

## 1. Jiri Zelinka

### Simulation of Space Charge Effects in Electron Optical System Based on the Calculations of Current Density

#### Abstract

We present a numerical method for the iterative computation of electron optical systems influenced by space charge with improved accuracy in the same calculation time. We replace the common algorithm for evaluating the space charge distribution with a new one based on the calculation of the current density distribution from an aberration polynomial. We introduce a re-meshing algorithm which adapts the mesh used for the field calculation by the finite element method in each iteration to the actual space charge distribution to keep it sufficiently fine in all areas with non-zero space charge.

(OVERALL: Your command of sentence structure and the register employed is suitable for an academic paper)

## 2. Kristyna Adamcova

### Molecular identification of bacteria in polybacterial specimens of urinary catheters and urine of cathetrized patients

**Objectives:** Complex bacterial colonization of catheters often causes catheterization-associated urinary tract infections (CAUTI) with polymicrobial nature. Polymicrobial infections being difficult to interpret and treat. Conventionally used culture techniques for bacterial detection can fail in cases of fastidious bacteria, anaerobes or bacteria sampled under the antibiotic treatment. For this reason, polybacterial samples represent methodological challenge for molecular approaches. The aim of this work is using of Denaturing Gradient Gel Electrophoresis (DGGE) followed by sequencing as a tool for detection of bacteria in catheters and urine.

**Methods:** A total of 98 specimens of urine and catheters were collected from 49 patients. The catheters were sonicated for bacterial disengaging from the biofilm. Isolated DNA was then amplified using PCR targeting V3-V5 region (460 bp) of 16S rRNA gene. Multiple length homogeneous amplicons were separated by DGGE. Extracted amplicons were, under the same conditions, reamplified and sequenced. The obtained sequences were then compared to the public databases.

**Results:** In total, we detected 231 bacteria of 29 genera in urine (n=115) and sonicates (n=116). In 12 samples from 6 patients (12,2%), we detected one bacterium in each material. The rest of the patients (87,8%) had 2-6 bacteria (median=3) in samples of urine (2-4) and sonicates (2-6). Ratio between G+ and G- bacteria were: 43,5% G+ / 56,5% G- in urine vs. 51,7%G+/48,3%G- in sonicates. Bacteria detected in samples of urine and sonicates, differed by their prevalence. In urine, the most prevalent genera were: Actinobaculum, Escherichia, Enterococcus, Proteus and Enterobacter. In sonicates, the most prevalent genera were: Actinobaculum, Enterococcus, Proteus, Escherichia, Propionimicrobium.

**Conclusion:** By using PCR-DGGE, we detected fastidious genera of bacteria such as Actinobaculum or Propionimicrobium in high prevalence, which is not easily detectable by conventional culture techniques. PCR-DGGE seems to be an applicable technique for screening of microbial community composition in urine and sonicates of catheters.

(OVERALL: Despite being a technical abstract, this is written in a style which can also be easily read and understood by a non-specialist (like me!). In parts, more specificity would further improve the tone).

## 3. Stanislava Kralova

Classification and typing of *Aeromonas* spp. isolated from water and clinical sources.

Abstract:

Genus *Aeromonas* consists of high number of valid recognized taxa, often showing unusual or atypical properties, which results in difficult identification of these bacteria to the species level. In this work, 84 strains of aeromonads isolated from water and clinical samples were identified and described. Identification was based on phenotyping using biochemical properties of these bacteria, as well as on genotyping based on multiplex-PCR and ERIC-PCR. Further description of isolated strains was based on detection of virulence factors, namely enterotoxin (Act) and flagellin (Fla). Only 40% of all isolates were identified through phenotypic methods. The number of reliable identifications among clinical strains was twice as high as among strains from the environment (12 out of 20 clinical strains compared to 18 out of 64 environmental strains). The use of multiplex-PCR allowed identification up to 89 % among all analysed strains. Another method, ERIC-PCR, was approved to be useful for the detection of closely related or even identical strains. However, this method appeared to be inadvisable for the identification of *Aeromonas* spp. Further genetic description of virulence genes showed the presence of both these factors in 42 % of all strains. Moreover, only 10 isolates possess neither of these virulence factors and all these strains were isolated from environmental sources. This work confirms difficulties in the identification of *Aeromonas* spp. using one single approach. Results gained through this work show that proper combination of different approaches enables reliable identification of *Aeromonas* spp. The presence of specific virulence factors suggests pathogenic potential of these bacteria and a need of further studies focused on virulence genes.

