

European Industrial Doctoral School Summer Workshop 2014

List of Abstracts

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INVESTMENTS IN EDUCATION DEVELOPMENT

This project is cofinanced by the European Social Fund and the state budget of the Czech Republic

European Industrial Doctoral School Summer Workshop 2014

List of Abstracts

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INVESTMENTS IN EDUCATION DEVELOPMENT

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UNDERSTANDING EMISSION FORMATION OF PELLETS OF TORREFIED BIOMASS

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Abstract

The European member states have in their EU2020 directive (2009/28/EC) set the goal that by 2020, 20% of all energy should originate from renewable resources of which 10% should be dedicated to the transportation sector [1]. Biomass is the only renewable energy source that can be used for production of transportation fuels and chemicals, but due to its fibrous structure bio-fuel production is challenged. Torrefaction is a pre-treatment process where biomass is heated to 200-350°C in the absence of oxygen. The heat treatment partially degrades the fibrous structure resulting in lower energy consumption during milling, and renders more spherically milled particles that facilitate feeding of material to 1) the gasification process (producing syngas that is synthesized to biofuels) or 2) co-combustion with coal in power plants. Pellets of torrefied material also have e.g. a higher energy density, a hydrophobic surface, and are resistant to micro-organisms, rendering them advantageous to raw wood pellets in terms of transport and storage economics [2, 3].

Today large quantities of raw pellets are transported worldwide, a large part by cargo ships. During transport and storage of pellets there are three main health and security concerns; 1) emission formation (CO, CO₂ and volatile organic compounds (VOCs))/O₂ depletion, 2) dust exposure (breathing and dermatologically), and 3) fire hazards (self-heating of pellets and dust explosions) [4]. We are currently studying more in depth the formation of emissions of pellets of torrefied material during closed storage.

Raw wood pellets are known to react with the surrounding O₂ and form CO, CO₂, and emit VOCs. When shipping of pellets increased early-mid 2000, several incidents of CO-poisoning with fatal outcome were reported in European ports. This rapidly led to strict regulations on ventilation and controls before entering closed cargo, according to the regulation; International Maritime Solid Bulk Cargoes Code (IMSBC code), issued the Maritime Safety Committee. Also raw pellets are known to spontaneously heat during storage, a reaction not fully understood but causes increased emissions [5]. Studies point to this being caused by degradation reactions taking place in pellets of fats, fatty acids, and resin by autooxidative reactions [6, 7]. Regulations for raw pellet handling during transport and storage are on-going, but the corresponding work for torrefied pellets is still in its cradle. Pellets of torrefied material are still not commercially available but there are many on-going initiatives worldwide, now in industrial demonstration scale. Torrefied pellets also form CO, CO₂, and also emit VOCs (with a different composition compared to raw pellets, due to degradation during the heat treatment) during storage. Formation rates, absolute amounts, and conditions for formation are not well understood but important to monitor to assess differences to raw pellets' emission behavior. Deeper understanding is also asked for from the industry before pellets from torrefied biomass can become commercial goods.

In order to obtain a high quality pellet of torrefied material there is a need to optimize torrefaction conditions; temperature and residence time in the reactor, together with the densification parameters; moisture content, particle size, and length of the pellet press. At more severe torrefaction conditions, the energy density increases of the wood chips, but due to the partial degradation of the cell walls' components (hemicellulose, cellulose, and lignin) it is harder to compact it into a durable pellet (something that is of high importance during transport and storage). Also the emission behavior of the pellets will be affected by the different torrefaction and densification conditions. We analyze emissions from pellets during storage using Gas Chromatography -Thermal Conductivity Detector, GC-TCD, and Head-Space Solid Micro Phase Extraction - Gas Chromatography-Mass Spectroscopy, HS-SPME-GC-MS, for determining of changes in concentrations of permanent gases (O₂, N₂, CO₂, CO, and CH₄) and VOCs, respectively. Compounds of interest from a health and safety perspective are of importance to quantify in order to determine if they surpass regulated exposure limits.

A direct outcome of this project is increased knowledge about which components are emitted and in which concentrations. This can be used to, if necessary, set recommendations for preventive precautions along the storage and transport chain. This project also aims at gaining a deeper understanding of the underlying reactions resulting in oxygen consumption, and formation of CO, CO₂ and VOCs.

Keywords: Torrefaction, Wood Pellets, Emissions

REFERENCES

- [1] European Parliament, C.,(2009) *Directive 2009/28/EC of the European Parliament and of the Council of 23 April 2009 on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC (Text with EEA relevance)*.
- [2] van der Stelt, M.J.C., et al., (2011) *Biomass upgrading by torrefaction for the production of biofuels: A review*. Biomass and Bioenergy, **35**(9): p. 3748-3762.
- [3] Uslu, A., A.P.C. Faaij, and P.C.A. Bergman, (2008) *Pre-treatment technologies, and their effect on international bioenergy supply chain logistics. Techno-economic evaluation of torrefaction, fast pyrolysis and pelletisation*. Energy, **33**(8): p. 1206-1223.
- [4] Urban Svedberg, A.K.,(2011) *Kunskapsöversikt - Faror och hälsorisker vid förvaring och transport av träpellets, träflis och timmer i slutna utrymmen.*, A. 2011:2, http://www.av.se/dokument/publikationer/rapporter/RAP2011_02.pdf.
- [5] Larsson, S.H., et al., (2012) *Temperature patterns in large scale wood pellet silo storage*. Applied Energy, **92**(0): p. 322-327.
- [6] SVEDBERG, U.R.A., et al., (2004) *Emission of Hexanal and Carbon Monoxide from Storage of Wood Pellets, a Potential Occupational and Domestic Health Hazard*. Annals of Occupational Hygiene, **48**(4): p. 339-349.
- [7] Arshadi, M., et al., (2009) *Emission of Volatile Aldehydes and Ketones from Wood Pellets under Controlled Conditions*. Annals of Occupational Hygiene, **53**(8): p. 797-805.

THE MUSICAL LANDSCAPE - MUSIC, PLACE AND THE REGIONALIZATION OF CULTURAL POLICY

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Abstract

Sweden, as most of Europe, has a long history of publicly funded music from the National Opera and Musical academy of Gustav III to later days patronage-like funding of the free music life. 2011 saw the biggest shift in Swedish cultural politics since the early 1970s as the centrally funded touring organization was closed and the Swedish Arts Councils' model of funding was radically changed. The earlier centralized cultural politics is undeniably shifting towards a cultural politics of regions (Duelund, P, 2003). This consequent regionalization contrasts with how music as a social phenomenon often is characterized either as being fluid and borderless or as national/international with local music as a visible counterpart.

Taking cues from research focusing on the links between music and place (i.e. Stokes, 1994; Connell, J., & Gibson, C, 2003) the project explores the dynamics of cultural policy in parallel with constantly shifting landscapes of sound. The formation and transformation of musical regional identities as social and thus contingent constructs (Glynos & Howarth, 2007) as well as the practical effects of cultural policy are central to the project. The main focus on the empirical level is on the region of Dalarna, which markets itself as the "first region of Sweden" with a rich cultural and musical history as well as being one of the most popular regions for tourists. It holds many interesting musical phenomena, such as the festivals Falun Folkmusic Festival and Peace & Love; the outdoor musical arena Dalhalla and the regionally funded orchestra Dalasinfoniettan. Comparisons with other Swedish regions, in example Västerbotten which has the city Umeå as Cultural Capital of 2014 but also with Germany's system of autonomous cultural policy regions, will be included. Through interviews with artists and decision makers on local, regional and central level; participant observations and discourse analysis of musical program presentations and policies, the doctoral student is following this process of political and musical change.

The doctorate is a joint effort between the *Department for Culture and Media Sciences* and the *Industrial Doctoral School* at Umeå University and the public agency *Music Development and Heritage Sweden*.

REFERENCES

- [1] Duelund, P. (2003). *The Nordic cultural model*. Copenhagen: Nordic Cultural Institute.
- [2] Connell, J., & Gibson, C. (2003). *Sound Tracks: Popular music, Identity and Space*. Routledge.
- [3] Stokes, M. (1994). *Ethnicity, Identity and Music: The Musical Construction och Place*. (M. Stokes, Ed.). Berg Publishers.
- [4] Glynos, J., & Howarth, D. (2007). *Logics of critical explanation in social and political theory*.

OPLS MODEL INTERPRETATION AND VARIABLE INFLUENCE ON PROJECTION (VIP)

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Abstract

The Orthogonal Projections to Latent Structures (OPLS) method [1] has provided a whole new range of multivariate analysis capabilities especially focused on facilitating model interpretation. More specifically, OPLS separates the systematic variation contained in X into two parts, one that is correlated (predictive) to Y and another part that is uncorrelated (orthogonal) to Y. This results in interesting applications for industry, as can be seen in [2], using different variants of OPLS (i.e. T-OPLS and W-OPLS) or multivariate curve resolution methods (e.g. MCR-ALS). Due to the wide range of applications of OPLS and other methods, the enhancement of model interpretability in this type of methodologies has become a must nowadays [3].

For Partial Least Squares (PLS), Variable Influence on Projection (VIP) is an established parameter that summarizes the importance of the X-variables in a PLS model with many components [4]. A new approach for VIP has been developed (leading to new equations and algorithms) to take full advantage of the OPLS model formalism for enhanced model interpretability [5]. This means it includes not only the predictive components, but also the orthogonal components. Four new variants of VIP adapted to OPLS were evaluated and compared using three data sets, one synthetic with known properties and two real-world cases. The results demonstrated the better performance of the OPLS-VIP compared to the standard PLS-VIP and its usefulness for a global model interpretation and also as precursor for variable selection. In addition, with this new approach of VIP we take advantage of having three different VIP profiles representing the VIP for global model interpretation, the VIP for the predictive components and the VIP for the orthogonal components.

Keywords: Variable Influence on Projection, VIP, OPLS, MCR-ALS, Variable Selection, PLS.

REFERENCES

- [1] Trygg J. and Wold S., Orthogonal projections to latent structures (O-PLS). *Journal of Chemometrics*, 2002. 16(3): p. 119-128.
- [2] Dumarey M., Galindo-Prieto B., Fransson M., Josefson M. and Trygg J., OPLS methods for the analysis of hyperspectral images - comparison with MCR-ALS. *Journal of Chemometrics* (accepted), 2014.
- [3] Galindo-Prieto B., Eriksson L. and Trygg J., OPLS Model Interpretation and Variable Influence on Projection (VIP). Poster presentation, Pardubice (Czech Republic), 2014.
- [4] Wold S., Johansson E. and Cocchi M., PLS - Partial Least-Squares Projections to Latent Structures. *3D QSAR in Drug Design* (Ed. Kubinyi H.), Theory Methods and Applications, ESCOM Science Publishers, Leiden, 1993: p. 523-550.
- [5] Galindo-Prieto B., Eriksson L. and Trygg J., Variable Influence on Projection (VIP) for OPLS. *Journal of Chemometrics* (accepted), 2014.

BIOMASS MIXED WITH FRACTIONATED WASTE: CHARACTERIZATION, OPTIMIZATION AND EMISSIONS

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Abstract

Household waste and biomass can be processed and used as fuels - Refuse Derived Fuels (RDFs) - in incineration processes, as replacement of fossil fuels. This way, the volume of the waste that is handled is reduced considerably and, in return, energy in form of electricity and/or heat is generated. However, hazardous pollutants such as polychlorinated dibenzo-*p*-dioxins and polychlorinated dibenzofurans (PCDD/Fs) can be generated as by-products. Food waste is one of the main sources of chlorine in household waste [1], along with plastic and paper. Chlorine plays an important role in PCDD/Fs formation and HCl is responsible for corrosion in boilers.

