarošík

Identifikátor: **RIV/00216208:11310/09:10000694**

Předkladatel výsledku do Pilíře II.:
Univerzita Karlova v Praze Přírodovědecká fakulta

Podíl předkladatele na výsledku: **50 %**

Anotace dle RIV:

The probability of escape from cultivation of alien woody plants in Central Europe increased with residence time in the Czech Republic, whereas the probability of naturalization increased with the residence time in Europe. This indicates that some species were already adapted to local conditions when introduced to the Czech Republic. Apart from residence time, the probability of escape depends on planting intensity (propagule pressure), and that of naturalization on the area of origin and fruit size; itis lower for species from Asia and those with small fruits. The probability of invasion is determined by a long residence time and the ability to tolerate low temperatures. These results indicate that a simple suite of factors determines, with a high probability, the invasion success of alien woody plants, and that the relative role of biological traits and other factors is stage dependent. Biological traits play a role in later stages of invasion.

Odůvodnění předkladatele:

The paper, published in one of the most prestigious ecological journals and accumulating over 50 citations on Web of Science, is an important contribution to understanding why some introduced plant species become successful invaders while others do not. Using the set of tree species cultivated for forestry purpose, it breaks the invasion process down to stages and seeks for determinants of invasiveness separately for each stages; this makes it methodically innovative and pioneering within the literature in the field. The probability of escape from cultivation of alien woody plants in Central Europe increased with residence time in the Czech Republic, whereas the probability of naturalization increased with the residence time in Europe. This indicates that some species were already adapted to local conditions when introduced to the Czech Republic. Apart from residence time, the probability of escape depends on planting intensity (propagule pressure), and that of naturalization on the area of origin and fruit size; it is lower for species from Asia and those with small fruits. The probability of invasion is determined by a long residence time and the ability to tolerate low temperatures. These results indicate that a simple suite of factors determines, with a high probability, the invasion success of alien woody plants, and that the relative role of biological traits and other factors is stage dependent. Biological traits play a role in later stages of invasion. The study was part of the PhD project of Martin Křivánek at the Department of Botany, Charles University in Prague, supervised by Petr Pyšek and co-supervised for statistical analyses by Vojtěch Jarošík.

Odůvodnění panelu:

This in-depth study of woody plants in the Czech Republic, comparing congeneric pairs one of which was invasive, escaped or naturalised, yields patterns applicable across the continent. The potential to escape seems determined by simple factors such as

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Production of mouse embryonic stem cell lines from maturing oocytes by direct conversion of meiosis into mitosis

Fulková Helena, Moško Tibor, Kott Tomáš, Fulka jr. Josef

Identifikátor: **RIV/00027014:_____/11:#0001386**

Předkladatel výsledku do Pilíře II.:
Výzkumný ústav živočišné výroby, v.v.i.

Podíl předkladatele na výsledku: **95 %**

Anotace dle RIV:

Described is a novel approach where ESC with all pluripotency parameters were established from oocytes in which metaphase I was converted directly into metaphase II-like stage. The embryos initiate development and reach the blastocyst stage from which the ESC lines are established.

Odůvodnění předkladatele:

ESCs are most commonly derived from embryos originating from oocytes that reached metaphase II stage. We have developed a novel approach where ESCs with all pluripotency parameters were established from oocytes in which metaphase I was converted, by incubating them in butorolactone 1 (Cdk 1 specific inhibitor), directly into a metaphase II-like stage without the intervening anaphase to telophase I transition. The resulting embryos initiate development and reach the blastocyst stage (up to 60%) from which the ECS lines are then very efficiently established. Thus, our approach represents an ethically acceptable method that can exploit oocytes that are typically discarded in in vitro fertilization clinics. Our preliminary experiments support this assumption, human oocytes without first polar bodies respond to BL 1 treatment similarly as mouse oocytes and form pseudo-pronuclei in the cytoplasm. Some of these oocytes cleaved and reached the blastocyst stage (Langerova et al., Cell Reprogramming 15, 389-393; 2013).

Odůvodnění panelu:

This is extremely important study describing mechanisms of production of embryonic stem cells directly from oocytes, thus avoiding all potential complications (ethical, technical, etc), associated with the production/collection of the embryonic stem cells

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

PTP1B Is an Effector of Activin Signaling and Regulates Neural Specification of Embryonic Stem Cells

MATULKA, Kamil, Hana HŘÍBKOVÁ, Petr DVOŘÁK a Yuh-Man SUN

Identifikátor: **RIV/00216224:14110/13:00070445**

Předkladatel výsledku do Pilíře II.:
Masarykova univerzita Lékařská fakulta

Podíl předkladatele na výsledku: **100 %**

Anotace dle RIV:

During embryogenesis, the Activin/Nodal pathway promotes the mesendodermal lineage and inhibits neural fate. The molecular mechanisms underlying this role of the Activin/Nodal pathway are not clear. In this study, we report a role for protein tyrosine phosphatase 1B (PTP1B) in Activin-mediated early fate decisions during ESC differentiation and show that PTP1B acts as an effector of the Activin pathway to specify mesendodermal or neural fate. We found that the Activin/ALK4 pathway directly recruits PTP1B and stimulates its release from the endoplasmic reticulum through ALK4-mediated cleavage. Subsequently, PTP1B suppresses p-ERK1/2 signaling to inhibit neural specification and promote mesendodermal commitment. These findings suggest that a noncanonicalActivin signaling pathway functions in lineage specification of mouse and human embryonic stem cells.

Odůvodnění předkladatele:

In vertebrates, one of the earliest steps of the formation of organs and tissues is the induction of the neuroectoderm and subsequently specification of mesendoderm. Such crucial fate decision is controlled by intricate networks that include growth factors (or cytokines), transcription factors, and other regulatory elements. Cytokines induce myriads of intracellular activities, including the activation or inhibition of multiple signal transduction pathways, culminating in phenotypic specification. This paper published in world-leading journal Cell Stem Cell sheds light on one specific molecular mechanism of this crucial cell lineage decision. In more detail, these data suggest that growth factor Activin not only activates a canonical transcription factor p-Smad2 signaling cascade through another effector molecule Alk(ALK)4 but also recruits enzyme named PTP1B and triggers the interaction between PTP1B and key signaling kinase p-Erk(ERK)1/2. This interaction down-regulates p-Erk(ERK)1/2 signaling and leads to the inhibition of neural induction. PTP1B also promotes mesendoderm specification, possibly in cooperation with p-Smad2 signaling. This complex study was the first to demonstrate that PTP1B acts as a novel member of the Activin/Alk(ALK)4 pathway to regulate p-Erk(ERK)1/2 signaling, which forms the first non-canonical signaling in Activin networks. Moreover, this study confers PTP1B with a novel and evolutionary conserved role in Activin-mediated functions in human and mouse embryonic stem cells. Finally, it was shown for the first time that PTP1B and Alk(ALK)4 form part of a novel non-canonical Activin signaling pathway that precisely controls mesendoderm or neuroectoderm lineage specification. Overall, this study may be instructive for controlled differentiation of human stem cells towards specific cell types with the strong impact on newly developed cell-based therapies. See the list of reviews and bibliometrics indicators in the attachement!

Odůvodnění panelu:

This study researched control of differentiation of human and mouse embryonic stem cells and the mechanisms responsible for their neuronal induction. The study shows that activin activates at least two downstream branches of signaling, one of the p-Sma

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Successful invaders co-opt pollinators of native flora and accumulate insect pollinators with increasing residence time

Pyšek Petr, Jarošík Vojtěch, Danihelka Jiří, Pergl Jan

Identifikátor: **RIV/67985939:_____/11:00365110**

Předkladatel výsledku do Pilíře II.:
Botanický ústav AV ČR, v. v. i.

Podíl předkladatele na výsledku: **60 %**

Anotace dle RIV:

Alien flora introduced to Central Europe contained a higher proportion of insect-pollinated species than did the Central European native flora and linked to a higher diversity of pollinators per species. However, the frequency of pollination modes in theintroduced alien flora gradually changed during the process of naturalization, becoming more similar to that of native species, and eventually, the naturalized species that became invasive did not differ in their frequency of pollination modes from native species. The results further suggest a remarkable role for pollination mode in successful invasions; self pollination tends to support spread of neophytes more than any other mode of pollination. Moreover, groups of plants that have been provided withlonger time to sample a wider range of habitats than recently arriving alien species have formed more associations with native pollinator species occurring in those habitats.

Odůvodnění předkladatele:

When studying determinants of invasiveness of plant species, it needs to be taken into account that the relationships between plants and organisms at other trophic levels result from centuries of mutual interactions. Pollination mode is one of the most important mutualistic relationships. Our study shows that alien flora introduced to Central Europe contained a higher proportion of insect-pollinated species than did the Central European native flora and hosted a higher diversity of pollinators per species. However, the frequency of pollination modes in the introduced alien flora gradually changed during the process of naturalization, becoming more similar to that of native species, and eventually, the naturalized species that became invasive did not differ in their frequency of pollination modes from native species. The results further suggest a remarkable role of the pollination mode in successful invasions; self pollination tends to support spread of invasive species more than any other mode of pollination. Moreover, groups of plants that have been provided with longer time to sample a wider range of habitats than recently arriving alien species have formed more associations with native pollinator species occurring in those habitats. Published in a prestigious journal Ecological Monographs (IF 7.443 for the year of publication), that only selects about 25-30 papers a year to publish, the study is the first in invasion literature to investigate shifts the of plant-pollinator interactions on a time scale of millennia, by using a study system in which the relationships were being newly formed following the introduction of plants to central Europe from other regions. The paper yielded 23 Google Scholar and 18 WoS citations as of mid 2014.

Odůvodnění panelu:

A large-scale interdisciplinary study at the interface between plant and animal ecology, significantly contributing to our understanding of triggers of invasive spread of alien plants. The authors were the first to investigate shifts of plant-pollinator i

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

SYNTHESIS OF CLONALITY AND POLYPLOIDY IN VERTEBRATE ANIMALS BY HYBRIDIZATION BETWEEN TWO SEXUAL SPECIES

Choleva Lukáš, Janko Karel, Bohlen Jörg, Šlechtová Věra, Rábová Marie, Ráb Petr

Identifikátor: **RIV/67985904:_____/12:00379682**

Předkladatel výsledku do Pilíře II.:
Ústav živočišné fyziologie a genetiky AV ČR, v. v. i.

Podíl předkladatele na výsledku: **100 %**

Anotace dle RIV:

Because most clonal vertebrates have hybrid genomic constitutions, tight linkages are assumed among hybridization, clonality, and polyploidy. However, predictions about how these processes mechanistically relate during the switch from sexual to clonal reproduction have not been validated. Therefore, we performed a crossing experiment to test the hypothesis that interspecific hybridization per se initiated clonal diploid and triploid spined loaches (Cobitis) and their gynogenetic reproduction. We rearedtwo F1 families resulting from the crossing of 14 pairs of two sexual species, and found their diploid hybrid constitution and a 1:1 sex ratio. While males were infertile, females produced unreduced nonrecombinant eggs (100%). Synthetic triploid femalesand males (96.3%) resulted in each of nine backcrossed families from eggs of synthesized diploid F1s fertilized by haploid sperm from sexual males. Five individuals (3.7%) from one backcross family were genetically identical to the somati

Odůvodnění předkladatele:

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Odůvodnění panelu:

The study provides a major insight into the relationships between hybridization, clonality and polyploidy in vertebrates. Using a series of demanding experiments, the authors elucidated the long-standing issue of causes and consequences of these evolution

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

The juvenile hormone signaling pathway in insect development

Jindra Marek

Identifikátor: **RIV/60077344:_____/13:00380858**

Předkladatel výsledku do Pilíře II.:
Biologické centrum AV ČR, v. v. i.

Podíl předkladatele na výsledku: **50 %**

Anotace dle RIV:

This review article in the leading entomology journal summarizes current mechanistic models of juvenile hormone signaling during insect metamorphosis. It identifies gaps in our understanding of juvenile hormone function and outlines directions for futureresearch.