(OVERALL: Well-formulated sentences. Focus on the use of the definite article; see other comments above, too)

#### **4. Palitha Lakshman Nugapitiya**

A Grammar of Sinhala Gi Poetic Language During 12-13th Centuries

Abstract

The study of Sinhala 'Gi' poetic language is very important with regards to Sinhalese grammatical tradition, as well as language history, since many scholars believe that the classical Sinhala grammar book the Sidat Sangara, written in 13th century AD, is based on this specific poetic language style called 'pure Sinhala.' This language style is different from normal written language which replete with Pali, Sanskrit and Tamil language borrowings and translated borrowings which are accepted in prose writing. This study is a descriptive linguistic analysis of Gi poetic language; it includes three major aspects of language analysis which are called morphology, phonology and syntax. In phonological analysis two new vowels and four consonants were identified which were not included in Sidat Sangara alphabet. A new case system is proposed to analyze Sinhala nouns according to case terminations of Gi language which can be applicable for even contemporary Sinhala written language as well. Although, the Sidat Sangara, in addition to contemporary Sinhala grammar, uses the meaning of nouns to categorize Sinhalese noun cases, this study proposes to base the diversity of noun suffixes. For this categorizing system, the number Sinhalese cases can be reduced from nine to six for masculine and feminine, with five cases for neutral nouns. Moreover, this study has revealed that three genders (masculine, feminine and neutral) can be identified when analyzing Gi language noun terminations instead of two genders alone (masculine and feminine) introduced by the Sidat Sangara. The subject verb agreement introduced by Sidat Sangara has to be changed according to the threefold gender system newly introduced in this analysis. In syntactic analysis, new sentence structures are also identified in Sinhala language and some of them are hereditary to the poetic language of Sinhala.

(OVERALL: Clear to follow. Pay attention to tone, register & minimising repetition)

## 5. Sarka Jelinkova

This is an abstract for my next article, which does not have a title yet. It is based on my Diploma thesis with the topic The effect of statins on human embryonic stem cells.

Human embryonic stem cells (hESC) are a potential source of material for cell replacement therapy as well as a model for studying the development and differentiation of cell in healthy or diseased human body. Multiple technical obstacles will need to be overcome to allow for the clinical use of hESC in future. First of all robust methods for reliable hESC differentiation onto the desired cell types must be developed. Also the signs of genome destabilization will have to be suppressed in long-term cultivated hESC.

We found that statins can reverse the effects of long-term cultivation of hESC. This includes limiting/eradicating the recurrence of compact morphology in very late passages or alterations of cell cycle mimicking short-term cultivated hESC. Stabilization of Oct4 pluripotency marker protein level was observed, which is known to be connected with robust pluripotent state. Moreover, when statin treated hESC were used for cardioidifferentiation, higher percentages of cardiomyocytes were identified in the formed embryonic bodies (EB) and more of these EBs were able to beat.

We show that statins rescue the phenotype of short-term cultivated hESC, which is usually lost due to prolonged in vitro cultivation. Thus, it is a novel approach to obtaining long-term cultivated hESC without currently common abnormalities.

Based on our cardioidifferentiation results, we argue that it is possible to implement statins into cardioidifferentiation protocol. That can also lead to higher yields of cardiomyocytes in hESC and induced pluripotent stem cell lines that are difficult to differentiate and ease the process of gaining cell material for disease modeling.

(OVERALL: Aside from the use of some colloquial expressions, this is a well-formulated abstract).

## 6. Marketa Novotna

Prediction models for the uptake of metals into various field crops

Abstract:

Field crops have among the food commodities one of the highest contribution on the human metal exposure. The crop-specific prediction models are a tool used to estimate potential dietary risks across large areas. The aim of this study was to develop our own prediction models and to compare the usability of other available models for our dataset.

We analyzed samples of potatoes, hop, maize, barley, wheat, rapeseed and permanent grassland from Czech monitoring database collected by Central Institute for Supervising and Testing in Agriculture (CISTA) from 1992 to 2009 on 64 sites distributed within Czech Republic. We then evaluated the influence of measured soil concentrations and soil factors such as pH, organic carbon and content of clay on the final concentrations in different agricultural plants for Cd, Cr, Cu, Mo, Ni, Pb and Zn.