This work will provide insight into the technical and chemical properties of RDF, and how its composition influences the emissions released to air during incineration.

Four different materials with varying energy content and chemical composition were used for RDFs production and tests. Pine and recovered wood (RW) were selected as non-contaminated and contaminated reference wood materials, respectively. Furthermore, two household wastes with a content of food waste of up to 5% and 20% respectively, were used. These in total four materials were combined in different weight percentages and they were then analysed for energy content, chlorine content, volatile matter and ash content. Elemental composition (CHNS) was also determined.

Preliminary results showed that there were no significant differences between pine and RW in terms of composition. Both materials contain less than 0.01%_{dry basis} chlorine and they have similar energy contents (18MJ/kg) [2]. Household waste with 20% food waste has higher chlorine content and lower energy content than household waste with 5% food waste. The fuel blends with 5% food waste are more reactive than those with 20% food waste. In addition, blends with 5% food waste also present higher energy content and less chlorine. These properties make fuels with 5% food more suitable for being used in incineration processes. The ratio 80:20 (wt.) for 5%food:pine gives the most reactive fuel with 20.9 MJ/kg and 16.5% ash content. Coming tests will focus on ignition properties of the RDFs and quantification of the gaseous emissions with special attention to POPs (persistent organic pollutants).

Keywords: Household waste; Biomass; Chlorine content; PCDD/Fs; RDFs

REFERENCES

- [1] Themelis, N.J. (2010). Chlorine sources, sinks and impacts in WTE power plants. Proceeding of the 18th Annual North American Waste-to-energy Conference. <http://www.seas.columbia.edu/earth/wtert/sofos/nawtec/.../nawtec18-3577.pdf>
- [2] Vassilev, S.V., Baxter, D., Andersen, L.K., Vassileva, C.G. (2010). An overview of the chemical composition of biomass. *Fuel*, **89**(5), 913-933.

SYNTACTICAL METHODS IN TEXT CLASSIFICATION

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Abstract

Despite over a century of research, the study of text classification is still chaotic. There are many variables in the problem, including choice of corpus, features, and classification algorithm [1]. Many studies develop a "novel approach" to text classification, using new features, algorithms, etc. to try to outperform some existing method [2][3][4]. Some try altering some of the parameters of the problem, to show that the success of their approach is independent of them. But what it seems few have done is to look at what does change with those parameters, to try to analyse the performance of existing methods in a systematic manner [5]. How does the accuracy of methods using well known features - word frequencies, character frequencies, syntax patterns - change with the amount of data? Could some methods be better for small corpuses, and some for large [1][6]? Does the size of the text to be investigated have an impact? What about the different algorithms of classification - does their usefulness vary depending on the data? Looking primarily at author identification, I am going to investigate these things.

Our research group is focused on syntax, so we are particularly interested in looking at syntactical methods. Many of the studies so far have found that syntactical methods seem to be less effective than simpler methods such as word and character frequencies [7]. Could it be that their apparent failure is due to a lack of data, and that with sufficient amounts of data they would surpass other methods? Another question is whether we can find some regularity in how the accuracy changes with the number of candidate classes. This could potentially help us estimate how reliable a method will be when we try to apply it to a different number of classes [1][8]. It could also, in principle, make it possible to compare the methods from different studies. In parallel, I am working on other projects, mostly in automata theory. There is a strong connection between automata theory and syntax, but these projects are from a more theoretical perspective.

I will be working in collaboration with many other researchers. The industrial connection is with the Swedish Defence Research Agency, who have a keen interest in author identification, as well as other kinds of text classification, and related classification problems. In the various projects, I also have connections with researchers from the universities of Uppsala, Lund, Linköping, Cambridge, and Stellenbosch, as well as other departments at our own university.

In general, the goal of my thesis work is to achieve a better understanding of text classification and the role of syntax therein. In particular, I hope that my results will make it easier to compare different methods of classification, and help find the most appropriate methods for a given situation, but also lead to greater theoretical insight in why, not only how, the accuracy depends on the parameters of the problem.

Keywords: Author identification, text classification, computational linguistics.

REFERENCES

- [1] Stamatatos, E. (2009). A survey of modern authorship attribution methods. *Journal of the American Society for Information Science and Technology*, vol. 60, 2009.
- [2] Kim, S., Kim, H., Wenginger, T. and Han, J. (2010). Authorship classification: a syntactic tree mining approach. *Proceedings of the ACM SIGKDD Workshop on Useful Patterns*, ser. UP '10. pp. 65–73.
- [3] Raghavan, S., Kovashka, A. and Mooney, R. (2010). Authorship attribution using probabilistic context-free grammars. *Proceedings of the ACL 2010 Conference Short Papers*, pp. 38–42.

- [4] Natarajan, P., Prasad, R., Subramanian, K., Saleem, S., Choi, F. and Schwartz, R. (2007). Finding structure in noisy text: Topic classification and unsupervised clustering. *International Journal of Document Analysis and Recognition (IJ DAR)* 10.3-4, pp. 187–198.
- [5] Rudman, J. (1998). The state of authorship attribution studies: Some problems and solutions. *Computers and the Humanities*, vol. 31, pp. 351–365.
- [6] Narayanan, A., Paskov, H., Zhenqiang Gong, N., Bethencourt, J., Shin, E. C. R. and Song, D. (2012). On the feasibility of internet-scale author identification. *2012 IEEE Symposium on Security and Privacy (SP)*, pp. 300–314.
- [7] Peng, F., Schuurmans, D., Keselj, V. and Wang, S. (2003). Language independent authorship attribution using character level language models. *Proceedings of the 10th Conference of the European Chapter of the Association for Computational Linguistics*, pp. 267–274.
- [8] Chaski, C. E. (2001). Empirical evaluations of language-based author identification techniques. *Forensic Linguistics*, vol. 8, pp. 1–65.

DETECTION OF B- AND E- THREATS USING SPECTROSCOPIC METHODS

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Abstract

During the last decades a number of Terrorist attacks against civilians has been carried out, were most commonly bombs of different types have been used but also some attacks using biological agents such as *Bacillus anthracis* that causes e.g. cutaneous anthrax on humans have been seen. Some of the maybe most well-known attacks are the World trade center attack on the 11th of September in 2001, the following anthrax letters sent a few weeks later to two U.S. senators and several news media offices, the London bombings on the 7th of July in 2005, the train bombing in Madrid on the 11th of March in 2004 and the Oklahoma bombing in 1995.

The effects on the society after these kinds of attacks are tremendous in several ways and the ability to have methods to prevent these horrible actions is vital, and even though the most preferable way would be that bombs and other “dangerous” devices never should be made, they sometimes are and to have a way to find these devices are important. Therefor to have an easy and reliable method to e.g. check luggage on airports, parked cars, boxes, mail, individual people, and other places for explosives and biological agents would be very good.

Finding a way to detect and identify these threats is not trivial due to the very large variations of containers and devices the threats can be hidden inside. However the threats all share one thing common and that is that they all contain explosives or b-agents of some kind, which narrows down the numbers of substances to search for a lot, and also, even though the explosive or b-agents them self are seldom visible outside the devices there are often traces outside the them in form of e.g. explosive particles or as in the case of b-agents the spores, and this makes it very interesting to study different spectroscopic techniques since they can scan these places without the need of touching the device. Not touching the device is very important if it contains an explosive since every extra distance away from a bomb reduces the damage in the case of an explosion.

In the past, the limiting factor for the development and usage of spectroscopic methods to find various types of hazard substances have been the detectors and the light sources used, but through the last years development of small high power lasers and intensified gated detectors, different spectroscopic methods such as Raman spectroscopy, laser induced fluorescence (LIF), laser induced breakdown spectroscopy (LIBS) and infrared spectroscopy (IR) are very promising and in more and more cases these techniques have “moved out” from development laboratories and are used in real scenarios.

This project focuses on different spectroscopic techniques such as Raman spectroscopy and what type of spectroscopic information that is possible to extract from collected spectra in order to detect and identify explosives and biological agents.

Keywords: Raman, spectroscopy, explosive, biological, detection

SPECTROSCOPIC AND CHROMATOGRAPHIC INVESTIGATIONS OF THE ALKALIZATION OF CELLULOSE

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Abstract

Formation of alkali cellulose is the first stage in the production of both viscose and cellulose ethers from cellulose pulps. Even though this step is vital for producing value added products from wood, the transformation process from cellulose pulp to alkali cellulose under industrial processing conditions has not yet been accurately described at the molecular level. The objective of this study is to gain a better molecular level understanding of the alkali cellulose formation mechanism. This is done by analysing the effects of temperature, reaction time, NaOH concentration and the presence of oxygen on the formation of alkali cellulose.

The experiments are divided into two distinct series; one focusing on cellulose ethers (Series 1) and the other on viscose production conditions (Series 2). NaOH is added to native Cellulose (I) to start the transformation to alkali cellulose. Washing NaOH out of the alkali cellulose structure stops the reaction and transforms all alkali cellulose to Cellulose II.

For Series 1, the influence of the reaction time, *temperature*, H₂O:NaOH:cellulose and NaOH:cellulose concentration ratios on the alkali cellulose formation was evaluated. In the case of Series 2, *temperature*, and H₂O:NaOH:cellulose were kept constant. The resulting mixture of Cellulose I/II obtained in both series have been dissolved in lithium chloride/N,N-dimethyl-acetamide (LiCl/ DMAc) for size exclusion chromatography (SEC). SEC and ¹³C CP-NMR was carried out in order to investigate the influence of the different parameters on the molecular weight distribution and transformation of the native Cellulose I to the allomorph Cellulose II, respectively. In the data presented, the influence of oxygen and contact time (as well as amount of NaOH solution) on the molecular weight distribution and distribution between the cellulose polymorphs are evaluated for some samples relevant to cellulose ether production.

Keywords: Cellulose I, Cellulose II, Alkali Cellulose, Size Exclusion Chromatography, LiCl/DMAc Molecular Weight Distribution, ¹³C CP-NMR.

ELECTRICITY DEMAND – DYNAMIC PRICING AND DETERMINANTS OF ELECTRICITY CONTRACT CHOICE

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Abstract

With the restructuring of electricity markets across Europe, particularly in the Nordic Countries, there has been an increasing focus on efficient pricing of electricity (e.g. dynamic pricing schemes). However, evidence for practicability of such methods, and in particular the possibilities for consumers to respond to such pricing, is rather scarce. Further, little is known about how consumers choose between different pricing schemes. As a first step, this study reports the results of an experiment, conducted between 2005 and 2008 in Sweden, measuring household electricity consumption at the appliance level. The study, commissioned by the Swedish Energy Agency, involved about 400 household in total, who had their consumption measured at 10-minute intervals for a period of between 15 and 90 days, for virtually all of their appliances (up to 46 appliances per household). In addition, interior and exterior temperatures were also measured at the same interval. Data at this level of detail have rarely been available for many countries.

Using this data set, we estimate end-use price elasticities on monthly level. Preliminary results suggest no significant elasticity to monthly price changes. Secondly, using a seemingly unrelated regression framework, we estimate end-use specific load curves and analyze how these correlate to possible restrictions on load shifting (e.g. the office hours schedule) within the day. Our analysis reports that household total load has two peaks corresponding, roughly, to the morning pre-office hours (6-8 AM) and evening post-return-to home hours (6-9 PM), and that the largest part of the load by far tends (unsurprisingly) to be heating and lighting, and this is the period when the nord-pool spot prices are at their highest.