Odůvodnění předkladatele:

This article is a landmark review of recent advances in insect endocrinology, in particular the molecular action of the terpenoid juvenile hormone (JH). It was published in 2013 by Annual Review of Entomology, which is the highest-ranking entomological journal (Impact Factor 13.589). The paper has been the sixth most accessed article of the journal in the past 12 months, and to date has received 42 citations (SCOPUS). The review is largely based on original breakthrough findings from the laboratory of Marek Jindra at the Institute of Entomology of the Biology Center. His team has identified the long-elusive receptor for the JH. Their studies have provided primary genetic evidence that a bHLH-PAS protein, previously known as Methoprene-tolerant (Met), mediates the biological effects of JH in developing and adult insects. Further work has defined the hormone-binding domain of Met, thus establishing it as a bona fide JH receptor at the molecular level. Interestingly, bHLH-PAS proteins comprise a family of transcription factors that in mammals are activated by external stimuli such as hypoxia (hypoxia factor, HIF) or environmenal pollutants (dioxin receptor, AhR). However, Met is the first bHLH-PAS protein known to act as a receptor for an authentic animal hormone. Results summarized in this review have solved an old problem of insect biology and have stimulated novel research worldwide. This research shows how juvenile hormone controls insect growth, development, and reproduction. Moreover, it explains the hitherto obscured molecular action of massively used JH-mimicking insecticides, and points the way towards designing better agents for pest control.

Odůvodnění panelu:

The article represents a landmark review of recent advances in insect endocrinology, in particular the molecular action of the terpenoid juvenile hormone. The review is based mainly on original research data obtained by the leading author and represents a

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Translation Reinitiation Relies on the Interaction between eIF3a/TIF32 and Progressively Folded cis-Acting mRNA Elements Preceding Short uORFs

Munzarová, Vanda; Pánek, Josef; Gunišová, Stanislava; Dányi, István; Szamecz, Bela; Valášek, Leoš

Identifikátor: **RIV/61388971:____/11:00366863**

Předkladatel výsledku do Pilíře II.:
Mikrobiologický ústav AV ČR, v. v. i.

Podíl předkladatele na výsledku: **100 %**

Anotace dle RIV:

Reinitiation is a gene-specific translational control mechanism characterized by the ability of some short upstream uORFs to tain post-termination 40S subunits on mRNA. Its efficiency depends on surrounding cis-acting sequences, uORF elongation rates, various initiation factors, and the intercistronic distance. To unravel effects of cis-acting sequences, we investigated previously unconsidered structural properties of one such a cis-enhancer in the mRNA leader of GCN4 using yeast genetics and biochemistry. This leader contains four uORFs but only uORF1, flanked by two transferrable 59 and 39 cisacting sequences, and allows efficient reinitiation. Recently we showed that the 59 cis-acting sequences stimulate reinitiation by interacting with the N-terminal domain (NTD) of the eIF3a/TIF32 subunit of the initiation factor eIF3 to stabilize post-termination 40S subunits on uORF1 to resume scanning downstream

Odůvodnění předkladatele:

Reinitiation is a gene-specific translational control mechanism characterized by the ability of some short upstream uORFs to retain post-termination 40S subunits on mRNA. Its efficiency depends on surrounding cis-acting sequences, uORF elongation rates, various initiation factors, and the intercistronic distance. To unravel effects of cis-acting sequences, we investigated previously unconsidered structural properties of one such a cis-enhancer in the mRNA leader of GCN4 using yeast genetics and biochemistry. This leader contains four uORFs but only uORF1, flanked by two transferrable 5' and 3' cis-acting sequences, and allows efficient reinitiation. Recently we showed that the 5' cis-acting sequences stimulate reinitiation by interacting with the N-terminal domain (NTD) of the eIF3a/TIF32 subunit of the initiation factor eIF3 to stabilize post-termination 40S subunits on uORF1 to resume scanning downstream. Here we identify four discernible reinitiation-promoting elements (RPEs) within the 5' sequences making up the 5' enhancer. Genetic epistasis experiments revealed that two of these RPEs operate in the eIF3a/TIF32-dependent manner. Likewise, two separate regions in the eIF3a/TIF32-NTD were identified that stimulate reinitiation in concert with the 5' enhancer. Computational modeling supported by experimental data suggests that, in order to act, the 5' enhancer must progressively fold into a specific secondary structure while the ribosome scans through it prior uORF1 translation. Finally, we demonstrate that the 5' enhancer's stimulatory activity is strictly dependent on and thus follows the 3' enhancer's activity. These findings allow us to propose for the first time a model of events required for efficient post-termination resumption of scanning. Strikingly, structurally similar RPE was predicted and identified also in the 5' leader of reinitiation-permissive uORF of yeast YAP1.

Odůvodnění panelu:

A very important paper showing a so far unknown mechanism of translational reinitiation.

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Universal species-area and endemics-area relationships at continental scales

David Storch

Identifikátor: **RIV/00216208:11620/12:10124091**

Předkladatel výsledku do Pilíře II.:
Univerzita Karlova v Praze Centrum pro teoretická studia

Podíl předkladatele na výsledku: **50 %**

Anotace dle RIV:

Despite the broad conceptual and applied relevance of how the number of species or endemics changes with area (the species-area and endemics-area relationships (SAR and EAR)), our understanding of universality and pervasiveness of these patterns across taxa and regions has remained limited. The SAR has traditionally been approximated by a power law(1), but recent theories predict a triphasic SAR in logarithmic space, characterized by steeper increases in species richness at both small and large spatialscales(2-6). Here we uncover such universally upward accelerating SARs for amphibians, birds and mammals across the world's major landmasses. Although apparently taxon-specific and continent-specific, all curves collapse into one universal function afterthe area is rescaled by using the mean range sizes of taxa within continents. In addition, all EARs approximately follow a power law with a slope close to 1, indicating that for most spatial scales there is roughly proportional species e

Odůvodnění předkladatele:

This paper, published in one of the most prestigious scientific journals, shows that one of the most studied ecological patterns, the species-area relationship, has at a continental scale a different form from the traditionally assumed power-law (a line when both axes are logarithmic). Still, the relationship between area and number of species is surprisingly universal (i.e. it holds for birds, mammals, and amphibians at all continents) when the axes are properly rescaled. It can be used for estimates of species richness at various (unsampled) spatial scales as well as for estimates of species extinctions due to area loss. All the work has been done at Charles University, where David Storch and Petr Keil worked and hosted Walter Jetz, who provided the data and later on in turn hosted Petr Keil in Yale (which is the reason why Petr Keil's affiliation is Yale, even though the work has been done at the Charles University). During less than two years from publication, the paper has been cited thirty times, according to Google Scholar, and David Storch was invited to have a plenary lecture on this issue at prestigious Gordon Research Conference.

Odůvodnění panelu:

The increasing number of species with extending area sampled is one of the key general laws in ecology. However, its form varies in space and with taxa studied. The publication is based on an ingenious method unifying the mathematical expression of the re

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

5-Azacitidine in aggressive myelodysplastic syndromes regulates chromatin structure at PU.1 gene and cell differentiation capacity

Nikola Čuřík, Pavel Burda, Karina Vargová, Vít Pospíšil, Petra Vlčková, Filipp Geirgievich Savvulidi, Emanuel Nečas, Marek Trněný, Anna Jonášová, Tomáš Stopka

Identifikátor: **RIV/00216208:11110/12:11444**

Předkladatel výsledku do Pilíře II.:
Univerzita Karlova v Praze 1. lékařská fakulta

Podíl předkladatele na výsledku: **56 %**

Anotace dle RIV:

Epigenetic 5-azacitidine (AZA) therapy of high-risk myelodysplastic syndromes (MDS) and acute myelogenous leukemia (AML) represents a promising, albeit not fully understood, approach. Hematopoietic transcription factor PU.1 is dynamically regulated by upstream regulatory element (URE), whose deletion causes downregulation of PU.1 leading to AML in mouse. In this study a significant group of the high-risk MDS patients, as well as MDS cell lines, displayed downregulation of PU.1 expression within CD34+ cells, which was associated with DNA methylation of the URE. AZA treatment in vitro significantly demethylated URE, leading to upregulation of PU.1 followed by derepression of its transcriptional targets and onset of myeloid differentiation. Addition of colony-stimulating factors (CSFs; granulocyte-CSF, granulocyte-macrophage-CSF and macrophage-CSF) modulated AZA-mediated effects on reprogramming of histone modifications at the URE and cell differentiation outcome. Our data collectively support the importance of modifying the URE chromatin structure as a regulatory mechanism of AZA-mediated activation of PU.1 and induction of the myeloid program in MDS.0

Odůvodnění předkladatele:

The Myelodysplastic syndrome (MDS) is clonal hematopoietic stem cell disorder of mostly older patients (median of age is 65 years for new diagnoses). The disease is characterized by improper differentiation of blood cells resulting at loss of their function, dysplasia and blasts accumulation in bone marrow. MDS can also transform into acute myeloid leukemia (AML). On molecular level, MDS is also characterized by aberrant DNA hypermethylation of many gene regulatory regions. This hypermethylation generally causes suppression of gene expression. 5-azacytidine (AZA, Vidaza) is drug with ability in low concentration to induce DNA demethylation. On the base of results obtained in test studies, AZA is used since 2008 as the first-line therapy for MDS patients in higher risk, for patients with Chronic myelomonocytic leukemia and also for some patients with AML in the Czech republic. It is assumed that the mechanism of the therapeutic effect of AZA involves restoring of suppressed expression of pro-differentiation and tumor-suppressor genes, and induction of cell differentiation. Despite the good results of the clinical practice, there are some patients who does not respond to AZA, or develop resistance. A key role in the differentiation of blood cells at the molecular level plays a transcription factor PU.1. Low expression of PU.1 is associated with impaired differentiation and leukemia. In our work, we have shown that patients with higher risk MDS have a very variable expression of PU.1. We have found that a group of patients with low expression PU.1 in blasts in the bone marrow has a significantly lower survival when treated with AZA compared to group of patients with higher expression PU.1. By using of molecular genetic methods and by using a transgenic mouse model, we showed AZA stimulates expression of PU.1 and its target genes, which induces myeloid differentiation and cell cycle arrest...

Odůvodnění panelu:

Výborné výzkumné výsledky s bezprostředním klinickým významem, publikované ve vynikajícím časopisu. Inovativní výzkumný přístup s vysokým významem pro klinické využití; výsledky studie byly publikovány v prestižním časopisu.

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

5-Azacitidine in aggressive myelodysplastic syndromes regulates chromatin structure at PU.1 gene and cell differentiation capacity

Trněný Marek, Jonášová Anna, Stopka Tomáš

Identifikátor: **RIV/00064165:_____/12:11444**

Předkladatel výsledku do Pilíře II.:
Všeobecná fakultní nemocnice v Praze (nerozlišená součást)

Podíl předkladatele na výsledku: **56 %**

Anotace dle RIV:

Epigenetic 5-azacitidine (AZA) therapy of high-risk myelodysplastic syndromes (MDS) and acute myelogenous leukemia (AML) represents a promising, albeit not fully understood, approach. Hematopoietic transcription factor PU.1 is dynamically regulated by upstream regulatory element (URE), whose deletion causes downregulation of PU.1 leading to AML in mouse. In this study a significant group of the high-risk MDS patients, as well as MDS cell lines, displayed downregulation of PU.1 expression within CD34+ cells, which was associated with DNA methylation of the URE. AZA treatment in vitro significantly demethylated URE, leading to upregulation of PU.1 followed by derepression of its transcriptional targets and onset of myeloid differentiation. Addition of colony-stimulating factors (CSFs; granulocyte-CSF, granulocyte-macrophage-CSF and macrophage-CSF) modulated AZA-mediated effects on reprogramming of histone modifications at the URE and cell differentiation outcome. Our data collectively support the importance of modifying the URE chromatin structure as a regulatory mechanism of AZA-mediated activation of PU.1 and induction of the myeloid program in MDS.0

Odůvodnění předkladatele:

The Myelodysplastic syndrome (MDS) is clonal hematopoietic stem cell disorder of mostly older patients (median of age is 65 years for new diagnoses). The disease is characterized by improper differentiation of blood cells resulting at loss of their function, dysplasia and blasts accumulation in bone marrow. MDS can also transform into acute myeloid leukemia (AML). On molecular level, MDS is also characterized by aberrant DNA hypermethylation of many gene regulatory regions. This hypermethylation generally causes suppression of gene expression. 5-azacytidine (AZA, Vidaza) is drug with ability in low concentration to induce DNA demethylation. On the base of results obtained in test studies, AZA is used since 2008 as the first-line therapy for MDS patients in higher risk, for patients with Chronic myelomonocytic leukemia and also for some patients with AML in the Czech republic. It is assumed that the mechanism of the therapeutic effect of AZA involves restoring of suppressed expression of pro-differentiation and tumor-suppressor genes, and induction of cell differentiation. Despite the good results of the clinical practice, there are some patients who does not respond to AZA, or develop resistance. A key role in the differentiation of blood cells at the molecular level plays a transcription factor PU.1. Low expression of PU.1 is associated with impaired differentiation and leukemia. In our work, we have shown that patients with higher risk MDS have a very variable expression of PU.1. We have found that a group of patients with low expression PU.1 in blasts in the bone marrow has a significantly lower survival when treated with AZA compared to group of patients with higher expression PU.1. By using of molecular genetic methods and by using a transgenic mouse model, we showed AZA stimulates expression of PU.1 and its target genes, which induces myeloid differentiation and cell cycle arrest...