Bioconcentration factors (BCF) as well as own prediction models for 7 field crops and 6 metals using interaction terms of variables were calculated. Explained variability of prediction models was from 19 to 93 % and the correlation of measured and predicted concentrations between 0.47 and 0.98 depending on each field crop and metal. We also developed hop and rapeseed prediction models, both of which are comparatively new in this field. Available models from literature illustrated that beside models for Cd inappropriate results i.e. correlation of measured and predicted concentrations lower than 0.25. A sufficient number of models for various plants and other metals was not found.

These findings highlight that regression models are very specific for different plants, metals and also environmental conditions. Very careful usage within range of site specific parameters is necessary. The addition of other parameters such as concentrations of metals in air, parameters of plants, interactions of metals or season specific variables is possible, and mostly increases explained variability but could cause problems with the levels of complexity of models and data requirement.

(OVERALL: This abstract shows good command of short sentence structures; multi-clause sentences require some work, in parts, so as to avoid incoherence)

## 7. Dana Stverakova

Identification of phage encoded proteins in Staphylococcus aureus using mass spectrometry

Abstract

Most of the Staphylococcus aureus strains contain prophages in their genomes. Prophages encode specific proteins including toxins, which enhance the virulence of Staphylococcus aureus. This study was conducted to find out if it is possible to identify specific phage proteins in S. aureus using mass spectrometry. Mass spectrometry has recently been used for the diagnostics of bacteria. In this study we used matrix assisted laser desorption ionization time-of-flight (MALDI-TOF) technology to identify specific proteins from 28 different phages in 60 S. aureus strains. All 28 phages were successfully identified using this method regardless of whether or not they were integrated in different S. aureus strains. The results showed that MALDI-TOF can be used for phage identification in S. aureus. It may be also useful for the identification of phages from different bacteria to track their spread in clinical strains and other bacterial strains in environment. MALDI-TOF is a fast and accurate method and results of this study make it a convenient tool for epidemiologists.

(OVERALL: A good effort. Please pay attention to use of the definite articles, and avoid colloquial expressions in academic writing).

## 8. Veronika Vrbovska

Microorganisms inhabiting the midgut of ixodid ticks

Abstract:

Ticks are important vectors of viral, bacterial and protozoan pathogens. There can also be found non-pathogenic and endosymbiotic microorganisms in ticks. The aim of this work was to study microbial diversity of the midgut of ticks Ixodes ricinus and Dermacentor reticulatus and to compare diversity between individual developmental stages (nymphs, males, females). A total of 166 bacterial strains were isolated, described and identified. Identification was based on 16S rRNA gene sequencing. Denaturing gradient gel electrophoresis (DGGE) was used to study differences in diversity. The most frequently isolated strains from both species of ticks belong to genera Bacillus and Paenibacillus. The results of the DGGE analysis demonstrated expected differences in diversity between I. ricinus and D. reticulatus, and also between different developmental stages of these ticks.

(OVERALL: Your sentence structures are clear. You may wish to pay attention to tense choice and reporting verbs).

## 9. Michal Jablonski

Title: Processing pipeline in jMRUI for a good clinical practice

Purpose:

To ensure reproducibility and automation of data processing in data processing software it is desirable to document well all processing steps. This is especially important in clinical practice and in medical research where it can be forced by granting organizations and/or government to provide processing history that cannot be modified by the user to avoid data fabrication. Documented history can be used for the automation of processing in the **form of** macros, for reproducibility **in form** of a processing protocol stored together with processed data, or can serve as a database of all processing steps **used and thus used** as a scientist's note or as a bug tracking tool for software developers.

## Methods:

In order to record the whole processing pipeline from the time of data loading to their quantitation in jMRUI1, a robust database recording of every action performed in jMRUI was developed in Java. The recording process is based on the relational H2 database management system<sup>2</sup> supporting the subset of the Structured Query Language<sup>3</sup> (SQL) standard. In current implementation, a single file database is used. The structure of the implemented database makes it possible to change to a centralised database located on an external server. Each processed data file is registered by its name and hash code. Since the hash code of the file depends only on its content, the same file will be recognised in different locations. By using the database it is possible to track the history of each file, including the files that were derived from those already processed (inheritance of processing history). Additionally the results of quantitation and other intermediate files are stored in the database directory with a unique identifier. The hash code approach also helps to save storage space as the intermediate files are stored only once. Aside from the storage of the processing history in the database, the history is also saved along with the processed data in a text log file.

(OVERALL: The development of your descriptive narrative is clear. Please minimise repetition and pay attention to appropriate use of the definite article).