At end-use level, this analysis sheds light on relatively intuitive facts; households use heating when it's cold, lighting when it's dark and cooking before they leave for work and when they get home. Based on these results, it is not evident that in the short-run, households have the possibility of shifting heating and lighting consumption to off-peak hours. Similarly, it would not make sense to cook food in the middle of the night even if that would be cheaper than cooking in the afternoon. Further, we calculate the cost reduction for an individual household from shifting load. In line with Allcott (2011), we find very small gains; roughly 2-5% daily cost decrease from shifting load up to 7 hours ahead. It's important to point out that given the above mentioned restrictions such load shifting should be unrealistic but provide a best case scenario.

Our estimation results have important implications for Swedish energy policy, in particular for the government's stated goal of real-time pricing. Starting from October 1st 2012, every household in Sweden has the right to have real time pricing. The success of real time pricing depends heavily on demand response which, our results indicate, are unlikely to be large without modest investments in technology and a substantial focus on it from the retailers, who appear to have little to gain from this switch, at least in the short run.

Finally, future work will explore how households choose electricity contracts. As this decision problem involves uncertainty (e.g. about future prices), this work will likely focus on risk-aversion but also on other determinants of contract choice.

Keywords: Electricity demand, dynamic pricing, risk-aversion.

THE ROLE OF NUCLEOTIDE EXCISION REPAIR FACTORS IN RESISTANCE TO NUCLEOSIDE ANALOGUES

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Abstract

The Nucleoside Analogue (NA) Gemcitabine (2', 2'-difluorodeoxycytidine; dFdC) is a clinically important cancer drug that is used in the treatment of solid tumours (including pancreatic, metastatic breast, ovarian and non-small cell lung cancer (Bergman, Pinedo, & Peters, 2002)). Gemcitabine is similar to deoxycytidine (the naturally occurring nucleotide), in that after phosphorylation to its triphosphate (TP) form, dFdCTP competes with dCTP for integration into DNA during DNA replication and acts as a elongating chain terminator, inhibiting further replication (Prakasha Gowda, Polizzi, Eckert, & Spratt, 2010). For a cell to survive treatment with this drug, the modified nucleotide needs to be removed from the DNA to allow replication restart. It remains largely unknown which DNA repair pathways are responsible for the removal of NAs from DNA. The nucleotide excision repair (NER) pathway may be one mechanism that is used for gemcitabine removal from the genome.

NER is responsible for removing bulky adducts from the DNA strand, particularly those caused by UV radiation, such as 6-4 photoproducts, or cyclopyrimidine dimers (Vermeulen, 2011). NER is an extremely orchestrated process which is carried out by no less than 30 proteins, with a core set of 7 proteins, termed XPA to G, that are responsible for the main mechanism. The whole NER mechanism can be broken down into the steps of recognition of damage, confirmation of damage, excision of the lesion, followed by repair and ligation of the strand. NER can be further categorised into global NER (GG-NER) where damage is recognised by surveillance of the whole genome, or transcription coupled NER (TC-NER) where the damage is detected by the stalling of polymerases, either in replication or transcription (Kamileri, Karakasilioti, & Garinis, 2012).

Genetic deficiency NER causes the condition termed Xeroderma Pigmentosum (XP). Patients with this condition have extreme sensitivity to UV light and have x1000 incidence of skin cancers (Ahmad & Hanaoka, 2008; Rezvani et al., 2010). Work here uses fibroblasts from patients with Xeroderma pigmentosum, to investigate the mechanisms within NER, in both structural and enzymatic requirements of each NER protein, to determine their role in the removal of nucleoside analogues from the DNA. The resistance of some cancers to chemotherapeutic attack is often a result of the work done by such DNA repair pathways, therefore understanding the repair pathway that offers resistance to various drugs is essential for optimising treatment for individual cancers.

REFERENCES

- [1] Ahmad, S. I., & Hanaoka, F. (2008). Molecular mechanisms of xeroderma pigmentosum. *Advances in Experimental Medicine and Biology*, 637, vii–xiv.
- [2] Bergman, A. M., Pinedo, H. M., & Peters, G. J. (2002). Determinants of resistance to 2', 2'-difluorodeoxycytidine (gemcitabine). *Drug Resistance Updates*, 5, 19–33.
- [3] Kamileri, I., Karakasilioti, I., & Garinis, G. a. (2012). Nucleotide excision repair: new tricks with old bricks. *Trends in Genetics: TIG*, 1–8.
- [4] Prakasha Gowda, a S., Polizzi, J. M., Eckert, K. a, & Spratt, T. E. (2010). Incorporation of gemcitabine and cytarabine into DNA by DNA polymerase beta and ligase III/XRCC1. *Biochemistry*, 49(23), 4833–40.

- [5] Rezvani, H. R., Mazurier, F., Morice-Picard, F., Jouary, T., Cario-André, M., Ged, C., ... Taïeb, A. (2010). Xeroderma pigmentosum: clues to understanding cancer initiation. *Dermatologica Sinica*, 28(3), 93–101.
- [6] Vermeulen, W. (2011). Dynamics of mammalian NER proteins. *DNA Repair*, 10(7), 760–71.

ADVANCING FRESHWATER BIOMONITORING IN THE UK, USING DNA BARCODING AND NEXT GENERATION SEQUENCING

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Abstract

Freshwater biomonitoring using macroinvertebrates as ecological indicators is a well-established method of ecosystem health assessment. Traditional biomonitoring applications employ morphological identification of species, which is very labour intensive and in many cases lacking in accuracy and speed [1]. Recent advances in molecular analysis though, like DNA Barcoding and Next Generation Sequencing (NGS) have allowed for these techniques to be employed for the identification of species. DNA barcoding of freshwater macroinvertebrates can increase the accuracy and resolution of identification which in turn can increase the efficiency and accuracy of ecosystem health assessment in applied biomonitoring [2]. At Bangor University, alongside the Environment Agency (EA) we are producing a comprehensive DNA barcoding library for 180 species of Trichoptera, Mollusca and Chironomidae from UK lakes and rivers, aiming to provide more information for the direct application of molecular methods in freshwater biomonitoring. The Chironomidae family of non-biting midges in particular, represent an excellent group for ecosystem assessment due to their huge capacity to act as indicator species and their extensive species diversity [3]. Furthermore, we are using Environmental DNA (eDNA), extracted directly from water samples, to detect the presence and temporal variation of chironomids as well as reconstruct ecological networks inside a Welsh lake ecosystem. By performing NGS of eDNA and bulk invertebrate samples, alongside sequence information from our Barcoding library, we are testing a faster, more accurate and less labour intensive method of ecosystem health assessment.

Keywords: Biomonitoring, Next Generation Sequencing, Environmental DNA (eDNA), Chironomidae, macroinvertebrates.

REFERENCES

- [1] Friberg N., et al. (2011). Biomonitoring of human impacts in freshwater ecosystems: the good, the bad and the ugly. *Advances in ecological Research* **44**, 1-68.
- [2] Pfrender M.E, et al. (2010). Assessing macroinvertebrate biodiversity in freshwater ecosystems: advances and challenges in DNA-based approaches. *The Quarterly Review of Biology* **85**, 319-340.
- [3] Ruse, L. (2010). Classification of nutrient impact on lakes using the chironomid pupal exuvial technique. *Ecological Indicators* **10**, 594-601.

TECHNOLOGY FOR ENVIRONMENTALLY FRIENDLY PRECIOUS METAL EXTRACTION FROM WASTE PCB

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Abstract

A successful study has shown that the potential for a highly viable two stage metal recovery process is possible provided the processes can be validated for PCB metal extraction. This project investigates and confirms the specific conditions of each stage. The process involves a series of linked operations from powdering of PCB, right through to metal recovery. The overall metal extraction process is commercially sensitive; therefore, certain areas of the project cannot be disclosed at present due to potential development of IP. The development of this process will promote more environmentally friendly resource recovery and recycling within the WEEE sector.

Keywords: PCB, thiourea, precious metals, recovery.

Introduction

The rapid development of Electrical and Electronic Equipment (EEE) has revolutionised the electronics industry. Printed circuit boards (PCBs) are an integral part of all EEE such as mobile phones, computers and home entertainment equipment. WEEE is the waste from discarded electrical and electronic products. The recycling systems associated with WEEE are far from optimised when it comes to the recovery of precious metals [1]. Recycling has an essential role in the life cycle of all EEE because it: conserves natural resources; reduces energy, water consumption and land use from metal acquisition and production; reduces inappropriate, hazardous waste management of WEEE and contributes to supply security.

The typical metal scrap in PCB consists of the base metals Cu (20%), Fe (8%), Sn (4%), Ni (2%), Pb (2%) and Zn (1%) and precious metals Ag (0.2%), Au (0.1%) and Pd (0.005%) [2]. The economic driving force for WEEE recycling is from the recovery of precious metals and the large fraction of copper from PCB [3]. Gold alone account for over 80% of the total value of materials associated with electronic waste [4].

Experimental

The dissolution process of precious metals using thiourea is the primary area of research. The behaviour of metals in solutions is studied and the effect of thiourea concentration, pH and Fe(III) sulphate on the dissolution processes. A High Performance Particle Sizer and Atomic Absorption Spectrometer are used to characterise solutions and provide information for subsequent processing.

As a two stage metal recovery process, the work will then investigate copper leaching from waste PCB. A grinder will be purchased to pre-treat the PCB components down to an optimal powder size in order to allow efficient copper leaching. Further stages will then result in purified metal solids. This will form the second part of the project work package to enable a review of the overall process efficiency and to optimise each operation within the two-part process.

Results to date

Experimental work has begun on the dissolution processes; however, limited results have been obtained at this stage.

REFERENCES

- [1] Zeng X, Zheng L, Xie H, Lu B, Xia K, Chao Kea. (2012). Current Status and Future Perspective of Waste Printed Circuit Boards Recycling. *Procedia Environmental Sciences* 16, pp. 590-7.
- [2] He W, Li G, Ma X, Wang H, Huang J, Xu Mea. (2006). WEEE recovery strategies and the WEEE treatment status in China. *Journal of Hazardous Materials* 136(3), pp. 502-12.
- [3] Guo, J.; Guo, J.; Xu, Z. (2009). Recycling of non-metallic fractions from waste printed circuit boards: A review. *Journal of Hazardous Materials* 168, pp. 567-590.
- [4] Einstein, A. (1916). General Theory of Relativity. *Annalen der Physik* 49(7), pp. 769-822.

NOVEL APPROACHES TO THE NON-INVASIVE TREATMENT AND SYMPTOM QUANTIFICATION OF RAYNAUD'S DISEASE: COMPARISON OF HEAT RETENTIVENESS OF MATERIALS AND USE OF INFRARED THERMOGRAPHY AND WARMTH PROVOCATION TESTING

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Abstract

Raynaud's disease is a disorder affecting the perfusion of blood in the microcirculatory system, particularly affecting the hands and feet¹. It affects approximately 10% of the population, and symptom severity can range from mild to severe depending on the cause². Research focuses on testing using cold-provocation and measuring vascular change, and only one known research study has been completed to test a specific Raynaud's glove against a placebo³.

The goal of the project is to provide tested and trialled gloves to people with Raynaud's disease; with the intention of reducing severity of symptoms. Potential sites in the gloves for further intervention (such as heated elements) are being investigated based on anatomical sites of vascular insufficiency; as described by the use of infrared image analysis following symptom provocation.