Odůvodnění panelu:

Výborné výzkumné výsledky s bezprostředním klinickým významem, publikované ve vynikajícím časopisu. Inovativní výzkumný přístup s vysokým významem pro klinické využití; výsledky studie byly publikovány v prestižním časopisu.

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

A Controlled Trial of Revascularization in Acute Stroke

Roubec Martin, Kuliha Martin, Procházka Václav, Krajča Jan, Czerný Daniel, Jonszta Tomáš, Školoudík David

Identifikátor: **RIV/00843989:_____/13:00103066**

Předkladatel výsledku do Pilíře II.:
Fakultní nemocnice Ostrava

Podíl předkladatele na výsledku: **70 %**

Anotace dle RIV:

To compare safety and utility of intraarterial revascularization with use of stents to no revascularization in patients who either failed to respond to intravenous thrombolysis (IVT) or have contraindications to IVT. Materials and Methods: The case-control study was approved by local ethics committees; all patients signed informed consent. One hundred thirty-one patients (74 men; mean age, 65.9 years ? 12.3; range, 25-86 years) with acute ischemic stroke (AIS) due to middle cerebral artery (MCA) occlusion were enrolled; 75 underwent IVT. No further recanalization therapy was performed in 26 (35%) IVT-treated patients with MCA recanalization (group 1). Patients with IVT failure after 60 minutes were allocated to endovascular treatment (group 2A) or no further therapy (group 2B). Patients with contraindication to IVT were allocated to endovascular treatment within 8 hours since AIS onset (group 3A) or to no recanalization therapy (group 3B). Neurologic deficit at admission, MCA recanaliz

Odůvodnění předkladatele:

This paper is giving actual results of the large group of patients that have been treated by the most actual approach of endovascular stroke therapy fat the dedicated cerebrovascular stroke center of exellence. In combination with the published book (result n.1) we are presenting the modern technique of the cerebrovascular disease treatment.

Odůvodnění panelu:

Důležité výsledky studie s bezprostředními klinickými dopady, publikované v prestižním časopisu.

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

AMP-activated Protein Kinase alfa2 Subunit Is Required for the Preservation of Hepatic Insulin Sensitivity by n-3 Polyunsaturated Fatty Acids

Jeleník, Tomáš - Rossmeisl, Martin - Kuda, Ondřej - Macek Jílková, Zuzana - Medříková, Daša - Kůs, Vladimír - Hensler, Michal - Janovská, Petra - Mikšík, Ivan - Flachs, Pavel - Kopecký, Jan (corresponding author)

Identifikátor: **RIV/67985823:_____/10:00349619**

Předkladatel výsledku do Pilíře II.:
Fyziologický ústav AV ČR, v. v. i.

Podíl předkladatele na výsledku: **79 %**

Anotace dle RIV:

Mice with a whole-body deletion of the alfa2 catalytic subunit of AMPK and their wild-type littermates were used for testing a hypothesis whether AMP-activated protein kinase (AMPK) has a role in the beneficial effects of n-3 LC-PUFAs. Our results show that n-3 LC-PUFA prevent hepatic insulin resistance in an AMPKalfa2-dependent manner and support the role of adiponectin and hepatic diacylglycerols in the regulation of insulin sensitivity. AMPK?2 is also essential for hypolipidemic and antisteatotic effects of n-3 LC-PUFA under insulin-stimulated conditions

Odůvodnění předkladatele:

This article published in the „best journal in the field“ contributes to the knowledge regarding the mechanisms of beneficial effects of dietary omega-3 long-chain polyunsaturated fatty acids (omega-3 PUFA) on insulin sensitivity and lipid metabolism in obesity. Specifically, the involvement of AMP-activated protein kinase (AMPK), which functions as a cellular energy sensor, in the metabolic action of omega-3 PUFA has been analyzed in transgenic mice with a whole-body deletion of the alpha2 catalytic subunit of AMPK and their wild-type littermates fed obesogenic high-fat diet supplemented or not with omega-3 PUFA. By using hyperinsulinemic-euglycemic clamps and lipidomic analyses we showed that omega-3 PUFA prevent hepatic insulin resistance in an AMPK-dependent manner, which is associated with the reduction of hepatic diacylglycerol levels. The results also support the role of insulin-sensitizing hormone adiponectin in the regulation of hepatic insulin sensitivity and suggest that AMPK is essential for the antisteatotic effects of omega-3 PUFA in the liver especially under insulin-stimulated conditions. One of the publications which triggered the 2013 Award by the Minister of Education, Youth and Sports to Jan Kopecky for the studies of the effects of omega-3 fatty acids. Times Cited: 25 in Web of Science Core Collection Impact Factor (2012) - DIABETES: 7,895

Odůvodnění panelu:

Velmi významné studie na zvířecím modelu s důležitými klinickými dopady, publikovaná v prestižním časopisu.

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Brain Structural Signature of Familial Predisposition for Bipolar Disorder: Replicable Evidence For Involvement of the Right Inferior Frontal Gyrus

Hájek, T (corresponding autor); Novák, T; Kopeček, M; Stopková, P; Höschl, C; Alda, M

Identifikátor: **RIV/00216208:11120/13:43906098**

Předkladatel výsledku do Pilíře II.:
Univerzita Karlova v Praze 3. lékařská fakulta

Podíl předkladatele na výsledku: **46 %**

Anotace dle RIV:

To translate our knowledge about neuroanatomy of bipolar disorder (BD) into a diagnostic tool, it is necessary to identify the neural signature of predisposition for BD and separate it from effects of long-standing illness and treatment. Thus, we examined the associations among genetic risk, illness burden, lithium treatment, and brain structure in BD. This is a two-center, replication-design, structural magnetic resonance imaging study. First, we investigated neuroanatomic markers of familial predisposition by comparing 50 unaffected and 36 affected relatives of BD probands as well as 49 control subjects using modulated voxel-based morphometry. Second, we investigated effects of long-standing illness and treatment on the identified markers in 19 youngparticipants early in the course of BD, 29 subjects with substantial burden of long-lasting BD and either minimal lifetime (n = 12), or long-term ongoing (n = 17) lithium treatment. RESULTS: Five groups, including the unaffected and affe

Odůvodnění předkladatele:

This publication is a result of an international collaboration of researchers from the 3rd Faculty of Medicine, Charles University, Prague with Canadian researchers from Dalhousie University, Halifax, University of Toronto, and McGill University, Montreal. The importance of the paper is well documented by the fact that it was selected for the cover page of the January 15 issue of the Biological Psychiatry, one of the leading journals in the field of medicine and psychiatry. The authors performed the very first replication design neuroimaging study in psychiatry and found an enlarged right inferior frontal gyrus (rIFG) in relatives of bipolar probands, regardless of whether they were themselves affected or unaffected with mood disorders. The larger rIFG volume was replicated in both the unaffected as well as affected offspring of bipolar parents from a parallel arm of the study performed in Prague, Czech Republic. Thus, this change may represent a neuroanatomical signature of familial predisposition for bipolar disorders and could aid in early identification of subjects at risk for BD even before any behavioral manifestations develop (Hajek et al., Biological Psychiatry, 2013). The study also illustrated how brain structural changes in BD may result from a dynamic interplay between illness burden and compensatory processes, which may be enhanced by pharmacological treatment.

Odůvodnění panelu:

Velmi kvalitní studie somatických aspektů bipolární psychózy s bezprostředním klinickým dopadem. Výborně napsaný článek ve vynikajícím časopisu.

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Comparison of cardiac surgery with left atrial surgical ablation vs. cardiac surgery without atrial ablation in patients with coronary and/or valvular heart disease plus atrial fibrillation: final results of the PRAGUE-12 randomized multicentre study

Budera, P (corresponding autor); Straka, Z; Osmančík, P; Vaněk, T; Jelínek, Š; Hlavička, J; Fojt, R; Widimský, P

Identifikátor: **RIV/00216208:11120/12:43906577**

Předkladatel výsledku do Pilíře II.:
Univerzita Karlova v Praze 3. lékařská fakulta

Podíl předkladatele na výsledku: **67 %**

Anotace dle RIV:

Aims Surgical ablation procedure can restore sinus rhythm (SR) in patients with atrial fibrillation (AF) undergoing cardiac surgery. However, it is not known whether it has any impact on long-term clinical outcomes.Methods and results This multicentre study randomized 224 patients with AF scheduled for valve and/or coronary surgery: group A (left atrial surgical ablation, n = 117) vs. group B (no ablation, n = 107). The primary efficacy outcome was the SR presence (without any AF episode) during a 24 helectrocardiogram (ECG) after 1 year. The primary safety outcome was the combined endpoint of death/myocardial infarction/stroke/renal failure at 30 days. A Holter-ECG after 1 year revealed SR in 60.2 of group A patients vs. 35.5 in group B (P = 0.002).The combined safety endpoint at 30 days occurred in 10.3 (group A) vs. 14.7 (group B, P = 0.411). All-cause 1-year mortality was 16.2 (A) vs. 17.4 (B, P = 0.800). Stroke occurred in 2.7 (A) vs. 4.3 (B) patients (P = 0.319). No difference

Odůvodnění předkladatele:

The „PRAGUE-12“ is an original academic randomized study, whose theme, design, coordination, realization and publication has been almost completely created and conducted by team of authors from Cardiocentre of the 3rd Faculty of Medicine, Charles University Prague. Co-workers from other hospitals participated in the study just by collecting data (Červinka, P; Hulman, M; Šmíd, M) or by statistical evaluation (Malý, M). The article presents one-year results of prospective, randomized, multicentre study PRAGUE-12, that was assessing the outcome of cardiac surgery with left atrial ablation vs. cardiac surgery alone (without ablation) in patients with coronary and/or valve disease and atrial fibrillation. This is the world largest randomized study dealing with the role of operative surgical ablation (MAZE) for atral fibrillation. The main findings were: 1) surgical ablation is effective in restoration and persistence of sinus rhythm when compared to control group, 2) adding ablation to standard cardiac surgical procedures is safe and does not increase a rate of perioperative complications, but also 3) that firts year of follow up did not show any significant clinical benefit for patients after ablation (i.e. there was no significant difference in serious clinical complications rates). The PRAGUE-12 is the largest prospective randomized study conducted up to now that is focused on this topic. It presents a very clear data about efficacy and mainly about safety of surgical ablation of atrial fibrillation – arrhythmia, that is called „the epidemic of the new millenium“ for its increasing incidence and also a great risk of serious complications. The results were presented in the „Hot Lines Clinical Trials“ (the most prestigious section of European Congress of Cardiology) and the authors of the study were nominated for a lot of other awards.

Odůvodnění panelu:

Vynikající, mezinárodně významné výsledky klinické studie provedené výlučně českou výzkumnou skupinou, publikované ve skvělém časopisu.

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Core/Shell Nanofibers with Embedded Liposomes as a Drug Delivery System

Míčková, Andrea; Buzgo, Matej; Rampichová, Michala; Filová, Eva; Amler, Evžen

Identifikátor: **RIV/68378041:_____/12:00377767**

Předkladatel výsledku do Pilíře II.:
Ústav experimentální medicíny AV ČR, v. v. i.