## 10. Veronika Kosarova

Advantages and disadvantages of handheld FTIR spectrometer for the analysis of cultural heritage

### ABSTRACT

Portable handheld mid-Fourier transform infrared spectrometer ExoScan FTIR (Agilent Technologies) with diffuse reflectance (DR) and attenuated total reflectance (ATR) were used for the analysis of reference samples of inorganic pigments in mixtures with organic binders with the aim to describe the analytical limits of the method on simple monolayer systems. In the second step, the equipment has been tested on simple paintings on paper support and on coloured photographs. Handheld instruments became very popular in recent years in different application fields, but, in a case of handheld FTIR, only a few studies have been reported as yet. The major limit for routine use can still be seen in a relatively high weight of instruments and the absence of any sighting system. When measured by hand, it is also not very easy to achieve a sufficient contact pressure to obtain reliable spectra with ATR holder. Further circumstances limiting any wider use of ATR system in handheld instruments is the fact of very low penetration (several micrometres only) causing that the analytical signal is collected from the top surface layer only. On the other hand, diffuse reflectance holder produces good-quality spectra in general, and the drawbacks are roughly the same as in IR microscopes (deformations of spectra, increased noise, poor signal from dark materials etc.). In this study, we compared the DR and ATR modes on model samples with very promising results, described the detection limits for proteinaceous binders in selected inorganic matrices, and tried to find the most perspective application fields of the handheld FTIR in the analysis of fine arts. We used the method for a distinguishing of paper treatment for the painting technique description in the modern art (watercolour, wax crayon or oil painting), and for the investigation of materials in coloured photographs.

(OVERALL: This text can be read by a non-expert and followed with limited difficulties. In order to further improve the writing, you are advised to pay attention to sentence length (shorter sentences are likely to be more accurate when compared with multi-clause constructions); and avoid colloquialisms).

## 11. Petr Zikan

PIC/MCC simulation of electron and ion currents to spherical Langmuir probe

### Abstract:

The Particle In Cell/Monte Carlo Collisions (PIC/MCC) simulation was used for the calculation of electron and ion currents to a spherical Langmuir (electrostatic) probes. This simulation took into

account the collisions of collected charged particles with neutral gas particles around the probe and it can calculate the probe currents at higher neutral gas pressures, where usual collisionless orbital motion limited (OML) probe theory is not applicable. The improvements of usual simulation techniques enabled the speed up the simulation and to calculate the probe current even for neutral gas pressures above 1 kPa. The simulations were carried out for two cases: i) probe with radius of 0.5 mm in non-thermal plasma with high electron temperature, ii) probe with radius of 10  $\mu\text{m}$  in afterglow plasma with low electron temperature. The influence of probe radius on electron probe current was also studied. The simulations showed that thick sheath limit of OML theory provides incorrect values of probe current for probes with radii larger than 200  $\mu\text{m}$ , even at very low neutral gas pressures. This effect stems basically from the following two reasons: i) the thick sheath limit for the OML theory does not hold; ii) due to the creation of a large presheath at such probes and subsequent decrease of charged particle concentrations at the sheath edge. The probe characteristics were calculated for probe with 0.5 mm radius for pressures up to 500 Pa. At this end of higher pressures, electron cooling was observed, which does not correspond to any real experimental conditions, and an external electric field would have to be considered in the simulation in order to calculate realistic charged species currents. The probe characteristic for probes with 10  $\mu\text{m}$  radius were calculated for pressures up to 3 kPa. The influence of collisions on electron and ion probe current was demonstrated and the procedure for electron and ion density determination from probe measurement at higher pressures was developed. The results from PIC/MCC simulations were compared with results from continuum theory.

(OVERALL: This is a good effort. You are advised to focus on tense use, avoiding colloquialisms and minimising the repetition of grammatical structures, e.g.: starting many sentences above with **The**).

## 12. Jiri Marek

### Media Streams Planning with Transcoding using Local Search Heuristics

#### Abstract

Recent advances in the processing capabilities of commodity hardware have enabled the deployment of high-performance collaborative environments in various application fields, where maximum image quality and interactivity are critical. In this paper, we focus on user-empowered collaborative environments that rely on information available to the users and that can be obtained from the end-nodes connected to the network. We build upon our previous work on scheduling strategies for multi-point data distribution, while utilizing partial network topology knowledge that may be provided by the users. The novelty introduced by this paper is improved scalability of the system by employing local search metaheuristics. This allows the maintainence of systems comprising more than twice as many applications compared to the previous approaches.

(OVERALL: Clear and easy to follow. Please also see my minor corrections above).