The project to date has involved two major components:

1. Materials have been sourced and tested for heat-retentiveness, by using calibrated temperature sensors and comparing the changes in temperature inside a given material, over a period of 150 minutes. Sodium-acetate phase change heat pads were used as the heat source. This aspect of the project compared a total of 11 different materials and combinations of materials, over a total of 72 tests. The benefits of this experiment were twofold: firstly the project company sponsor (TONUS Europe) received a report based on the materials tested, with a view to manufacturing Raynaud's gloves; secondly a new methodology was developed, which can be reproduced to test any future materials. The conclusion from this experiment was that whilst combining materials was more effective than most materials alone, some materials outperformed the combinations; more study is warranted. More materials have been sampled, and Raynaud's gloves have been given to participants, and are proving to be beneficial, particularly the most recent layered gloves containing reflective membranes given to participants early 2014.

2. Subjects (n=6, 4m, 2f) were invited to take part in an ethically approved pilot study to visualise the effects of warmth provocation on the hands. Temperatures were recorded using Infrared thermography with off-line analysis. Temperature measurements were taken from the dorsal nail bed to the dorsal metacarpophalangeal joint: the latter was subtracted from the former to give the "distal-dorsal-difference" (DDD). DDD is a standard measurement used in previous cold provocation studies, and a temperature difference equal to or greater in a negative direction than -1°C is positive for Raynaud's disease. 2 of the female subjects indicated a history of symptoms of extreme coldness with regular numbness in the fingers, but had never been given a medical diagnosis of Raynaud's disease. Results indicated that the two subjects with potential Raynaud's had a different recovery profile to those who reported no problems with their hands. These 2 subjects also experienced a larger DDD, in a negative direction, after a period of more than 5 minutes following the warmth provocation. The results of this study warranted further investigation with modifications to the timing of measurement both pre and post-stimulation. The results of the pilot study were been accepted for inclusion at the International Union of Physiological Sciences (IUPS) conference 2013 for poster presentation. A total of 120 subjects have now been tested, including heat/cold comparison studies, as well as cross-over studies. This data is currently being analysed and we are looking towards a minimum of 3 publications, and thesis submission for PhD.

REFERENCES

- [1] Kim, Y.H., Siew-Weng, Ng., Heung, S.S. and Hee, C.A. (2011). Classification of Raynaud's Disease Based on Angiographic Findings. *Journal of Plastic, Reconstructive and Aesthetic Surgery*, xx: 1-9.
- [2] Silman, A., Holligan, S., Brennan, P., Maddison P. (1990). Prevalence of Symptoms of Raynaud's Phenomenon in General Practice. *BMJ*, 301: 590-592.
- [3] Anderson, M.E., Moore, T.L., Lunt, M. And Herrick, A.L. (2006). The 'Distal-Dorsal Difference': a Thermographic Parameter by Which to Differentiate Between Primary and Secondary Raynaud's Phenomenon. *Rheumatology*, 46: 533-538

DETECTION OF RESPIRATORY DISEASE BY EXHALED BREATH METABOLIC PROFILING USING ION MOBILITY SPECTROMETRY

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Abstract

Human breath analysis is a powerful non-invasive technique for the rapid identification of gas-phase analytes that reflect the metabolic activity of the body [1-5]. Ion Mobility Spectrometry coupled with a Multi Capillary Column (MCC/IMS) allows exhaled breath to be rapidly analysed and characterised with great precision. This technique, never used in the UK before, is quick and simple to use in the clinical setting. Successful studies have shown that diseases can be identified with high specificity and sensitivity, continuously reiterating the massive potential of breath analysis as a tool in the medical field.

However, these studies, while rigours in their science, are not always easily transferable into the clinical or multi-clinical setting. This paper reflects on a respiratory study, carried out in a 'true' clinical setting, which identifies the main issues of translation of breath analysis into everyday clinical use. Conducted in different health Trusts within the National Health Service (NHS) in the UK, this study identifies issues surrounding ethics, patient access, patient pathway and diagnosis.

150 patients with respiratory disease, in three different clinical settings, participated in the study. The high number of participants reflects the numerous compounding factors relating to complex physiological mechanisms and the limitations of the clinical setting. The respiratory data are compared to control data taken from 150 healthy participants of the general public. This study highlights how breath analysis as a diagnostic tool can be translated into the NHS, and illustrates appropriate approaches for patient contact within the clinical setting. It has bridged the gap between effective laboratory research and clinical utility and is the first step towards a multi centred national trial using breath analysis.

Keywords: Breath analysis, clinical utility, MCC/IMS, NHS

REFERENCES

- [1] Baumbach JI. (2009). Ion mobility spectrometry coupled with multi-capillary columns for metabolic profiling of human breath. *Journal of Breath Research* 3(4):1-16.
- [2] Baumbach JI, Vautz W, Ruzsanyi V, and Freitag L. (2005). *Metabolites in human breath: ion mobility spectrometers as diagnostic tools for lung diseases*. World Scientific Publishing Co. Pte. Ltd. pp 53-66.
- [3] Buszewski B, Keszy M, Ligor T, and Amann A. (2007). Human exhaled air analytics: biomarkers of diseases. *Biomedical Chromatography* 21(6):553-566.
- [4] de Lacy Costello B, Amann A, Al-Kateb H, Flynn C, Filipiak W, Khalid T, Osborne D, and Ratcliffe NM. (2014). A review of the volatiles from the healthy human body. *Journal of Breath Research* 8(1):014001.
- [5] Ruzsanyi V, Baumbach J, Sielemann S, Litterst P, Westhoff M, and Freitag L. (2005). Detection of human metabolites using multi-capillary columns coupled to ion mobility spectrometers. *Journal of Chromatography A* 1084(1-2):145-151.

THE ECONOMIC ASPIRATIONS OF YOUNG PEOPLE IN WALES

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Abstract

Using the 'perceived', 'conceived' and 'lived' spaces of the Lefebvrian trialectic as a starting point this research questions the influence that social and spatial practices have on young people in Wales and the young people's economic aspirations in the 'present' as well as their conceptualization of their 'future selves'.

Focusing on the notion of 'economic aspirations' it asks questions around the concrete, physical spaces young people inhabit (the perceived), the impact of education and economic policies (the conceived) and their actual day-to-day experiences (the lived). The success - or otherwise - of society's engagement with youth is often highlighted most starkly in deprived areas. Where policies developed at the macro scale seemingly have little relevance - let alone positive impact - at the micro level and physical spaces are often run-down, neglected, fragmented and fragmenting.

The isolation and lack of opportunity in these areas contrast starkly with the aspirations found amongst the 13-15 year olds who form an energetic if often misunderstood and marginalised part of these communities. (Joseph Rowntree Foundation Report, 2011) The methods employed have involved focus groups with young people in education and training and interviews with local practitioners and professionals working with young people, and national level policy-makers and stakeholders in the statutory, voluntary and business sectors.

Keywords: Young People, Aspirations, Human Geography, Education, Employment, Economy, Identity, Citizenship, Futures.

REFERENCES

- [1] Aalberts, T. (2004) The Future of Sovereignty on Multilevel Governance Europe – A Constructivist Reading, *Journal of Common Market Studies*, 42:1, pp.23-46
- [2] Alderson, P. & Morrow, V. (2004) *Ethics, social research and consulting with children and young people*, Ilford:Barnardo's
- [3] Andolina, M., Jenkins, K., Keeter, S. & Zukin, C. (2002) Searching for the Meaning of Youth Civic Engagement: Notes From the Field, *Applied Developmental Science*, 6:4, pp. 189-95.
- [4] Andrews, R. & Lewis, G. (2000) Citizenship education in Wales: community, culture and the Curriculum Cymreig, paper presented at the British Educational research Association Conference, cardiff University, 7-10/09/2000, www.leeds.ac.uk/educol/documents/00001571.htm (accessed 08/01/13)
- [5] Archard, D. (2002) *Children: Rights and Childhood*, Padstow:Routledge
- [6] Arnot, M. (1997) 'Gendered Citizenry': New Feminist Perspectives on Education and Citizenship, *British Educational Research Journal*, 23:3, pp. 275-95.
- [7] Betts, S.L., (2006) "A Few Hours a Week": Charity Shop Volunteering, Social Capital and Civil Society in Wales', in Day, G., Dunkerley, D. & Thompson, A., (eds) *Civil Society in Wales*, Wiltshire:University of Wales Press, pp.125-144

- [8] Brubaker, R. (2002) Ethnicity Without Groups, *The Selected Works (sic) of Roger Brubaker*, <http://works.bepress.com/wrb/7> (accessed 27/11/12) University of California, Los Angeles.
- [9] Bullen, A. & Whitehead, M. (2005) Negotiating the Networks of Space, Time and Substance: A Geographical Perspective on the Sustainable Citizen, *Citizenship Studies*, 9:5, pp.499-516.
- [10] Casey, E. (2008) Comments on "Theorizing sociospatial relations", *Environment and Planning D: Society and Space*, 26, pp. 402-4.
- [11] Chambers, I. (2002) Citizenship, Language and Modernity, *Publications of the Modern Language Association*, 117:1, pp. 24-31.
- [12] Communities and Local Government Analysis and Discussion paper (2008) *Aspiration and attainment amongst young people in deprived communities*, Department for Children, Schools and Families.
- [13] Crouch, D. (2001) Spatialities and the feeling of doing, *Social & Cultural Geography*, 2:1, pp. 61-75.
- [14] Davidson, J. (2003) Editorial - The Challenge of Education for Sustainable Development and Global Citizenship in Wales, *Journal of Geography in Higher Education*, 27:3, pp. 235-38.
- [15] Davies, C. & Dunkerley, D. (2006) Young People, Identity and Citizenship, in Day, G., Dunkerley, D. & Thompson, A. eds. (2006) *Civil Society in Wales*, Wiltshire: University of Wales Press
- [16] De Blij, H. (2010) *The Power of Place*, USA:Oxford University Press
- [17] Desforges, L., Jones, R. & Woods, M. (2005) New Geographies of Citizenship, *Citizenship Studies*, 9:5, pp.439-51.
- [18] Devine, D. (2002) Children's Citizenship and the Structuring of Adult-child Relations in the Primary School, *Childhood*, 9, pp. 303-20.
- [19] Drainville, A. (1995) Of Social Spaces, Citizenship, and the Nature of Power in the World Economy, *Alternatives: Global, Local, Political*, 20:1, pp. 51-79.
- [20] Drummond, L. & Peake, L. (2005) Introduction to Engin Isin's *Being Political: Genealogies of Citizenship*, *Political Geography*, 24, pp. 341-3.
- [21] Edwards, B., Goodwin, M. & Woods, M. (2003) Citizenship, community and participation in small towns: a case study of regeneration partnerships, in Imrie, R. & Raco, M. eds. (2003) *Urban Renaissance? New Labour, community and urban policy*, Bristol: Policy Press, pp.181-204.
- [22] Elden, S., (2001) *Mapping the Present: Heidegger, Foucault and the Project of Spatial History*, Bodmin:Continuum
- [23] Elden, S., (2004) *Understanding Henri Lefebvre*, Bodmin:Continuum
- [24] Frändberg, L. (2008) Paths in Transnational Time-space: Representing Mobility Biographies of Young Swedes, *Geografiska Annaler B*, ***
- [25] Green, A.E. & White, R.J. (2007) *Attachment to place: Social networks, mobility and prospects of young people*, Joseph Rowntree Foundation, www.jrf.org.uk - printed copy given to me so no access date
- [26] Gregory, D., Johnston, R., Pratt, G., Watts, M.J. & Whatmore, S., (eds) (2010) *The Dictionary of Human Geography*, Singapore:Wiley-Blackwell