Podíl předkladatele na výsledku: **38 %**

Anotace dle RIV:

We produced 2 different nanofiber-liposome systems in the present study: liposomes blended within nanofibers and core/shell nanofibers with embedded liposomes. We demonstrate that blend electrospinning does not conserve intact liposomes in contrast to coaxial electrospinning which enables the incorporation of liposomes into nanofibers. We report polyvinyl alcohol-core/poly-?-caprolactone-shell nanofibers with embedded liposomes and show that they preserve the enzymatic activity of encapsulated horseradish peroxidase. The potential of this system was also demonstrated by the enhancement of mesenchymal stem cell proliferation.

Odůvodnění předkladatele:

The broader application of liposomes in regenerative medicine is hampered by their short half-life and inefficient retention at the site of application. These disadvantages could be significantly reduced by their combination with nanofibers. We produced 2 different nanofiber-liposome systems in the present study, that is, liposomes blended within nanofibers and core/shell nanofibers with embedded liposomes. Herein, we demonstrate that blend electrospinning does not conserve intact liposomes. In contrast, coaxial electrospinning enables the incorporation of liposomes into nanofibers. We report polyvinyl alcohol-core/poly-?-caprolactone-shell nanofibers with embedded liposomes and show that they preserve the enzymatic activity of encapsulated horseradish peroxidase. The potential of this system was also demonstrated by the enhancement of mesenchymal stem cell proliferation. In conclusion, intact liposomes incorporated into nanofibers by coaxial electrospinning are very promising as a drug delivery system.

Odůvodnění panelu:

Mimořádně kvalitní výsledky originálního farmaceutického výzkumu s výborným publikačním výstupem.

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

C-terminal phosphorylation of Hsp70 and Hsp90 regulates alternate binding to co-chaperones CHIP and HOP to determine cellular protein folding/degradation balances

Petr Müller, Eva Růčková, Roman Hrstka, Bořivoj Vojtěšek

Identifikátor: **RIV/00209805:_____/13:#0000417**

Předkladatel výsledku do Pilíře II.:
Masarykův onkologický ústav

Podíl předkladatele na výsledku: **90 %**

Anotace dle RIV:

Heat shock proteins Hsp90 and Hsp70 facilitate protein folding but can also direct proteins for ubiquitin-mediated degradation. The mechanisms regulating these opposite activities involve Hsp binding to co-chaperones including CHIP and HOP at their C-termini. We demonstrated that the extreme C-termini of Hsp70 and Hsp90 contain phosphorylation sites targeted by kinases including CK1, CK2 and GSK3-b in vitro. The phosphorylation of Hsp90 and Hsp70 prevents binding to CHIP and thus enhances binding to HOP. Highly proliferative cells contain phosphorylated chaperones in complex with HOP and phospho-mimetic and non-phosphorylable Hsp mutant proteins show that phosphorylation is directly associated with increased proliferation rate. We also demonstrate thatprimary human cancers contain high levels of phosphorylated chaperones and show increased levels of HOP protein and mRNA. These data identify C-terminal phosphorylation of Hsp70 and Hsp90 as a switch for regulating co-chaperone binding a

Odůvodnění předkladatele:

It is well known that Hsp90 is selectively activated in human cancer and that cancer cells become addicted to increased chaperoning activity, such that cancers can be effectively and selectively treated with agents that inhibit Hsp90. We have identified that a key mechanism for the dynamic regulation of chaperone activity is C-terminal phosphorylation, which regulates binding to co-chaperones that either fold (HOP) or degrade client proteins (CHIP). These co-chaperones are themselves regulated, such that replicating tumour cells possess a dominant pro-folding environment and non-proliferating cells exhibit a dominant protein degradation phenotype. These are the first data to demonstrate C-terminal phosphorylation of Hsp90 and Hsp70 and identify this as the mechanism by which chaperone function toggles between protein folding and degradation. The findings provide the basis for the rational design of therapies that target the protein folding machinery of cancer cells by exploiting the abnormal activation of a dominant pro-folding environment. In particular, individualized strategies can be designed that combine inhibitors of the tumor-specific abnormalities in Hsp90/HOP folding activity whilst enhancing CHIP levels to restore a balanced regulation of protein stability. Moreover, the detection of c-terminal phosphorylation of Hsp70 and Hsp90 can be also exploited in prediction of sensitivity of cancers to Hsp90 inhibitors that are currently tested in numerous clinical trials. Finally, the data provide a framework both for understanding normal protein homeostasis and the disruptions that occur to chaperone activity in cancer, and allow for the identification of novel chemotherapies that can restore the normal balance of protein folding/degradation in cancer.

Odůvodnění panelu:

Velmi kvalitní původní práce o molekulární patogenezi s významnými klinickými důsledky, publikovaná ve výborném časopisu.

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Dynamics of T-cell infiltration during the course of ovarian cancer: The gradual shift from a Th17 effector cell response to a predominant infiltration by regulatory T-cells

Brtnický, Tomáš; Kocián, Petr; Rob, Lukáš; Bartůňková, Jiřina; Špíšek, Radek

Identifikátor: **RIV/00064203:_____/13:10193840**

Předkladatel výsledku do Pilíře II.:
Fakultní nemocnice v Motole

Podíl předkladatele na výsledku: **40 %**

Anotace dle RIV:

The type of immune cells that are present within the tumor microenvironment can play a crucial role in the survival of patients. However, little is known about the dynamics of the tumor-infiltrating immune cells during disease progression. We studied theimmune cells that infiltrated the tumor tissues of ovarian cancer patients at different stages of disease. The early stages of development of ovarian carcinomas were characterized by a strong Th17 immune response, whereas in stage II patients, recruitment of high numbers of Th1 cells was observed. In disseminated tumors (Stages III-IV), we detected a dominant population of Helios 1 activated regulatory T cells (Tregs) along with high numbers of monocytes/macrophages and myeloid dendritic cells (mDCs).Tumor-infiltrating Tregs had markedly lower expression of CCR4 than circulating Tregs, and the numbers of tumor-infiltrating Tregs significantly correlated with the levels of CCL22 in ovarian tumor cell culture supernatants, suggesting th

Odůvodnění předkladatele:

This article represents one of the major scientific achivements of Motol University Hospital. The work inititated in the Department of Immunology investigated a role of dendritic cells in tumors, particularly prostate and ovarian carcinoma. Longtime and complex investigation of dendritic cells resulted in a development of dendritic cells based vaccine against cancer. Based on these discoveries a vaccine for preclinical and later for clinical testing was developped and further manufactured by a biotechnological company. The project and clinical trilas are still ongoing, its original foundation was in brief published here: FOCUS on FOCIS: combined chemo-immunotherapy for the treatment of hormone-refractory metastatic prostate cancer. Clin Immunol. 2009 Apr;131(1):1-10.

Odůvodnění panelu:

Významný výstup onkologického výzkumu, který byl publikován ve velmi kvalitním časopisu.

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Effect of natalizumab on clinical and radiological disease activity in multiple sclerosis: a retrospective analysis of the Natalizumab Safety and Efficacy in Relapsing-Remitting Multiple Sclerosis (AFFIRM) study

Eva Havrdová

Identifikátor: **RIV/00216208:11110/09:3950**

Předkladatel výsledku do Pilíře II.:
Univerzita Karlova v Praze 1. lékařská fakulta

Podíl předkladatele na výsledku: **25 %**

Anotace dle RIV:

The efficacy of natalizumab on clinical and radiological measures in the phase III Natalizumab Safety and Efficacy in Relapsing-Remitting Multiple Sclerosis (AFFIRM) study has prompted the investigation of whether natalizumab can increase the proportion of patients with relapsing-remitting multiple sclerosis who do not have disease activity.0

Odůvodnění předkladatele:

Formation of the "disease-free" concept (long-term remission without clinical or radiological signs of disease activity) is a crucial contribution for evaluating the treatment effect in multiple sclerosis (MS). Through intensive therapeutic regimen (natalizumab) there was for the first time in relapsing multiple sclerosis long-term remission reached when patient has no attacks, no progression of disability and no new or gadolinium-enhancing lesions on MRI. This concept has been accepted worldwide, and the effect of all new immunomodulatory drugs has been evaluated according to this concept.

Odůvodnění panelu:

Mezinárodní multicentrická studie o léčbě roztroušené sklerózy, koordinovaná českými autory s prioritními výsledky a přímým klinickým významem. Publikována ve vynikajícím časopise.

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Effect of natalizumab on clinical and radiological disease activity in multiple sclerosis: a retrospective analysis of the Natalizumab Safety and Efficacy in Relapsing-Remitting Multiple Sclerosis (AFFIRM) study

Havrdová Eva

Identifikátor: **RIV/00064165:_____/09:3950**

Předkladatel výsledku do Pilíře II.:
Všeobecná fakultní nemocnice v Praze (nerozlišená součást)

Podíl předkladatele na výsledku: **25 %**

Anotace dle RIV:

The efficacy of natalizumab on clinical and radiological measures in the phase III Natalizumab Safety and Efficacy in Relapsing-Remitting Multiple Sclerosis (AFFIRM) study has prompted the investigation of whether natalizumab can increase the proportion of patients with relapsing-remitting multiple sclerosis who do not have disease activity.0

Odůvodnění předkladatele:

Formation of the "disease-free" concept (long-term remission without clinical or radiological signs of disease activity) is a crucial contribution for evaluating the treatment effect in multiple sclerosis (MS). Through intensive therapeutic regimen (natalizumab) there was for the first time in relapsing multiple sclerosis long-term remission reached when patient has no attacks, no progression of disability and no new or gadolinium-enhancing lesions on MRI. This concept has been accepted worldwide, and the effect of all new immunomodulatory drugs has been evaluated according to this concept.

Odůvodnění panelu:

Mezinárodní multicentrická studie o léčbě roztroušené sklerózy, koordinovaná českými autory s prioritními výsledky a přímým klinickým významem. Publikována ve vynikajícím časopise.

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Effect of prophylactic paracetamol administration at time of vaccination on febrile reactions and antibody responses in children: two open-label, randomised controlled trials

PRYMULA Roman - garant výsledku; CHLÍBEK Roman; VACKOVÁ Marie; SMETANA Jan

Identifikátor: **RIV/60162694:G44__/09:00002199**

Předkladatel výsledku do Pilíře II.:
Ministerstvo obrany Univerzita obrany - Fakulta vojenského zdravotnictví Hradec Králové

Podíl předkladatele na výsledku: **80 %**

Anotace dle RIV:

Although fever is part of the normal inflammatory process after immunisation, prophylactic antipyretic drugs are sometimes recommended to allay concerns of high fever and febrile convulsion. We assessed the effect of prophylactic administration of paracetamol at vaccination on infant febrile reaction rates and vaccine responses.

Odůvodnění předkladatele:

There are unique evaluation results of the effect of prophylactic paracetamol administration in children before vaccination. The study has proven that prophylactic paracetamol administration decreases the antibody response to vaccination against pneumococci, diphtheria, tetanus and pertussis. The geometric mean of specific IgG antibody concentrations was significantly lower in the follow-up group with paracetamol in comparison with the control group. Until then, paracetamol had been administered in many countries just before vaccination as a prevention of potential development of febrile reactions. The study results showed on one hand the decrease of febrile reactions after vaccination and on the other hand the decrease of the specific antibody response. The proposals following this study were adopted that paracetamol administration in children before vaccination should not be routinely recommended. The work gained worldwide scientific acceptance and by the present day it has been cited totally 86 times according to the WoS, and the H-index of the main author is 15. IF – 39.060.

Odůvodnění panelu:

Vynikající randomizovaná kontrolovaná vakcinační studie koordinovaná českými autory a publikovaná ve výborném časopisu.

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Effects of Human C-Reactive Protein on Pathogenesis of Features of the Metabolic Syndrome

Pravenec, Michal (corresponding author) - Zídek, Václav - Landa, Vladimír - Mlejnek, Petr- Šimáková, Miroslava - Šilhavý, Jan

Identifikátor: **RIV/67985823:_____/11:00358902**

Předkladatel výsledku do Pilíře II.:
Fyziologický ústav AV ČR, v. v. i.