- [27] Gutman, L.M. & Akerman, R. (2008) *Determinants of Aspirations*
- [28] Guarneros-Meza, V., Martin, S., Downe, J. & Entwistle, T. (2010) Understanding citizen engagement in Wales: a governmentality approach, paper presented at the Political Studies Association Annual Conference Edinburgh 31st March - 2nd April 2010, Centre for Local & Regional Government Research, Cardiff University.
- [29] Gutman, L.M. & Akerman, R. (2008) *Determinants of Aspirations*,
- [30] Hacking, I. (2004a) *Historical Ontology*, USA: Harvard University Press.
- [31] Hacking, I. (2004b) Between Michel Foucault and Erving Goffman: between discourse in the abstract and face-to-face interaction, *Economy and Society*, 33:3, pp. 277-302
- [32] Hinchliffe, S. (2000) 'Introduction', in Hinchliffe, S. & Woodward, K., (eds) *The Natural and the Social: uncertainty, risk, change*, Bath:Routledge, pp.1-5
- [33] Isin, E. (2002) *Being Political*, USA: University of Minnesota Press.
- [34] Isin, E. (2004) The Neurotic Citizen, *Citizenship Studies*, 8:3, pp.217-35.
- [35] Jackson, T. (2010) *Prosperity Without Growth*, UK:Earthscan
- [36] Jessop, B., Brenner, N. & Jones, M. (2008) Theorizing sociospatial relations, *Environment and Planning D: Society and Space*, 26, pp. 389-401.
- [37] Jones, M. (2009) Phase space: geography, relational thinking, and beyond, *Progress in Human Geography*, 33:4, pp. 487-506
- [38] Jones, G. & Wallace, C. (1992) *Youth, Family and Citizenship*,
- [39] Kearns, A. (1995) Active citizenship and local governance: political and geographical dimensions, *Political Geography*, 14:2, pp. 155-75.
- [40] Kellerman, A. (1989) *Time, Space, and Society: Geographical Societal Perspectives*, Dordrecht: Kluwer Academic Publishers.
- [41] Kintrea, K., St Clair, R. & Houston, M. (2011a) *The influence of parents, places and poverty on educational attitudes and aspirations*, accessed www.jrf.org.uk
- [42] Kintrea, K., St. Clair, R. & Houston, M. (2011b) *The influence of parents, places and poverty on educational attitudes and aspirations*, Findings Document, accessed www.jrf.org.uk
- [43] Kofman, E. (1995) Citizenship for some but not for others: spaces of citizenship in contemporary Europe, *Political Geography*, 14:2, pp.121-37.
- [44] Marinetto, M. (2003) Who wants to be an Active Citizen?: The Politics and Practice of Community Involvement, *Sociology*, 37, pp. 103-20.
- [45] Massey, D. (1999) Space-time, 'science' and the relationship between physical geography and human geography, *Transactions of the Insitute of British Geographers*, 24, pp.261-76.
- [46] Massey, D. (2004) 'Geographies of Responsibility', *Geografiska Annaler*,
- [47] Massey, D. (2006) *For Space*, London: Sage Publications.

- [48] Matthews, H. & Tucker, F. (2006) On the other side of the tracks: the psychogeographies and everyday lives of rural teenagers in the UK, in Spencer, C. & Blades, M. eds. (2006) *Children and their Environments: Learning, Using and Designing Spaces*, New York: Cambridge University Press.
- [49] McCann, E. (2002) Space, citizenship, and the right to the city: A brief overview, *GeoJournal*, 58, pp. 77-9.
- [50] Merrifield, A. (1993) 'Place and space: a Lefebvrian reconciliation', *Transactions of the Institute of British Geographers*, 18:4, pp.516-531
- [51] Mills, S. (2013) 'An instruction in good citizenship': scouting and the historical geographies of citizenship education, *Transactions of the Institute of British Geographers*, 38, pp. 120-34
- [52] Mooney, G. & Williams, C. (2006) Forging ne 'ways of life'? Social policy and nation building in devolved Scotland and Wales, *Critical Social Policy*, 26, pp. 608-29.
- [53] Painter, J. & Philo, C. (1995) Spaces of citizenship: an introduction, *Political Geography*, 14:2, pp. 107-20.
- [54] Papanek, V. (2004) *Design for the Real World*, China:Thames & Hudson
- [55] Phillips, J., (2004) 'Laws, contingencies, irreversible divergence and physical geography', *Professional Geographer*, 56, pp.37-43
- [56] Pred, A. (1996) The choreography of existence: Comments on Hägerstrand's time-geography and its usefulness' in Agnew, J., Livingstone, D. & Rogers, A. eds. (2003) *Human Geography an essential anthology*, Oxford: Blackwell Publishing, pp.637-49.
- [57] Roberts, I. (2007) 'Adolescence', in Zwozdiak-Myers, P. (ed) *Childhood and Youth Studies*, Trowbridge:Learning Matters pp.85-98
- [58] Said, E. (2003) *Orientalism*, London: Penguin Books.
- [59] Scourfield, J., Dicks, B., Drakeford, M. & Davies, A. (2006) *Children, Place and Identity*, Trowbridge:Routledge
- [60] Sherlock, A. & Dunmore, P. (2012) The UN Convention on the Rights of the Child in relation to children's rights in education: from policy to practice in Wales, A Pilot Study undertaken for the Centre for Welsh Legal Affairs, Aberystwyth University.
- [61] Simms, A., (2007) *Tescopoly*, EU:Constable
- [62] Skelton, T. (2000) 'Nothing to do, Nowhere to go?' Teenage girls and 'public' space in the Rhondda Valleys, South Wales, in Holloway, S. & Valentine, G. eds. (2000) *Children's Geographies*, London: Routledge, pp. 80-99.
- [63] Smith, S. (1989) Society, Space and Citizenship: A human Geography for the 'New Times'?, *Transactions of the Institute of British Geographers*, 14:2, pp.144-56.
- [64] Smith, S. (1995) Comment - Citizenship: all or nothing? *Political Geography*, 14:2, pp.190-3.
- [65] Smith, J & Osborn, M. (2008) 'Interpretative Phenomenological Analysis', *Qualitative Psychology: Practical Guide to Research Methods*, Smith, J (ed.) pp.53-80, London:Sage
- [66] Somers, M. (1994) 'The narrative constitution of identity: A relational and network approach, *Theory and Society*, 23, pp. 605-49.
- [67] Staeheli, L. (1999) Globalization and the Scales of Citizenship, *Geography Research Forum*, 19, pp. 60-77.

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- [68] Staeheli, L. (2008) Citizenship and the problem of community, *Political Geography*, 27, pp. 5-21.
- [69] Thomson, R., Holland, J., McGrellis, S., Bell, R., Henderson, S., & Sharpe, S. (2004) Inventing adulthoods: a biographical approach to understanding youth citizenship, *The Sociological Review*, pp.218-39.
- [70] Tillich, P. (2000) *The Courage to Be*, USA:Yale Nota Bene
- [71] Tonge, J. & Mycock, A. (2010) Citizenship and Political Engagement AMong Young People: The Workings and Findings of the Youth Citizenship Commission, *Parliamentary Affairs*, 63:1, pp.182-200.
- [72] Tuan, Y. (1975) 'Images and Mental Maps', *Annals of the Association of American Geographers*, 65:2, pp.205-213
- [73] Valentine, G. (2003) Boundary Crossings: Transitions from Childhood to Adulthood, *Children's Geographies*, 1:1, pp. 37-52.
- [74] Wales Rural Observatory (2007) *Small and Market Towns in Rural Wales and their Hinterlands*, Research Report 13, Welsh Government, Cardiff University and Aberystwyth University.
- [75] Wearing, M. (2011) Strengthening youth citizenship and social inclusion practice - The Australian case: Towards right based and inclusive practice in services for marginalized young people, *Children and Youth Services Review*, 33, pp.534-40.
- [76] Welsh Government (2012) *Children's Rights Scheme*. ***
- [77] Wilkinson, R. & Pickett, K. (2010) *The Spirit Level*, St. Ives:Penguin
- [78] Wood, J. (2010) 'Preferred Futures': Active Citizenship, Government and Young People's Voices, *Youth & Policy*, 105, pp.50-70.
- [79] Wood, A. & Roberts, S. (2011) *Economic Geography: Places, networks and flows*, Abingdon: Routledge.
- [80] Žižek, S. (2000) *The Ticklish Subject*, London: Verso.

THE ROLE OF ESTUARINE SEDIMENTS AS A RESERVOIR FOR PATHOGENIC MICROORGANISMS

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Abstract

Anthropogenic activity resulting from agriculture, storm water discharge and sewage treatment has a significant impact upon the transport of human microbial pathogens from catchment to coast (Hong *et al.*, 2010). In addition as the global climate changes and storm and flood events become more frequent an increase in rainfall will significantly impact the transportation of microbial pathogens into the coastal zone (GESAMP 70, 2001). It is imperative that we understand how the increased flow of microbial pathogens will affect the environment and subsequently human health. The role of sediments as a reservoir of microbial pathogens is a new and novel aspect to the story of microbial pollution in rivers, estuaries and coastal habitats. By using a suite of multi-disciplinary techniques pathogen concentrations within sediments can be assessed. Molecular and culture-based methods will be used to determine pathogen load, viability, community composition and interaction with sediments in order to characterise the mechanisms that underpin the transport and persistence of pathogens in the Conwy catchment.

Keywords: Sediments, pathogen, faecal indicator bacteria, estuary.

REFERENCES

- [1] GESAMP. (2001). The sea of troubles. GESAMP Rep. Stud. 70:19-20.
- [2] Hong, H., Qiu, J. and Liang, Y. (2010). Environmental factors influencing the distribution of total and fecal coliform bacteria in six water storage reservoirs in the Pearl River Delta Region, China. *J Environ Sci (China)* 22(5), pp. 663-668

THE FOUNDATION PHASE CURRICULUM, ENGAGING CHILDREN IN LEARNING: A HEALTH PERSPECTIVE

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Abstract

The Foundation Phase curriculum of education in Wales, for children aged three to seven years was introduced in 2007. The Foundation Phase differs in many respects to the previous curriculum, the most significant of which are the substantially increased use of outdoor and experiential learning techniques. However it was highlighted in an evaluation of the Foundation Phase that there is currently a lack of knowledge as to the impacts of the new scheme, thus calling for investigation with specific need to explore the impacts on children's learning, development and health (Welsh Government 2013¹). In an aim to address this need, the study presented herein explored the health impacts of the teaching methods adopted under the Foundation Phase curriculum of education in Wales, for children aged three to seven years. The project took a dual approach to the investigation. First, it provided a detailed analogy of teacher perceptions and experiences through the employment of teaching methods as set out by the Foundation Phase curriculum. Second, it explored children's physical activity and engagement within different teaching settings as encouraged by the Foundation Phase. Physical activity was measured with the use of pedometers and engagement was measured using the Child Engagement Questionnaire (McWilliam, 1991²). Together, these investigations provide a systematic analysis of the health related benefits of the Foundation Phase in a relatively large Welsh Primary school, and a qualitative account of teacher experience on the current curricula. These two aspects of the current study have been investigated separately, however, the findings of teachers' experience serve to provide understanding and context to the quantitative results. Experimental tasks were designed in line with the Foundation Phase curriculum of education and relevant expected outcomes for numeracy. These tasks were conducted with children from Nursery to Year 2 during indoor and outdoor sessions. Numeracy was not a topic of investigation in the current study but served to provide a comparable area of study across locations and year groups. Physical activity and Engagement scores were recorded and statistical analyses found a significantly higher level of physical activity outdoors, while the indoor location provided a higher level of task-directed individual engagement. Further results were also found in relation to impacts of economic background and subcomponents of engagement, which raise questions as to the complexities of engagement in an educational context. These results demonstrate the importance of the continued use of indoor and outdoor locations for learning as part of the Foundation Phase, and demonstrate a holistic approach to learning that provides a variety of health benefits for children in Wales.

Keywords: Holistic, early years, education, health, engagement, physical activity, outdoor learning.

REFERENCES

- [1] Welsh Government. Department of Knowledge and Analytical Services. (2013). *Evaluating the Foundation Phase: Policy Logic Model and Programme Theory*. Retrieved from <http://wales.gov.uk/docs/caecd/research/130318-evaluating-foundation-phase-policy-logic-model-programme-theory-en.pdf>
- [2] McWilliam, R. A. (1991). Children's Engagement Questionnaire (CEQ). Unpublished Instrument. Available from <http://www.siskin.org/downloads/ChildEngageQuestionnaire.pdf>

WHAT IS THE FUTURE BUSINESS MODEL FOR IMPROVED DIGITAL MUSIC MARKETING AND SALES; THAT WILL ENABLE THE MOST EFFICIENT METHOD OF ENGAGEMENT WITH CONSUMERS OF MINORITY LANGUAGE, NICHE MUSIC PRODUCTIONS FROM SME COMPANIES?

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Abstract

For over a decade the music industry has been in a state of flux. Whilst there has always been challenges facing the fair, legal and ethical distribution of music; the introduction of online downloading sped up the pirating process and added a new dimension to the ease with which it could be conducted. Moving online, ensuring that all consumers made the transition, and allowing music to enter the unknown market place with less control and higher risks, was a challenge for record companies of all sizes. However, this study identifies ways of capitalising on new opportunities in order to ensure a stable and successful music Welsh industry for the future, despite the initial difficulties. This study also looked at other media industries to assess whether the Welsh music industry can adapt or adopt new techniques for digital distribution and marketing.

The music industry has continually evolved since the earliest recordings of musical works on wax cylinder recordings (Carboni, 2012). However, at each stage of the change it has been controlled and governed by music industry leaders. When Mp3 as a file format arrived on the market in the late 1990's it was not done via consultation with the industry, and rather than embracing the new technology, it was feared and dismissed. Napster's launch in 1999 it brought the Mp3 format to the mass market, offering free transfer of music files to its service users. Napster became the fastest downloaded software with the number of downloads running into billions of tracks a year (Rutter, 2010). The music industry was not responsible for the compressed music file technology and its development happened before the industry was able to develop a business strategy to exploit its potential.

Music streaming, downloading, file sharing, social media applications have all become methods of music consumption. There has never been an easier time for music consumers to find, download or listen to music (Fischbeck, 2000). However whilst there are many advantages to these models for the consumer, there is very little structure to safeguard the products (Zentner 2006). Music producers fear that without a presence on music websites such as Spotify, We7 or SoundCloud their music will not be discovered, used or bought by anyone. This is counter argued by Cardew who claims that Spotify is 'not worth bothering with' (Cardew, 2011). However due in large to the oligopoly that the technology companies have obtained, it is difficult for production companies to secure a digital contract that works in their favour. This power struggle is not restricted to the music industry. The power of such market oligopolisation was evident with the contract that Google Books created in 2008. Very few publishers were consulted on the processes; however the worldwide influence of Google allowed them to continue with their own agenda (Sudler, 2012). The position for consumers looking for digital books is favourable; however for publishers they face a similar predicament to the music industry. Today's music industry, not only in Wales, but globally is showing a continued decline in individual revenue, a decline in physical sales and a downturn in music downloads.

This study uses a mixed methods approach to methodology. The surrounding literature is reviewed covering copyright law, consumer behaviour and psychology, piracy and digital business models for e-commerce. Approaches taken by other media industries are also reviewed. This gained epistemology is used to generate a consumers survey to be qualitatively analysed using Pearson's Chi Squared tests to measure significance. Prior studies have considered either producers or consumers perspectives whereas this study evaluates both perspectives in order to generate a sustainable and viable solution. This study comes at an exciting time for music in Wales. Due to changes that are happening to improve revenue from royalties for music play in Wales; the development of a new Welsh collection society combined with an improved business model will see Welsh music secure a sustainable future (Y Gynghrair). This study contributes to the discussion on how to monetise the activities surrounding the music industry in Wales.

Keywords: Technology, music, copyright, consumer behaviour, piracy, business models, digital distribution, e-commerce.

REFERENCES

- [1] Carboni, M., 2012. The classical music industry and the future that digital innovations can bring to its business models.
- [2] Cardew, B., 2011. Music Week - Music Week - Music business magazine - "Spotify is not worth bothering with": The debate rages on. Available at: <http://www.musicweek.com/story.asp?sectioncode=1&storycode=1047507&c=1> [Accessed November 17, 2011].
- [3] Fischbeck, B., 2000. Digital Music Business Models. e-Business II.
- [4] Rutter, J., 2010. Consumers, crime and the downloading of music. Prometheus 28, 411–418.
- [5] Sudler, H., 2013. Effectiveness of anti-piracy technology: Finding appropriate solutions for evolving online piracy. Business Horizons 56, 149–157.
- [6] Y Gynghyair, n.d. Gwybodaeth | Y Gynghrair [WWW Document]. URL <http://ygyngghrair.com> (accessed 4.28.14).
- [7] Zentner, A., 2006. Measuring the Effect of File Sharing on Music Purchases. Journal of Law and Economics 49, 63–90.

MATURATION, PLAYER CHARACTERISTICS AND PLAYER DEVELOPMENT IN U15 JUNIOR RUGBY IN WALES

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Abstract

INTRODUCTION:

Rugby Union requires players of various body types to fulfil a range of roles within the team. For instance, forwards are typically heavier, with greater lean tissue mass, fat mass and stature than backs [3]. Rugby is introduced to children from a young age and because of their physical attributes children can be placed into different positions or even miss out on playing and being selected due to their physical capabilities [1]. For short term competitive success more physically mature players have a higher chance of being selected as they are able to physically outperform less physically mature players. As players develop at different rates, levels of physical maturity differ between adolescents of the same chronological age [8]. Thus it is important to account for maturation in player development pathways.

AIM:

To assess the effect of maturation on strength and power and psychological aspects of sub-elite junior rugby players.

METHOD:

The study recruited all players from the U15 Dewar shield squads from 22 districts across Wales (n=590; age=14.8±0.5years; weight=70.3±12.7kg; Height=173.2±7.5cm; Sitting Height=91.0±4.2cm). The anthropometric measures were repeated every 10 players to acquire a Technical Error of Measurement % (TEM%; Height=0.10%; Weight=0.39%; Sitting height=0.41%). These players were grouped (N=10) into positions. Each player was measured for stature, body mass and sitting height [5] and maturation offset (MO) calculated (1.45±0.75years) [8]. The players isometric back and leg strength was assessed using a back and leg dynamometer [2]. Leg power was assessed using a countermovement jump on a force platform [9]. Players also completed a motivational (BREQ-2, [7]) and a sporting life history questionnaire [4]. Player's post codes were also noted for deprivation data.

RESULTS:

The players back strength was 106.1±26.2kg, leg strength 121.3±27.9kg and their lower body power output 3344±639W respectively. Pearson correlation coefficient's were used to assess the relationship between MO and power (r=0.67; P<0.05). An ANOVA revealed a significant difference in power between positions (F=p<0.05). A subsequent ANCOVA was used to correct for MO. ANOVA $r^2=0.17$; $F_{9,565} = 12.535$ p<0.001. ANCOVA $r^2=0.47$; $F_{9,564} = 2.695$ p=0.004. The back and leg dynamometer, questionnaires and deprivation data are yet to be analysed.

DISCUSSION:

The significant relationship between leg power and MO is partly driven by circulating androgens [6]. Power was significantly different between playing position. Maturation offset decreased the variance between groups and accounted for 30% of the difference in power between playing positions, making it a significant contribution to power independent of position. The number 8's were most and the scrum halves the least powerful even after correcting for MO. There is limited data on leg power in this age group, on average scores were high.

CONCLUSION:

In conclusion maturation measures are reliable and repeatable as demonstrated by the TEM% scores. Power was significantly related to MO. Level of maturation is an important factor to consider in the player development pathway to develop each individual player. A limitation of the study is that MO is a predictive equation.

Keywords: Maturation, Rugby Union, Sub-elite, Leg Power, back and leg isometric strength, sporting life history, motivation

REFERENCES

- [1] Armstrong, N., McManus, A.M. (2011). *The Elite Young Athlete*. Basel: Karger. pp.17-19.
- [2] Coldwells, A., Atkinson, G., Reilly, T. (1994). Sources of variation in back and leg dynamometry. *Ergonomics*, 37, pp. 79-86.
- [3] Duthie, G., Pyne, D., Hooper, S. (2003). *Applied Physiology and Game Analysis of Rugby Union*. *Sports Medicine*, 33, pp. 973-991
- [4] Ford, P. R., Carling, C., Garces, M., Marques, M., Miguel, C., Farrant, A., et al. (2012). The developmental activities of elite soccer players aged under-16 years from Brazil, England, France, Ghana, Mexico, Portugal and Sweden. *Journal of Sports Sciences*, 30, pp. 1653-63.
- [5] Lohman, T. G., Roche, A. F., Martorell, R. (1991). *Anthropometric standardization reference manual*. Champaign: Illinois.
- [6] Malina R. M., Bouchard C. and Bar-Or O. (2004). *Growth, maturation and physical activity*. 2, Human Kinetics (Champaign, IL).
- [7] Markland, D. & Tobin, V. (2004). A modification of the Behavioral Regulation in Exercise Questionnaire to include an assessment of amotivation. *Journal of Sport and Exercise Psychology*, 26, pp. 191-196.
- [8] Mirwald, R. L., Baxter-Jones, A. D., Bailey, D. A., Beunen, G. P. (2002). An assessment of maturity from anthropometrics measurements. *Medicine and Science in Sports and Exercise*. 34, pp. 689-694.
- [9] Owen, N. J., Watkins, J., Kilduff, L. P., Bevan, H. R., Bennett, M. (Acceptance - 2013). Development of a criterion method to determine peak mechanical power output in a countermovement jump. *Journal of Strength & Conditioning Research*.

CHEMICAL, MICROBIAL AND SENSORIAL ATTRIBUTES OF MODIFIED ATMOSPHERE PACKED MEAT AND FISH PRODUCTS FOR THE DEVELOPMENT OF AN INTEGRATED OPTICAL SENSOR FOR FOOD PACKAGING

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Abstract

The aim of this research project is the development of an optical sensor for integration in packaging films. The sensor will non-destructively detect microbiological and chemical spoilage of food products, and check package integrity by monitoring the CO₂-concentration present in modified atmosphere packages (MAP). Three meat (poultry, beef, pork) and three fish products (cod, pangasius, grey shrimps) will be monitored during shelf-life for microbial growth and volatile organic compounds production. To identify and quantify the latter, GC-MS-SPME and SIFT-MS will be applied. The experiments will be carried out for various gas mixtures and different storage temperatures (4 & 8 °C). Simultaneously, the samples will also be evaluated for their sensorial attributes. All the obtained data will be processed and analysed applying machine learning and multivariate statistical methods.