Podíl předkladatele na výsledku: **50 %**

Anotace dle RIV:

We sought to investigate whether increased levels of human CRP, per se, can promote increases in blood pressure and disturbances in glucose and lipid metabolism characteristic of the metabolic syndrome. To accomplish this goal, we transgenically expressed human CRP in the spontaneously hypertensive rat (SHR) and found that that increased CRP is more than just a marker of inflammation and can directly promote multiple features of the metabolic syndrome

Odůvodnění předkladatele:

It is still an enigma whether the increase in CRP contributes to the pathogenesis of metabolic syndrome, per se, or is a secondary response to inflammation in this disease state. In this regard, we demonstrated increases in blood pressure, insulin resistance, microalbuminuria, and plasma triglyceride and reduced serum adiponectin in the SHRs in which human CRP was transgenically expressed in the liver under control of the apolipoprotein E promoter. This transgenic rat showed enhanced inflammation and oxidative stress. This kind of analysis is crucial in terms of investigating the actual roles of CRP, and inflammation generally, in the pathogenesis of metabolic disorders with elevated blood pressure. The important role of inflammation is further supported by testing anti-inflammatory effects of drugs such as rosuvastatin or fumaric acid esters: treatment of SHR-CRP transgenic rats was associated with reduced inflammation, amelioration of metabolic disturbances and hypertension (Šilhavý et al. Rosuvastatin can block pro-inflammatory actions of transgenic human C-reactive protein without reducing its circulating levels, Cardiovasc Ther 32:59-65, 2014; Šilhavý et al. Fumaric acid esters can block pro-inflammatory actions of human CRP and ameliorate metabolic disturbances in transgenic spontaneously hypertensive rats, Plos One, 2014, in press). Times Cited: 18 in Web of Science Core Collection Impact Factor (2012) - HYPERTENSION: 6,873

Odůvodnění panelu:

Pozoruhodné výsledky metabolického výzkumu, publikované ve velmi kvalitním časopisu.

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Fertility-sparing surgery in patients with cervical cancer

Lukáš Rob, Petr Škapa, Helena Robová

Identifikátor: **RIV/00216208:11130/11:6963**

Předkladatel výsledku do Pilíře II.:
Univerzita Karlova v Praze 2. lékařská fakulta

Podíl předkladatele na výsledku: **100 %**

Anotace dle RIV:

There are several types of fertility saving procedures that can be done in patients with cervical cancer, which differ in terms of surgical approach and extent of paracervical resection. This review assesses oncological and pregnancy results after different procedures. The oncological results of vaginal radical trachelectomies (VRT) and abdominal radical trachelectomies (ART) are similar for tumours less than 2 cm in size, and are now considered safe surgical procedures. Oncological outcomes of VRT and ART in tumours larger than 2 cm are also identical, but the results cannot be considered satisfactory. Preliminary findings of less radical procedures (ie, deep cone and simple trachelectomy) in patients with tumours less than 2 cm, and negative sentinel and other pelvic lymph nodes, are comparable with the results of VRT and ART Downstaging tumours larger than 2 cm by neoadjuvant chemotherapy is still an experimental procedure and will need multicentre cooperation to verify its oncological safety. Pregnancy results vary statistically with the different methods.0

Odůvodnění předkladatele:

The publication of the "Review Article" in the most prestigious journal in the group focused on oncological gynecology from the authors of Department of Obstetrics and Gynaecology, all authors are from the 2nd Medical Faculty of Charles University.

Odůvodnění panelu:

Výborné výsledky vlastních studií ve formě souborného článku, publikované ve vynikajícím časopisu, s plně českým autorstvím.

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Fibrinopeptides A and B release in the process of surface fibrin formation.

Riedel, Tomáš - Suttnar, Jiří - Dyr, Jan Evangelista

Identifikátor: **RIV/00023736:_____/11:00008863**

Předkladatel výsledku do Pilíře II.:
Ústav hematologie a krevní transfúze

Podíl předkladatele na výsledku: **65 %**

Anotace dle RIV:

Fibrinogen adsorption on a surface results in the modification of its functional characteristics. The release of fibrinopeptides from surface-adsorbed fibrinogen and from surface bound fibrinogen-fibrin complexes differed significantly, when compared tothat from fibrinogen in solution. The release of FpB occurred without the delay (lag-phase) characteristic for its release from fibrinogen in solution. The amount of FpB released from "end-on" adsorbed fibrinogen and from adsorbed fibrinogen-fibrin complexes was much higher than that of FpA.

Odůvodnění předkladatele:

Supplement KV04 see Vysledek1.zip

Odůvodnění panelu:

Velmi významná studie s publikací ve vysoce impaktovaném časopisu.

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Heart Failure with Preserved Ejection Fraction in Outpatients with Unexplained Dyspnea a Pressure-Volume Loop Analysis

Trakalová, H.; Hrabáková, H.; Marušková, M; Karásek, J; Kočka, V

Identifikátor: **RIV/00216208:11120/10:00002435**

Předkladatel výsledku do Pilíře II.:
Univerzita Karlova v Praze 3. lékařská fakulta

Podíl předkladatele na výsledku: **71 %**

Anotace dle RIV:

The aim of the present study was to diagnose heart failure with preserved ejection fraction (HFPEF) in outpatients with unexplained chronic dyspnea and to elucidate its underlying mechanisms in this population using invasive pressure-volume loop analysis. The diagnosis of HFPEF in stable outpatients with unexplained dyspnea is difficult. A significant proportion of stable outpatients with unexplained chronic dyspnea may have HFPEF. In the patients whom we studied, increased LV stiffness, dyssynchrony, and dynamic mitral regurgitation were the major mechanisms underlying development of HFPEF.

Odůvodnění předkladatele:

Extremely interesting and really original work applying clinical physiology methods to examine the mechanisms of dyspnoe and heart failure with preserved ejection fraction of left ventricle. Selected patients with this clinical picture underwent left and right heart catheterization including thermodilution and coronary angiography. Simultaneously, invasive pressure-volume loops and echocardiography were performed, both under resting conditions and during different hemodynamic conditions (afterload/preload/contractility). These measurements allowed very precise separation of cardiac and non-cardiac causes of symptoms, increased left ventricle end-diastolic pressure was present at 66% of patients and possible causes are thoroughly analysed.

Odůvodnění panelu:

Vynikající výsledky výzkumu výlučně české výzkumné skupiny, publikované ve velmi významném časopisu.

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Hippo/Mst1 stimulates transcription of the proapoptotic mediator NOXA in a FoxO1-dependent manner

Karel Valis, Jaromira Chladova, Jakub Rohlena, Jaroslav Truksa, Jiri Neuzil

Identifikátor: **RIV/86652036:_____/11:00358947**

Předkladatel výsledku do Pilíře II.:
Biotechnologický ústav AV ČR, v. v. i.

Podíl předkladatele na výsledku: **80 %**

Anotace dle RIV:

Previous studies of the cytotoxic effects of alpha-tocopheryl succinate (alpha-TOS) on cancer cells identified a mechanism whereby alpha-TOS caused apoptosis requiring the Noxa-Bak axis. In the present study, ab initio analysis revealed a conserved FoxO-binding site in the NOXA promoter, and specific affinity of FoxO proteins to this site was confirmed by fluorescence anisotropy. FoxO1 and FoxO3a proteins accumulated in the nucleus of alpha-TOS-treated cells, and the specific FoxO1 association with theNOXA promoter and its activation were validated by chromatin immunoprecipitation. Using siRNA knockdown, a specific role for the FoxO1 protein in activating NOXA transcription was identified. The proapoptotic kinase Hippo/Mst1 was found to be strongly activated by alpha-TOS, and inhibiting Hippo/Mst1 by specific siRNA prevented phosphorylation of FoxO1 and its nuclear translocation. Thus, alpha-TOS induce apoptosis by a mechanism involving the Hippo/Mst1-FoxO1-Noxa pathway

Odůvodnění předkladatele:

The proapoptotic protein Noxa, a member of the BH3-only Bcl-2 protein family, can effectively induce apoptosis in cancer cells, although the relevant regulatory pathways have been obscure. Previous studies of the cytotoxic effects of alpha-tocopheryl succinate (alpha-TOS) on cancer cells identified a mechanism whereby alpha-TOS caused apoptosis requiring the Noxa-Bak axis. In the present study, ab initio analysis revealed a conserved FoxO-binding site (DBE; DAF-16 binding element) in the NOXA promoter, and specific affinity of FoxO proteins to this DBE was confirmed by fluorescence anisotropy. FoxO1 and FoxO3a proteins accumulated in the nucleus of alpha-TOS-treated cells, and the drug-induced specific FoxO1 association with the NOXA promoter and its activation were validated by chromatin immunoprecipitation. Using siRNA knockdown, a specific role for the FoxO1 protein in activating NOXA transcription in cancer cells was identified. Furthermore, the proapoptotic kinase Hippo/Mst1 was found to be strongly activated by alpha-TOS, and inhibiting Hippo/Mst1 by specific siRNA prevented phosphorylation of FoxO1 and its nuclear translocation, thereby reducing levels of NOXA transcription and apoptosis in cancer cells exposed to alpha-TOS. Thus, we have demonstrated that anticancer drugs, exemplified by alpha-TOS, induce apoptosis by a mechanism involving the Hippo/Mst1-FoxO1-Noxa pathway. We propose that activation of this pathway provides a new paradigm for developing targeted cancer treatments.

Odůvodnění panelu:

Vynikající výzkumná studie výhradně českého výzkumného týmu, publikovaná ve vysoce impaktovaném časopisu.

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Human Tumor Cells Killed by Anthracyclines Induce a Tumor-Specific Immune Response

Jitka Fučíková, Petra Králíková, Anna Fialová, Tomáš Brtnický, Lukáš Rob, Jiřina Bartůňková, Radek Špíšek

Identifikátor: **RIV/00216208:11130/11:7037**

Předkladatel výsledku do Pilíře II.:
Univerzita Karlova v Praze 2. lékařská fakulta

Podíl předkladatele na výsledku: **100 %**

Anotace dle RIV:

Immunogenic cell death is characterized by the early surface exposure of chaperones including calreticulin and HSPs, which affect dendritic cell (DC) maturation and the uptake and presentation of tumor antigens. It has also been shown that it is characterized by the late release of high mobility group box 1 (HMGB1), which acts through Toll-like receptor 4 (TLR4) and augments the presentation of antigens from dying tumor cells to DCs. Most of the data on immunogenic tumor cell death were obtained using mouse models. In this study, we investigated the capacity of clinically used chemotherapeutics to induce immunogenic cell death in human tumor cell lines and primary tumor cells. We found that only anthracyclines induced a rapid translocation of calreticulin, HSP70, and HSP90 to the cell surface and the release of HMGB1 12 hours after the treatment. The interaction of immature DCs with immunogenic tumor cells led to an increased tumor cell uptake and induces moderate phenotypic maturation of DCs. Killed tumor cell-loaded DCs efficiently stimulated tumor-specific IFN-gamma-producing T cells. DCs pulsed with killed immunogenic tumor cells also induced significantly lower numbers of regulatory T cells than those pulsed with nonimmunogenic tumor cells. These data indicate that human prostate cancer, ovarian cancer, and acute lymphoblastic leukemia cells share the key features of immunogenic cell death with mice tumor cells. These data also identify anthracyclines as anticancer drugs capable of inducing immunogenic cell death in sensitive human tumor cells. Cancer Res; 71(14); 4821-33. (C) 2011 AACR.0

Odůvodnění předkladatele:

Original scientific results of the working group the Department of Immunology focused on tumor immunology. Long-term high-quality publication copyright proportion of scientists 2nd Faculty of Medicine, Charles University, published in quality journals of the field of immunology.

Odůvodnění panelu:

Výborné výsledky české výzkumné skupiny, publikované ve vysoce impaktovaném časopisu.