REFERENCES

- [1] Nosedá, B., Goethals, J., De Smedt, L., Dewulf, J., Samapundo, S., Van Langenhove, H., & Devlieghere, F. (2012). Effect of O₂-CO₂ enriched atmospheres on microbiological growth and volatile metabolite production in packaged cooked peeled gray shrimp (*Crangon crangon*). *International Journal of Food Microbiology*, 160(1), 65–75
- [2] Nosedá, B., Islam, M. T., Eriksson, M., Heyndrickx, M., De Reu, K., Van Langenhove, H., & Devlieghere, F. (2012). Microbiological spoilage of vacuum and modified atmosphere packaged Vietnamese *Pangasius hypophthalmus* fillets. *Food Microbiology*, 30(2), 408–19.
- [3] Olivares, A., Dryahina, K., Španěl, P., & Flores, M. (2012). Rapid detection of lipid oxidation in beef muscle packed under modified atmosphere by measuring volatile organic compounds using SIFT-MS. *Food Chemistry*, 135(3), 1801–8.

ECOLOGICAL ASSESSMENT OF RIVERS IN UGANDA: STUDIES OF BENTHIC MACROINVERTEBRATE USE FOR BIO-MONITORING RIVERS IN THE ALBERTINE RIFT

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Abstract

This river monitoring study was carried out to assess the water quality of three major rivers and tributaries in the Albertine rift namely; Mubuku, Nyamugasani and Nyawambwa using physicochemical parameters and benthic macro invertebrates as biological indicators. Seventy sampling locations were taken along these three rivers and their tributaries. These rivers are important sources for drinking water supply, irrigation, domestic uses, industrial processes, hydroelectric power for Kasese district. Samples were collected and analyzed over a two-month period from February to March, 2014. Macroinvertebrates were collected using standard dip net based on the Rapid Bio assessment Protocols for use in streams and wadeable rivers and identified to Family level. During the study period, a total of 32,579 individuals belonging to 4 phyla, 7 classes, 17 orders and 56 families were collected. Water quality findings based on biotic indices of SASS and ASPT showed that 40 (57.14%) locations were natural (pristine), 15(21.4%) good, 7 (10%) fair or moderate and 8 (11.4%) poor. ASPT and SASS score of the study showed the water quality ranged from natural (pristine) to poor. All 70 locations had EPT taxa. Additionally, 16 physicochemical parameters were measured to determine their effects on benthic macro-invertebrates communities and water quality. These findings highlighted the pollution trends along the sampling locations from upstream to downstream.

Keywords: ecological assessment, macro invertebrates, bio monitoring, water quality, biotic index, Albertine rift.

REFERENCES

- [1] APHA, 1995. Standards methods for the examination of water and wastewater American Public Health Association, 19th edn. Port City Press, Baltimore, Maryland, USA.
- [2] Bain, M. B., Finn, J. T., and Booke, H. E., 1988. Stream flow regulation and fish community structure. *Ecology* 69, 382–92.
- [3] Baptista, D.F., Buss, D.F., Egler, M., Giovanelli, A., Silveira, M.P., and Nessiamian, J. L., 2007. A multimetric index based on benthic macroinvertebrates for evaluation of Atlantic Forest streams at Rio de Janeiro State, Brazil. *Hydrobiologia* 575, 83–94.
- [4] Barbour, M.T., Stribling, J.B., and Karr, J.R., 1995. Multimetric approach for establishing biocriteria and measuring biological condition. pp. 63-77 in W.S. Davis and T.P. Simon (editors). *Biological assessment and criteria. Tools for water resource planning and decision making.* Lewis Publishers, Boca Raton, Florida.
- [5] Beyene, A., 2010. Development and validation of ecological water quality monitoring tools for Ethiopian rivers, Uitgeverij ASP (Academic and Scientific Publisher nv), Brussels, Belgium: 1-302.
- [6] Boonsoong, B., Sangpradub, N., and Barbour, M.T., 2009. Development of rapid bioassessment approaches using benthic macroinvertebrates for Thai streams. *Environmental Monitoring and Assessment* 155, 129-47.

- [7] Chutter, F.M., 1972. An empirical biotic index of the quality of water in South African streams and rivers. *Water Research* 6, 19-30.
- [8] De Pauw, N. and Hawkes, H.A., 1993. Biological monitoring of river water quality. In: Walley, W.J. and Judd, S. (eds). *River water quality monitoring and control*. Aston University, Birmingham, UK, 87-111.
- [9] De Pauw, N., Gabriels, W., and Goethals, P., 2006. River monitoring and assessment methods based on macroinvertebrates. In: Ziglio, G., Siligardi, M. and Flaim, G.(Eds.), *Biological monitoring of rivers. Application and perspectives*. John Wiley and Sons, UK, 113-134.
- [10] Eggermont, H., K. Van Damme & J. M. Russell, in press. Ruwenzori Mountains (Mountains of the Moon): headwaters of the White Nile. In Dumont, H. J. (ed.), *The Nile Basin. Monographiae Biologicae*, Springer.
- [11] Gabriels, W., Lock, K., De Pauw, N., and Goethals, P., 2010. Multimetric Macroinvertebrate Index Flanders (MMIF) for biological assessment of rivers and lakes in Flanders (Belgium). *Limnologica* 40, 199-207.
- [12] Haase, P., Lohse, S., Pauls, S., Schindehütte, P., Sundermann, A., Roluffs, P., and Hering, D., 2004. Assessing streams in Germany with benthic invertebrates: Development of a practical standardised protocol for macroinvertebrate sampling and sorting. *Limnologica* 34, 349-365.
- [13] Hawkes, H.A., 1997. Origin and development of the biological monitoring working party score system. *Water Resource* 32, 964-968.
- [14] Hilsenhoff, W.L., 1977. Using a Biotic index to evaluate water quality in streams. *Tech. Bull. Wisc. Dept. Nat. Res.* pp. 132.
- [15] Howard, P., 1991. *Nature Conservation in Uganda's Tropical Forest Reserves*. IUCN, Gland.
- [16] Hughes, R.M., 1995. Defining acceptable biological status by comparing with reference conditions. In Davis, W.S. and T.P. Simon (eds.), *Biological Assessment and Criteria: Tools for Water Resource Planning and Decision Making*. Lewis Publishers, Boca Raton, FL, 31-47.
- [17] Hynes, H.B.N., 1970: *The Ecology of Running Waters*, Liverpool University Press, 555p.
- [18] Karr, J.R. and Dudley, D.R., 1981. Ecological perspective on water quality goals. *Environmental Management* 9, 55-68.
- [19] Karr, J.R., Allan, J.D., and Benke, A.C., 2000. River conservation in the United States and Canada. *Global Perspectives on River Conservation: Science, Policy, Practice* (Eds P.J. Boon, B.R. Davies and G.E. Petts), J. Wiley, Chichester, UK, 3-39.
- [20] Klemm, D.J., Blocksom, K.A., Fulk, F.A., Herlihy, A.T., Hughes, R.M., Kaufmann, P.R., Peck, D.V. Stoddard, J.L., Thoeny, W.T., Griffith, M.B. and Davis, W.S., 2003. Development and evaluation of a macroinvertebrate biotic integrity index (MBII) for regionally assessing Mid-Atlantic Highlands streams. *Environmental Management* 31, 656-669.
- [21] Knoben, R., Ross, C., and Van Oirschot, M., 1995. UN/ECE Task force on monitoring and assessment. In: *Biological assessment methods for watercourses*. Netherlands: RIZA, pp. 86.
- [22] Lock, K., Asenova, M., and Goethals, P., 2011. Benthic macroinvertebrates as indicators of the water quality in Bulgaria: A case-study in the Iskar river basin. *Limnologica* 41, 334– 338.
- [23] Lorenz, M. O. "Methods for Measuring the Concentration of Wealth." *Amer. Stat. Assoc.* 9, 209-219, 1905.

E.I.D.S. Summer Workshop 2014

- [24] McCafferty, W.P. and Provonsha, A.V., 1983. Aquatic Entomology: The fishermen's and ecologists' illustrated guide to insects and their relatives. Jones and Bartlett Publishers. Boston. USA, pp. 448.
- [25] Metcalfe, J.L., 1989. Biological water quality assessment of running waters based on macroinvertebrate communities: history and present status in Europe. *Environmental Pollution* 60, 101-139.
- [26] Resh, V.H., 2007. Multinational, freshwater bio monitoring programs in the developing world: lessons learned from African and Southeast Asian river surveys. *Environmental Management*, 39,737-48.
- [27] Rosenberg, D.M. and Resh, V.H., 1993. Freshwater biomonitoring and benthic macroinvertebrates. Chapman and Hall. New York. London, pp. 488.
- [28] Thorne, R.S. and Williams, W.P., 1997. The response of benthic macroinvertebrates to pollution in developing countries: A multimetric system of bioassessment. *Freshwater Biology* 37, 671-686.
- [29] Verdonschot, P. F. M., and Moog, O., 2006. Tools for assessing European streams with macroinvertebrates: Major results and conclusions from the STAR project. *Hydrobiologia* 566, 299–309.

IMPROVING ACCURACY AND ROBUSTNESS OF GLOBAL TACTICAL FORECASTS IN A B2B ENVIRONMENT

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Abstract

Forecasting is a central input to the demand planning process in modern supply chains. Over- or under-forecasting can have detrimental effects for the operations throughout the organisations, resulting in over-stocking, loss of liquidity or lost sales. Such forecasts often only rely on historical sales. It might be preferable to build demand forecasts using leading indicators, capturing various aspects of the market. Here, the need for forecasting with leading indicators is explained. After giving an overview of current available models and how these are implemented in industry nowadays, the research goal is outlined and the interactions with the partners are visualized.

Traditional sales forecasting is done with endogenous models, for example exponential smoothing. These models perform poorly in the current volatile business environment. The traditional forecasting methods cannot foresee a sudden drop in demand and a sudden recovery. Earlier research [1] shows that these models can be improved using exogenous indicators. Several indicators are available of numerous sources: statistical bureaus, research survey institutes and federal banks. These indicators can be leading, coincidental or lagging and they know an evolution over the last ten years: they are available faster (one month after computation) and on a lower level of detail. A good illustration where indicator models outperform the traditional forecasting is the crisis of 2007-2010, as shown in Figure 1.

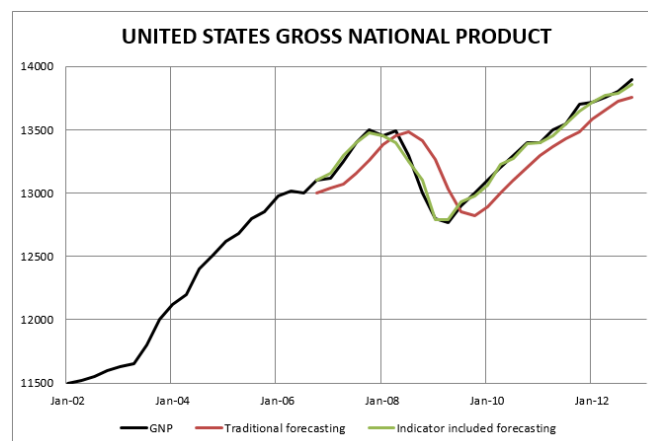


Figure 1: Traditional forecasting technique (Moving Average 3) vs forecasting with exogenous indicator

The forecasting field can be divided into subjective judgmental forecasts and objective data driven forecasting. In this last quantitative forecasting segment, both endogenous and exogenous techniques are currently used in the forecast process [2]. Exogenous indicators are typically used on a high strategic level. Examples of the used models are regression, ARIMAX, data mining and artificial intelligence techniques. Most of the forecasts are made on a 5-10 year horizon. There is a clear gap in the current research for mid-term forecasting solutions with the use of exogenous variables. The limited amount of available business data excludes the use of several techniques, which add an additional constraint to this research.