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Identification of expanded-criteria donor kidney grafts at lower risk of delayed graft function

Baláž Peter, Rokošný Slavomír, Wohlfahrtová Mariana, Wohlfahrt Peter, Bartoňová Anastázie, Pokorná Eva, Honsová Eva, Viklický Ondřej

Identifikátor: **RIV/00023001:_____/13:00058691**

Předkladatel výsledku do Pilíře II.:
Institut klinické a experimentální medicíny

Podíl předkladatele na výsledku: **95 %**

Anotace dle RIV:

Background. Organ shortage leads to the increased use of expanded-criteria donor (ECD) kidneys, which contribute to a higher risk of delayed graft function (DGF) after transplantation. The aim of this study was to determine factors that may better predict the risk of DGF. Methods. Histologic assessments of donor renal biopsy were used with other clinical variables to predict the risk of DGF after kidney transplantation. The total Banff score equaled the sum of interstitial fibrosis (CI), tubular atrophy, arteriolar hyaline thickening, fibrous intimal thickening (CV), and fraction of sclerotized glomeruli. Results. In total, 126 of 344 patients developed DGF after kidney transplantation. The histologic score for CI, tubular atrophy, and CV and the totalBanff score were increased in patients with DGF. Only CI and CV were independent predictors of DGF (PG0.01). A CIV score (CI+CV; odds ratio, 2.68; 95% confidence interval, 1.55Y4.66; PG0.001) was superior to the combination of the total

Odůvodnění předkladatele:

Organ shortage leads to the increased use of expanded-criteria donor (ECD) kidneys, which contribute to a higher risk of delayed graft function (DGF) after transplantation. The aim of this study was to determine factors that may better predict the risk of DGF what is very important in current kidney transplantation program. The main conclusion of the present study was that composite CIV score better identifies ECD kidneys with a lower risk of developing DGF and morphologic evaluation of ECD kidneys and donor characteristics may improve kidney allocation.

Odůvodnění panelu:

Originální výsledky českého transplantologického výzkumu, publikované ve vysoce impaktovaném časopisu.

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Lipolytic effects of B-type natriuretic peptide (1-32) in adipose tissue of heart failure patients compared with healthy controls

Polák, J; Wedellová, Z

Identifikátor: **RIV/00216208:11120/11:00003376**

Předkladatel výsledku do Pilíře II.:
Univerzita Karlova v Praze 3. lékařská fakulta

Podíl předkladatele na výsledku: **25 %**

Anotace dle RIV:

Our goal was to examine the role of B-type natriuretic peptide (BNP) in lipolysis regulation in heart failure (HF) patients. Enhanced adipose tissue lipolysis can contribute to myocardial lipid overload, insulin resistance, and cachexia in advanced HF. Natriuretic peptides were recently recognized to stimulate lipolysis in healthy subjects. 10 nondiabetic HF patients (New York Heart Association functional class III, 50% nonischemic etiology) and 13 healthy subjects (control subjects) of similar age, sex, and body composition underwent a microdialysis study of subcutaneous abdominal adipose tissue. Four microdialysis probes were simultaneously perfused with 0.1 mu M BNP(1-32), 10 mu M BNP(1-32), 10 mu M norepinephrine (NE) or Ringer's solution. Outgoingdialysate glycerol concentration (DGC) was measured as an index of lipolysis. BNP(1-32) exerts strong lipolytic effects in humans. Despite marked elevation of plasma immunoreactive BNP, the responsiveness of adipose tissue to BNP(1-32) i

Odůvodnění předkladatele:

Patients suffering from advanced heart failure typically exhibit elevated levels of plasam BNP (brain natriuretic peptide) levels. This study demonstrated strong lipolytic effect of BNP in adipose tissue of these patiens, which might contribute to cachexia development, cardiotoxicity and heart failure progression. Experimental work and lipolysis investigation procedures were performed at the Third Faculty of Medicine. Protocol of lipolytic studies was developed and subsequently executed by authors from the Third Faculty of Medicine. Collaborators and co-authors from IKEM (Institute of Clinical and Experimental Medicine) contributed substantially to the study as they performed patient identification and recruitment as well as all clinical assessments of research. study subjects including echocardiography, body composition analysis and biochemical parameters determination. The work has been published in one of the leading cardiology journal with a high impact factor and accompannied by an editorial written by a recognized expert in myocardial metabolism. The work has been awarded the Czech cardiology society award „The best in Czech cardiology 2011“. In our opinion, one of the most important aspects represented by this work is a fruitful cross-specialty and cross-institutional colaboration as well as the involvement of PhD students into cutting-edge.

Odůvodnění panelu:

Výborná multicentrická studie koordinovaná českou výzkumnou skupinou, mimořádný přínos kardiologickému výzkumu a vysoce impaktovaná publikace.

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Low circulating Dickkopf-1 and its link with severity of spinal involvement in diffuse idiopathic skeletal hyperostosis

Ladislav Šenolt, Olga Kryštufková, Šárka Forejtová, Lucie Andrés Cerezo, Jindřiška Gatterová, Karel Pavelka, Jiří Vencovský

Identifikátor: **RIV/00216208:11110/12:12738**

Předkladatel výsledku do Pilíře II.:
Univerzita Karlova v Praze 1. lékařská fakulta

Podíl předkladatele na výsledku: **47 %**

Anotace dle RIV:

Dickkopf-1 (DKK-1) is an inhibitor of osteoblastogenesis, and its lower levels are linked to new bone formation. We have found that the levels of serum DKK-1 were significantly lower in patients with DISH than in healthy controls and were associated with more severe spinal involvement.0

Odůvodnění předkladatele:

Diffuse idiopathic skeletal hyperostosis (DISH) is a common disorder among older adults and is characterised by back pain, new bone formation, calcification and ossification of the anterior longitudinal ligament of the spine. Dickkopf-1 (DKK-1) is recognised as a key regulator of bone remodelling by inhibition of the Wnt signalling required for new bone formation. The cause of the disease is however not completely understood. Therefore we explored DKK-1's association with the severity of spinal involvement in DISH. We were the first to identify that total serum DKK-1 levels were significantly lower in patients with DISH than in healthy controls and importantly, that low serum levels of DKK-1 were associated with more severe spinal involvement in DISH. These observations indicate that DKK-1 may play a significant role in bone formation during DISH and may become potential target for this disease.

Odůvodnění panelu:

Vynikající výsledky české výzkumné skupiny, publikované ve velmi kvalitním časopisu.

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Missense mutations located in structural p53 DNA-binding motifs are associated with extremely poor survival in Chronic lymphocytic leukemia

Trbušek Martin, Šmardová Jana, Malčíková Jitka, Šebejová Ludmila, Svitáková Miluše, Mráz Marek, Skuhrová Francová Hana, Doubek Michael, Brychtová Yvona, Kuglík Petr, Pospíšilová Šárka, Mayer Jiří, Vránová Vladimíra

Identifikátor: **RIV/65269705:____/11:#0001301**

Předkladatel výsledku do Pilíře II.:
Fakultní nemocnice Brno (nerozlišená součást)

Podíl předkladatele na výsledku: **46 %**

Anotace dle RIV:

Purpose There is a distinct connection between TP53 defects and poor prognosis in chronic lymphocytic leukemia (CLL). It remains unclear whether patients harboring TP53 mutations represent a homogenous prognostic group. Patients and Methods We evaluatedthe survival of patients with CLL and p53 defects identified at our institution by p53 yeast functional assay and complementary interphase fluorescence in situ hybridization analysis detecting del(17p) from 2003 to 2010.

Odůvodnění předkladatele:

The study analyzing an impact of distinct p53 mutations in patients with chronic lymphocytic leukemia utilized a unique patients´ cohort, both concerning its size and its detailed genetic characterization. The importance of the obtained research outputs is primarily obvious through the corresponding publication in the Journal of Clinical Oncology having the impact factor 18,038 and 2,5th top percentile in the field of Oncology. The importance of the study is also underlined by its publishing in the journal intended for oncology in general, which shows that its impact is not limited to hematological malignancies but exceeds to other cancers as well. This probably reflects the fact that principal observation made within the study (i.e. particular mutations may change p53 to oncoprotein), has been predicted formerly using experimental systems derived from solid tumors and has been confirmed after that through few studies (including ours) having privilege to analyze large samples´ collection from real clinical practice. We believe that, in addition to current importance for patients´ prognosis, our results may become in long-term perspective also important towards targeted therapy, as activated oncogenes (like mutated p53 in this case) seems to be key element supporting cancer cells´ proliferation and survival.

Odůvodnění panelu:

Velmi kvalitní výsledky českého výzkumu o genetických aspektech leukémie, publikované v časopisu s vysokým faktorem impaktu. Výzkum může mít přímý klinický význam.

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Missense mutations located in structural p53 DNA-binding motifs are associated with extremely poor survival in Chronic lymphocytic leukemia

TRBUŠEK, Martin, Jana ŠMARDOVÁ, Jitka MALČÍKOVÁ, Ludmila ŠEBEJOVÁ, Petr DOBEŠ, Miluše SVITÁKOVÁ, Vladimíra VRANOVÁ, Marek MRÁZ, Hana SKUHROVÁ FRANCOVÁ, Michael DOUBEK, Yvona BRYCHTOVÁ, Petr KUGLÍK, Šárka POSPÍŠILOVÁ a Jiří MAYER

Identifikátor: **RIV/00216224:14740/11:00052704**

Předkladatel výsledku do Pilíře II.:
Masarykova univerzita Středoevropský technologický institut

Podíl předkladatele na výsledku: **46 %**

Anotace dle RIV:

Purpose There is a distinct connection between TP53 defects and poor prognosis in chronic lymphocytic leukemia (CLL). It remains unclear whether patients harboring TP53 mutations represent a homogenous prognostic group. Patients and Methods We evaluatedthe survival of patients with CLL and p53 defects identified at our institution by p53 yeast functional assay and complementary interphase fluorescence in situ hybridization analysis detecting del(17p) from 2003 to 2010.

Odůvodnění předkladatele:

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Odůvodnění panelu:

Velmi kvalitní výsledky českého výzkumu o genetických aspektech leukémie, publikované v časopisu s vysokým faktorem impaktu. Výzkum může mít přímý klinický význam.

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Molecular phenotypes of acute rejection predict kidney graft prognosis

Viklický Ondřej, Hřibová Petra, Volk H. D, Slatinská Janka, Petrášek Jan, Bandúr Štěpán, Honsová Eva, Reinke Petra

Identifikátor: **RIV/00023001:_____/10:00002177**

Předkladatel výsledku do Pilíře II.:
Institut klinické a experimentální medicíny

Podíl předkladatele na výsledku: **95 %**

Anotace dle RIV:

These data suggest that severe antibody-mediated rejection and T cell-mediated rejection result in graft loss by distinct mechanisms. Molecular phenotypes of early acute rejection might help to identify grafts with poor prognosis, allowing earlier application of additional therapies.

Odůvodnění předkladatele:

In this study, distinct molecular phenotypes of early kidney graft rejection were determined. Higher intrarenal expression of CD20 were associated with better outcome of both, T cell- and antibody mediated rejections.

Odůvodnění panelu:

Výborné výsledky české transplantační medicíny, publikované ve vynikajícím časopisu.

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Monoallelic and biallelic inactivation of TP53 gene in chronic lymphocytic leukemia: selection, impact on survival, and response to DNA damage.

Jana ŠMARDOVÁ, Boris TICHÝ, Vladimíra VRANOVÁ, Miluše SVITÁKOVÁ, Michael DOUBEK, Martin KLABUSAY, Jiří MAYER

Identifikátor: **RIV/00216224:14110/09:00038032**

Předkladatel výsledku do Pilíře II.:
Masarykova univerzita Lékařská fakulta

Podíl předkladatele na výsledku: **39 %**

Anotace dle RIV:

Deletion of TP53 gene, under routine assessment by fluorescence in situ hybridization analysis, connects with the worst prognosis in chronic lymphocytic leukemia (CLL). The presence of isolated TP53 mutation (without deletion) is associated with reducedsurvival in CLL patients. It is unclear how these abnormalities are selected and what their mutual proportion is. We used methodologies with similar sensitivity for the detection of deletions (interphase fluorescence in situ hybridization) and mutations(yeast functional analysis) and analyzed a large consecutive series of 400 CLL patients; a subset of p53-wild-type cases (n = 132) was screened repeatedly during disease course. The most common type of TP53 inactivation, ie, mutation accompanied by deletion of the remaining allele, occurred in 42 patients (10.5%). Among additional defects, the frequency of the isolated TP53 mutation (n = 20; 5%) and the combination of 2 or more mutations on separate alleles (n = 5; 1.

Odůvodnění předkladatele:

This published work represents an important achievement in the field of chronic lymphocytic leukemia (CLL) translational research. In this study, we documented the clear negative impact of mutations in tumor-suppressor geneTP53 both on patients' cells behaviour in vitro on and on patient´s prognosis in vivo. Therefore we provided the evidence for the importance of TP53 mutational status examination in CLL patients. Our study together with observations published by other groups resulted in implementation of TP53 mutational analysis in addition to routinely used cytogenetic analysis in the recommendations for CLL patients´ management published in the year 2012. Thus our study has a direct impact on clinical practice and the results of our work are utilized widely. We also described the clonal evolution of TP53 defects during the course of the disease and showed for a first time a clear relationship between therapy intervention and TP53 mutations´ occurrence. This is an important observation with unambiguous impact on patients´ outcome that provided a basis for other ongoing studies. The significance of the study is reflected by the number of citations. Scientometric evaluation: • IF factor (2009): 10.555 • times cited: 47 • high visibility journals citing this work: LEUKEMIA LYMPHOMA (7x); BLOOD (4x); JOURNAL OF CLINICAL ONCOLOGY (3x) • percentile: 95,5

Odůvodnění panelu:

Významné výsledky českého onkologického výzkumu, publikované ve vysoce impaktovaném časopisu.

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Novel predictors of left ventricular reverse remodeling in individuals with recent-onset dilated cardiomyopathy

Kubánek Miloš, Šramko Marek, Malušková Jana, Kautznerová Dana, Weichet Jiří, Lupínek Petr, Vrbská Jana, Málek Ivan, Kautzner Josef

Identifikátor: **RIV/00023001:_____/13:00056089**

Předkladatel výsledku do Pilíře II.:
Institut klinické a experimentální medicíny

Podíl předkladatele na výsledku: **90 %**

Anotace dle RIV:

OBJECTIVES: This study aimed to evaluate the performance of cardiac magnetic resonance (CMR), cardiac biomarkers, and endomyocardial biopsy (EMB) results to predict left ventricular reverse remodeling (LVRR) in individuals with recent-onset dilated cardiomyopathy (DCM). BACKGROUND: LVRR is a marker of a favorable prognosis in individuals with recent-onset DCM. We used the aforementioned novel methods of prognostication to predict this event. METHODS: A total of 44 consecutive patients with recent-onsetDCM underwent at baseline CMR, measurement of biomarkers and EMB together with conventional methods, including cardiopulmonary exercise testing and echocardiography. Measurement of B-type natriuretic peptide (BNP) and the cardiological examination were repeated at 3, 6, and 12 months. CMR was repeated at 12 months. LVRR was defined as an absolute increase in left ventricular ejection fraction from >=10% to a final value of > 35% accompanied by a decrease in left ventricular end-diastolic

Odůvodnění předkladatele:

Left ventricular reverse remodeling (LVRR) is a marker od favourable prognosis in patients with recent onset dilated cardiomyopathy (DCM). Prediction of this phenomenon is of great clinical importace as surrogate marker of patients' prognosis. In this study novel predictors of LVRR – cardiac magnetic rezonance (CMR), cardiac biomarkers and endomyocardial biopsy (EMB) were evaluated. This appears to be the first report directly comparing these methods in the patients with recent onset DCM. The study showed contribution of CMR and serial BNP testing, which provide better prediction of LVRR than conventional methods and EMB results. The findings in this study are original and also important for clinical practice.

Odůvodnění panelu:

Vynikající výsledky českého kardiologického výzkumu, publikované ve vysoce impaktovaném časopisu.

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Permanent Cardiac Pacing in Children: Choosing the Optimal Pacing Site A Multicenter Study

Janoušek, Jan; Krupičková, Sylvia; Kubuš, Peter

Identifikátor: **RIV/00064203:_____/13:10193311**

Předkladatel výsledku do Pilíře II.:
Fakultní nemocnice v Motole

Podíl předkladatele na výsledku: **90 %**

Anotace dle RIV:

Background-We evaluated the effects of the site of ventricular pacing on left ventricular (LV) synchrony and function in children requiring permanent pacing. Methods and Results-One hundred seventy-eight children (aged < 18 years) from 21 centers with atrioventricular block and a structurally normal heart undergoing permanent pacing were studied cross-sectionally. Median age at evaluation was 11.2 (interquartile range, 6.3-15.0) years. Median pacing duration was 5.4 (interquartile range, 3.1-8.8) years.Pacing sites were the free wall of the right ventricular (RV) outflow tract (n=8), lateral RV (n=44), RV apex (n=61), RV septum (n=29), LV apex (n=12), LV midlateral wall (n=17), and LV base (n=7). LV synchrony, pump function, and contraction efficiencywere significantly affected by pacing site and were superior in children paced at the LV apex/LV midlateral wall. LV dyssynchrony correlated inversely with LV ejection fraction (R=0.80, P=0.031). Pacing from the RV outflow tract/lateral

Odůvodnění předkladatele:

Here we present a work from our Center for Pediatric Cardiology from Motol University hospital. Center for pediatric Cardiology is a well respected center with a long time history, starting in the second half of a last century. Till now it is the only complex center providing care and acute surgery for critically ill neonates and young children in the country. Besides general diagnosis and treatment of patients the center runs also several special projects, including prenatal screening for heart diseases, a highly successful system organized nationally and applied elsewhere. Specialists from this field from our center are working in world-known hospitals abroad, tranferring their knowledge gained here in the Czech Republic. Long list of publications from this center documents their excellence and a really exceptional position in our country. Here we present series of articles from recent years on several relevant topics, including disorders of heart rhytm, ultrasound screening of congenital heart disease, and on treatment of heart diseases in pediatric population. For our Motol University Hospital the Center for Pediatric Cardiology, together with Department of Cardiology for adults, form a very important complex for heart diseases that fullfils our motto: We serve Generations". Both departments show excellence in their work, which is also represented here, in our choice of excellent outcomes of our research activities. 30 Výborná studie organizovaná a koordinovaná českými autory, která přinesla důležité výsledky a byla publikována ve vysoce impaktovaném časopisu. Výborná studie organizovaná a koordinovaná českými autory, která přinesla důležité výsledky a byla publikována ve vysoce impaktovaném časopisu.

Odůvodnění panelu:

Vynikající výsledky českého kardiologického výzkumu, publikované ve vysoce impaktovaném časopisu.

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Predictors of Improvement of Unrepaired Moderate Ischemic Mitral Regurgitation in Patients Undergoing Elective Isolated Coronary Artery Bypass Graft Surgery

Pěnička, M (corresponding autor); Línková, H; Lang, O; Fojt, R; Kočka, V

Identifikátor: **RIV/00216208:11120/09:00002088**

Předkladatel výsledku do Pilíře II.:
Univerzita Karlova v Praze 3. lékařská fakulta

Podíl předkladatele na výsledku: **71 %**

Anotace dle RIV:

The persistence of moderate ischemic mitral regurgitation (IMR) after isolated coronary artery bypass graft surgery is an important independent predictor of long-term mortality. The aim of the present study was to identify predictors of postoperative improvement in moderate IMR in patients with ischemic heart disease undergoing elective isolated coronary artery bypass graft surgery.

Odůvodnění předkladatele:

This original purely academic project was concepted and realised at LF3 UK Prague (in cooperation with hospital FNKV). Two co-authors from Belgium participated on data analysis. Results were published in Circulation, the most prestigious cardiology journal, official journal of American Heart Association (the oldest cardiology society in the world). In summary, we have analysed the factors which could predict the improvement of moderate ischemic mitral regurgitation after surgical coronary revascularization (papillary muscle ischemia as possible cause) without any surgical intervention on mitral valve.

Odůvodnění panelu:

Vynikající studie navržená a provedená z převážné části českým výzkumným týmem. Přinesla důležité a prakticky využitelné výsledky a byla publikována ve vynikajícím časopisu.

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Primary angioplasty in acute myocardial infarction with right bundle branch block: should new onset right bundle branch block be added to future guidelines as an indication for reperfusion therapy?

Widimský, P (corresponding autor); Roháč, F; Petr, R; Knot, J; Bílková, D; Fischerová, M; Vondrák, K; Lorenzová, A

Identifikátor: **RIV/00216208:11120/12:00003769**

Předkladatel výsledku do Pilíře II.:
Univerzita Karlova v Praze 3. lékařská fakulta

Podíl předkladatele na výsledku: **35 %**

Anotace dle RIV:

The current guidelines recommend reperfusion therapy in acute myocardial infarction (AMI) with ST-segment elevation or left bundle branch block (LBBB). Surprisingly, the right bundle branch block (RBBB) is not listed as an indication for reperfusion therapy. This study analysed patients with AMI presenting with RBBB [with or without left anterior hemiblock (LAH) or left posterior hemiblock (LPH)] and compared them with those presenting with LBBB or with other electrocardiographic (ECG) patterns. The aimwas to describe angiographic patterns and primary angioplasty use in AMI patients with RBBB. Methods and results. A cohort of 6742 patients with AMI admitted to eight participating hospitals was analysed. Baseline clinical characteristics, ECG patterns,coronary angiographic, and echocardiographic data were correlated with the reperfusion therapies used and with in-hospital outcomes. Right bundle branch block was present in 6.3% of AMI patients: 2.8% had RBBB alone, 3.2% had RBBB + LAH,

Odůvodnění předkladatele:

This publication is a result of an original idea of employees of Cardiocenter of Third Medical Faculty of Charles University. This idea was followed up by a multicentre study (8 centers) with international participation (3 countries) that were coordinated by Cardiocenter of Third Medical Faculty of Charles University. The central database consisting of almost 7000 patients with acute mycardial infarction was maintained by Third Medical Faculty of Charles University. Moreover, the entire statistical analysis were performed at this faculty with the assistance of an outside coworker (M. Malý). The project was the reason that led to a modification in the European Society of Cardiology guidelines. The first author of this project has been invited to the team of authors for these recommendations. This project was selected by an editor in chief of European Heart Journal, prof. T. Luscher, from among four best publications of this journal in a given calendar year, and presented in thus-named section („The Best of the European Heart Journal“) of European Society of Cardiology Congress.

Odůvodnění panelu:

Výborné výsledky kardiologické klinické studie, publikované ve vynikajícím časopisu.

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Quantification of fusion transcript reveals a subgroup with distinct biological properties and predicts relapse in BCR/ABL-positive ALL: implications for residual disease monitoring

Žaliová, Markéta; Krejčíková, Kateřina; Mužíková, Kateřina; Starý, Jan; Trka, Jan; Zuna, Jan

Identifikátor: **RIV/00064203:_____/09:5331**

Předkladatel výsledku do Pilíře II.:
Fakultní nemocnice v Motole

Podíl předkladatele na výsledku: **30 %**

Anotace dle RIV:

We analysed and compared MRD levels quantified by BCR/ABL transcript detection and by the standard Ig/TCR-based method in 218 bone marrow specimens from 17 children with BCR/ABL-positive ALL. We found only a limited overall correlation of MRD levels as assessed by the two methods. We show that multilineage involvement is at least partly responsible for the discrepancy. Our data demonstrate that BCR/ABL monitoring enables better and earlier prediction of relapse compared to the standard Ig/TCR methodology.0

Odůvodnění předkladatele:

This is one from a strog series of articles originating in our Department of Hematooncology. This department with a long history serves children with organ and hematological malignities, as well as with blood diseases. The department presents with a particularly excellent record in research activities. Those are based mainly on detailed molecular and cytological analyses of blood cells, complemented by detailed studies of solid tumors. members of the team are deeply involved in international collaboration, contributing to international guidelines in a diagnosis and treatment of oncological and hematological diseases. Recent work coming from Department of Hematooncology, Stary J et al. Intensive chemotherapy for childhood acute lymphoblastic leukemia: results of the randomized intercontinental trial ALL IC-BFM 2002.J Clin Oncol. 2014 Jan 20;32(3):174-84, was particularly important and raised a lot of attention as it presented an outcome of long term international collaboration, proving an efficacy of intensive chemotherapy regiment in ALL. Here we present a series of articles from the department on solid tumors (Wilms tumor as an example) and on leukemias in children.

Odůvodnění panelu:

Velmi významný originální výzkum provedený výlučně v české výzkumné instituci, který přinesl důležité výsledky a byl publikován ve výborném časopise.

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Quantification of fusion transcript reveals a subgroup with distinct biological properties and predicts relapse in BCR/ABL-positive ALL: implications for residual disease monitoring

Markéta Žaliová, Eva Froňková, Kateřina Krejčíková, Kateřina Mužíková, Ester Mejstříková, Jan Starý, Jan Trka, Jan Zuna

Identifikátor: **RIV/00216208:11130/09:5331**

Předkladatel výsledku do Pilíře II.:
Univerzita Karlova v Praze 2. lékařská fakulta

Podíl předkladatele na výsledku: **30 %**

Anotace dle RIV:

We analysed and compared MRD levels quantified by BCR/ABL transcript detection and by the standard Ig/TCR-based method in 218 bone marrow specimens from 17 children with BCR/ABL-positive ALL. We found only a limited overall correlation of MRD levels as assessed by the two methods. We show that multilineage involvement is at least partly responsible for the discrepancy. Our data demonstrate that BCR/ABL monitoring enables better and earlier prediction of relapse compared to the standard Ig/TCR methodology.0

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Odůvodnění panelu:

Velmi významný originální výzkum provedený výlučně v české výzkumné instituci, který přinesl důležité výsledky a byl publikován ve výborném časopise.

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Real-time PCR quantification of major Wilms' tumor gene 1 (WT1) isoforms in acute myeloid leukemia, their characteristic expression patterns and possible functional consequences

Starý, Jan; Trka, Jan

Identifikátor: **RIV/00064203:_____/12:8238**

Předkladatel výsledku do Pilíře II.:
Fakultní nemocnice v Motole

Podíl předkladatele na výsledku: **20 %**

Anotace dle RIV:

Wilms' tumor gene 1 (WT1) functions including some contradictory effects may be explained by the presence and interactions of its isoforms, however, their evaluation has been so far complicated by several technical problems. We designed unique quantitative PCR systems for direct quantification of the major WT1 isoforms A[EX5 - /KTS -], B[+ / -], C[- / +] and D[+ / +] and verified their sensitivity, specificity and reproducibility in extensive testing. With this method we evaluated WT1 total and isoform expression in 23 normal bone marrow (BM) samples, 73 childhood acute myeloid leukemia (AML), 20 childhood myelodysplastic syndrome (MDS), 9 childhood severe aplastic anemia (SAA), 30 adult AML and 29 adult MDS patients. WT1 isoform patterns showed differences among these samples and clustered them into groups representing the specific diagnoses ($P<0.0001$). Isoform profiles were independent of total WT1 expression and possess certain common features-overexpression of isoform D and EX5[+] variants. The KTS[+]/KTS[+] ratio was less variable than the EX5[+]/EX5[-] ratio and differed between children and adults ($P<0.001$); the EX5[+]/EX5[-] ratio varied between diagnoses (AML vs MDS, $P<0.001$). These findings bring new insights into WT1 isoform function and suggest that the ratio of WT1 isoforms, particularly EX5 variants, is probably crucial for the process of malignant transformation.0

Odůvodnění předkladatele:

This is one from a strong series of articles originating in our Department of Hematooncology. This department with a long history serves children with organ and hematological malignities, as well as with blood diseases. The department presents with a particularly excellent record in research activities. Those are based mainly on detailed molecular and cytological analyses of blood cells, complemented by detailed studies of solid tumors. Members of the team are deeply involved in international collaboration, contributing to international guidelines in a diagnosis and treatment of oncological and hematological diseases. Recent work coming from Department of Hematooncology, Stary J et al. Intensive chemotherapy for childhood acute lymphoblastic leukemia: results of the randomized intercontinental trial ALL IC-BFM 2002.J Clin Oncol. 2014 Jan 20;32(3):174-84, was particularly important and raised a lot of attention as it presented an outcome of long term international collaboration, proving an efficacy of intensive chemotherapy regiment in ALL. Here we present a series of articles from the department on solid tumors (Wilms tumor as an example) and on leukemias in children.

Odůvodnění panelu:

Velmi kvalitní studie navržená a koordinovaná českou výzkumnou institucí, s publikací v prestižním časopisu.

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Real-time PCR quantification of major Wilms' tumor gene 1 (WT1) isoforms in acute myeloid leukemia, their characteristic expression patterns and possible functional consequences

Karolina Kramarzová, Jan Stuchlý, Jan Starý, Jan Trka

Identifikátor: **RIV/00216208:11130/12:8238**

Předkladatel výsledku do Pilíře II.:
Univerzita Karlova v Praze 2. lékařská fakulta

Podíl předkladatele na výsledku: **20 %**

Anotace dle RIV:

Wilms' tumor gene 1 (WT1) functions including some contradictory effects may be explained by the presence and interactions of its isoforms, however, their evaluation has been so far complicated by several technical problems. We designed unique quantitative PCR systems for direct quantification of the major WT1 isoforms A[EX5 - /KTS -], B[+ / -], C[- / +] and D[+ / +] and verified their sensitivity, specificity and reproducibility in extensive testing. With this method we evaluated WT1 total and isoform expression in 23 normal bone marrow (BM) samples, 73 childhood acute myeloid leukemia (AML), 20 childhood myelodysplastic syndrome (MDS), 9 childhood severe aplastic anemia (SAA), 30 adult AML and 29 adult MDS patients. WT1 isoform patterns showed differences among these samples and clustered them into groups representing the specific diagnoses ($P<0.0001$). Isoform profiles were independent of total WT1 expression and possess certain common features-overexpression of isoform D and EX5[+] variants. The KTS[+]/KTS[+] ratio was less variable than the EX5[+]/EX5[-] ratio and differed between children and adults ($P<0.001$); the EX5[+]/EX5[-] ratio varied between diagnoses (AML vs MDS, $P<0.001$). These findings bring new insights into WT1 isoform function and suggest that the ratio of WT1 isoforms, particularly EX5 variants, is probably crucial for the process of malignant transformation.0

Odůvodnění předkladatele:

This is one from a strong series of articles originating in our Department of Hematooncology. This department with a long history serves children with organ and hematological malignities, as well as with blood diseases. The department presents with a particularly excellent record in research activities. Those are based mainly on detailed molecular and cytological analyses of blood cells, complemented by detailed studies of solid tumors. Members of the team are deeply involved in international collaboration, contributing to international guidelines in a diagnosis and treatment of oncological and hematological diseases. Recent work coming from Department of Hematooncology, Stary J et al. Intensive chemotherapy for childhood acute lymphoblastic leukemia: results of the randomized intercontinental trial ALL IC-BFM 2002.J Clin Oncol. 2014 Jan 20;32(3):174-84, was particularly important and raised a lot of attention as it presented an outcome of long term international collaboration, proving an efficacy of intensive chemotherapy regiment in ALL. Here we present a series of articles from the department on solid tumors (Wilms tumor as an example) and on leukemias in children.

Odůvodnění panelu:

Velmi kvalitní studie navržená a koordinovaná českou výzkumnou institucí, s publikací v prestižním časopisu.

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Relationships between right ventricular function, body composition, and prognosis in advanced heart failure

Melenovský Vojtěch, Kotrč Martin, Borlaug Barry, Marek Tomáš, Kovář Jan, Málek Ivan, Kautzner Josef

Identifikátor: **RIV/00023001:_____/13:00058733**

Předkladatel výsledku do Pilíře II.:
Institut klinické a experimentální medicíny

Podíl předkladatele na výsledku: **95 %**

Anotace dle RIV:

Objectives: This study sought to examine the relationships between right ventricular (RV) function, body composition, and prognosis in patients with advanced heart failure (HF). Background: Previous studies investigating HF-related cachexia have not examined the impact of RV function on body composition. We hypothesized that RV dysfunction is linked to weight loss, abnormal body composition, and worsened prognosis in advanced HF. Methods: Subjects with advanced HF (n = 408) underwent prospective assessment of body composition (skinfold thickness, dual-energy X-ray absorptiometry), comprehensive echocardiography, and blood testing. Subjects were followed up for adverse events (defined as death, transplantation, or circulatory assist device). Results Subjects with RV dysfunction (51%) had lower body mass index, lower fat mass index, and were more likely to display cachexia (19%). The extent of RV dysfunction correlated with greater antecedent weight loss and a lower fat/ lean body mass r

Odůvodnění předkladatele:

This large prospective cohort study investigates impact and mechanisms of cachexia in advanced heart failure patients. The study documents profound effect of weight loss on prognosis and it suggests that depletion of fat mass is more linked to adverse prognosis than lean mass loss. The study for the first time creates a mechanistic link between cachexia and impaired right ventricular function which has important consequences for therapy and optimal planning of care for advanced heart failure patients.

Odůvodnění panelu:

Vynikající kolaborativní studie publikovaná ve vysoce impaktovaném časopisu.

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Spatial navigation impairment is proportional to right hippocampal volume

Zuzana Nedelská, Jan Laczó, Jiří Lisý, Jakub Hort

Identifikátor: **RIV/00216208:11130/12:8061**

Předkladatel výsledku do Pilíře II.:
Univerzita Karlova v Praze 2. lékařská fakulta

Podíl předkladatele na výsledku: **60 %**

Anotace dle RIV:

Cognitive deficits in older adults attributable to Alzheimer's disease (AD) pathology are featured early on by hippocampal impairment. Among these individuals, deterioration in spatial navigation, manifested by poor hippocampus-dependent allocentric navigation, may occur well before the clinical onset of dementia. Our aim was to determine whether allocentric spatial navigation impairment would be proportional to right hippocampal volume loss irrespective of general brain atrophy. We also contrasted the respective spatial navigation scores of the real-space human Morris water maze with its corresponding 2D computer version. We included 42 cognitively impaired patients with either amnestic mild cognitive impairment (n = 23) or mild and moderate AD (n = 19), and 14 cognitively intact older controls. All participants underwent 1.5T MRI brain scanning with subsequent automatic measurement of the total brain and hippocampal (right and left) volumes. Allocentric spatial navigation was tested in the real-space version of the human Morris water maze and in its corresponding computer version. Participants used two navigational cues to locate an invisible goal independent of the start position. We found that smaller right hippocampal volume was associated with poorer navigation performance in both the real-space (beta = -0.62, P < 0.001) and virtual (beta = -0.43, P = 0.026) versions, controlling for demographic variables, total brain and left hippocampal volumes. In subsequent analyses, the results were significant in cognitively impaired (P <= 0.05) but not in cognitively healthy (P > 0.59) subjects. The respective real-space and virtual scores strongly correlated with each other. Our findings indicate that the right hippocampus plays a critical role in allocentric navigation, particularly when cognitive impairment is present.0

Odůvodnění předkladatele:

This is the original articles of neurological group (Department of Paediatric Neurology and Department of Neurology) with high share of copyright 2nd Medical Faculty of Charles University in the prestigious multidisciplinary journal.

Odůvodnění panelu:

Výborná výzkumná publikace publikovaná ve vysoce impaktovaném časopisu.

PLNÝ NÁZEV VYBRANÉHO PŘÍSPĚVKU TŘÍDY A

Transpulmonary B-Type Natriuretic Peptide Uptake and Cyclic Guanosine Monophosphate Release in Heart Failure and Pulmonary Hypertension The Effects of Sildenafil

Melenovský Vojtěch, Al-Hiti Hikmet, Kazdová Ludmila, Jabor Antonín, Syrovátka Petr, Málek Ivan, Kettner Jiří, Kautzner Josef

Identifikátor: **RIV/00023001:_____/09:00001953**

Předkladatel výsledku do Pilíře II.:
Institut klinické a experimentální medicíny

Podíl předkladatele na výsledku: **100 %**

Anotace dle RIV:

The H-PVR patients have stiffening of both pulmonary and systemic arteries, preserved transpulmonary BNP uptake, but diminished cGMP release, which is reversible by the administration of sildenafil. This study provides in vivo evidence that phosphodiesterase 5A inhibition restores sensitivity of pulmonary vasculature to endogenous cGMP-dependent vasodilators.

Odůvodnění předkladatele:

The goal of this case-control mechanistic study was to investigate clinical and biochemical determinants responsible for elevation of pulmonary vascular resistance in patients with heart failure (HF). The study for the first time illustrates that HF patients with pulmonary hypertension and high pulmonary vascular resistance have diminished release of cGMP in pulmonary vasculature, reversible by inhibition of cGMP degradation by PDE5A inhibitor sildenafil, paralleled by beneficial hemodynamic effects. The study provides mechanistic explanation for beneficial effect on PFE5A in HF patients and creases a rational for the use of this drugs for prevention of RV dysfunction in HF patients.

Odůvodnění panelu:

Výtečná studie s významným klinickým dopadem, publikovaná ve vynikajícím časopisu.