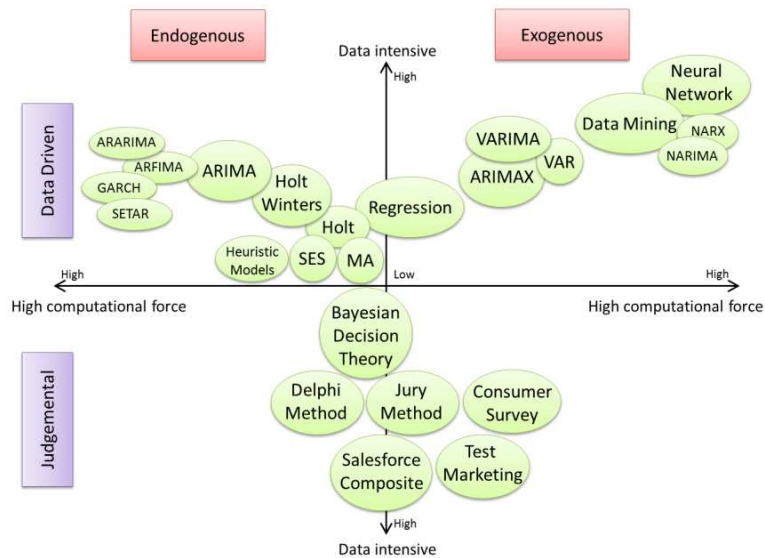


Figure 2: Graphical overview of some forecasting techniques

Projected outcome versus current situation

There are three levels of aggregation in the forecasting process. The highest strategic level works in quarterly buckets and knows a forecasting horizon of 3-10 years. The mid-term tactical level works month by month and has a time horizon of 6 to 18 months. The lowest level is the operational level and works in weekly buckets up to 18 months, but only the first three months are really used. The goal of the further forecasts is to have an impression of the further trend.

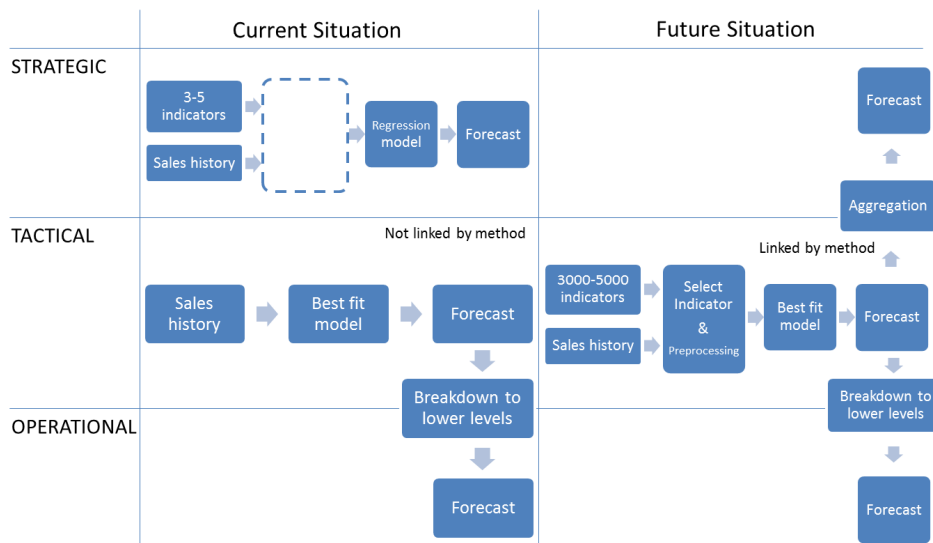


Figure 3: Current situation versus Projected outcome

On the left side of the figure is the current situation visualized, consolidating the results of interviews with supply chain professionals of the Advisory Board of this research. As visible in the figure, some indicators are used in the strategic level, but there is no link by method to the tactical or operational level. Sometimes a belly feeling trend is added to the tactical level, but this is not done by method. The operational level is a disaggregation of the tactical level by time series forecasting models.

This research wants to start from the tactical level with a large database of indicators. The indicators will be researched mutually and in combination with the sales history. The strategic and operational level will be built by aggregation and disaggregation techniques. The improvement will be measured on the three levels on the forecasting accuracy measures.

In order to achieve the maximal input on both academic and business insights, this research is in collaboration with several parties (Figure 4). The academic institutions are specialized in the state-of-the-art models and techniques, while the business insights are obtained of a board of managers.

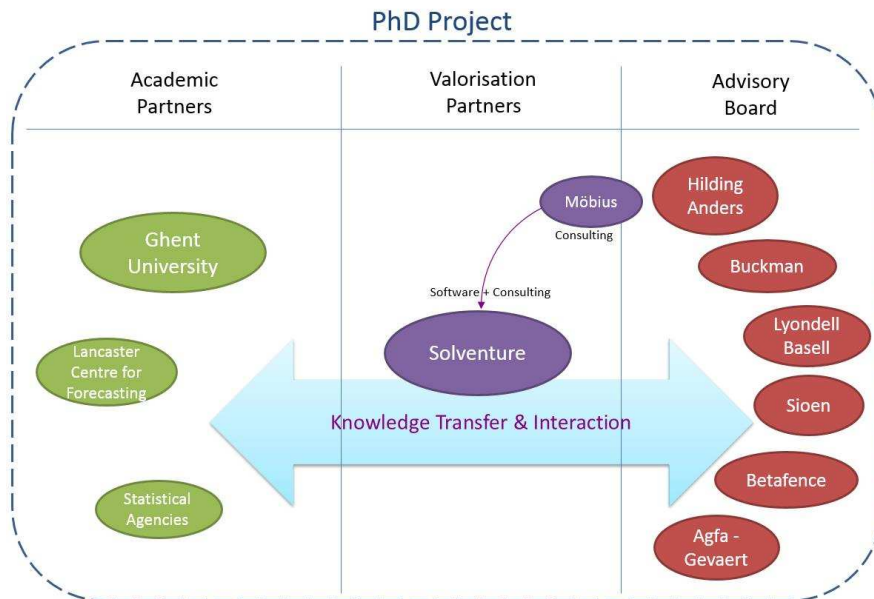


Figure 4: Parties involved in the PhD Research

Keywords: Sales Forecasting, Exogenous Leading Indicators, Variable Selection, Exponential Smoothing, Regression

REFERENCES

- [1] Yves Sagaert. Enhancing sales forecasts through the use of adequate exogenous indicators: A case study, 2013.
- [2] Jan G. De Gooijer, Rob J. Hyndman, 25 years of time series forecasting, International Journal of Forecasting, Volume 22, Issue 3, 2006, Pages 443-473, ISSN 0169-2070

TERABIT-PER-SECOND OPTICAL COMMUNICATION SYSTEMS ENABLED BY DIGITAL SIGNAL PROCESSING

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Abstract

In the last decade, fibre-optic telecommunication networks have experienced a rapid evolution in terms of signal transmission and detection engineering. The dissemination of bandwidth-consuming applications and services, such as cloud-computing, file-sharing and high-definition TV broadcasting, has caused a tremendous increase in data traffic demand, pushing the capacity limits of the existent optical network infrastructure. This ever increasing need for bandwidth is exhausting the capacity of field deployed core networks, based on simple and inefficient intensity modulation and direct detection techniques [1]. These legacy fibre systems support up to 40 Gb/s optical channels with spectral efficiency below 1 b/s/Hz. In order to keep up with a traffic growth of approximately 60% per year [2], while avoiding the enormous costs of deploying a whole new optical infrastructure, a technological breakthrough in terms of signal transmission and detection is needed. A new generation of optical systems using coherent detection [3] and advanced modulation formats [4] is now being developed to enable multi-Terabit communications, with per channel bit-rates of 100/400/1000 Gb/s and spectral efficiencies up to 10 b/s/Hz. The development of low-cost and low-complexity digital coherent receivers is the key enabler for future wideband optical networks. Using the carrier-phase information retrieved by coherent detection in electrical domain, efficient digital equalizers for linear and nonlinear impairments can be designed and implemented, improving the signal-to-noise ratio (SNR) and consequently the maximum bit-rate and communication reach [5]. Digital equalization of chromatic dispersion avoids the use of dispersion compensation fibres, reducing the added noise and providing higher flexibility against topologic changes in the network [6]. The equalization of nonlinear impairments is a crucial new target to maximize both the transmission distance and the SNR for high-order modulation formats with short inter-symbol spacing [7]. In this scope, we have developed a frequency-domain Volterra series nonlinear equalizer (VSNE) whose high performance and parallel structure are very attractive for real-time implementation [8,9]. Employing the VSNE technique, a bit-error ratio (BER) decrease of up to 85% has been experimentally demonstrated for a 100G polarization-multiplexed quadrature phase-shift keying (PM-QPSK) transmission system [10]. More recently, the VSNE computational effort has been tackled by a symmetric reconstruction of the third-order Volterra kernel, originating a restrict set of parallel frequency-domain filters and resulting in a computational gain of several orders of magnitude, relatively to the originally proposed VSNE algorithm [11]. These advances are expected to enable real-time implementation and commercial deployment of nonlinear equalization for fibre-optic communication systems in the upcoming years.

Keywords: Optical communication systems, coherent detection, digital signal processing.

REFERENCES

- [1] R.-J. Essiambre and R. W. Tkach, "Capacity Trends and Limits of Optical Communication Networks," *Proceedings of the IEEE*, vol. 100, no. 5, pp. 1035-1055, 2012.
- [2] R. W. Tkach, "Scaling optical communications for the next decade and beyond," *Bell Labs Technical Journal*, vol. 14, no. 4, pp. 3-9, 2010.
- [3] E. Ip, A. Lau, D. Barros, and J. M. Kahn, "Coherent detection in optical fiber systems," *Opt. Express*, vol. 16, no. 2, pp. 753-791, 2008.
- [4] G. Charlet, "Progress in optical modulation formats for high-bit rate WDM transmissions," *IEEE J. Sel. Topics Quantum Electron.*, vol. 12, no. 4, pp. 469-483, 2006.

- [5] E. M. Ip and J. M. Kahn, "Fiber Impairment Compensation Using Coherent Detection and Digital Signal Processing," *IEEE/OSA J. Lightw. Technol.*, vol. 28, no. 4, pp. 502-519, 2010.
- [6] S. J. Savory, G. Gavioli, R. I. Killey, and P. Bayvel, "Electronic compensation of chromatic dispersion using a digital coherent receiver," *Opt. Express*, vol. 15, no. 5, pp. 2120-2126, 2007.
- [7] E. Ip, P. Ji, E. Mateo, Y.-K. Huang, L. Xu, D. Qian, N. Bai and T. Wang, "100G and Beyond Transmission Technologies for Evolving Optical Networks and Relevant Physical-Layer Issues," *Proceedings of the IEEE*, vol. 100, no. 5, pp. 1065-1078, 2012.
- [8] F. P. Guiomar, J. Reis, A. Teixeira, and A. N. Pinto, "Digital postcompensation using Volterra series transfer function," *IEEE Photon. Technol. Lett.*, vol. 23, no. 19, pp. 1412-1414, Oct. 2011.
- [9] F. P. Guiomar, J. D. Reis, A. T. Teixeira and A. N. Pinto, "Mitigation of intra-channel nonlinearities using a frequency-domain Volterra series equalizer," *Optics Express*, vol. 20, no. 2, pp. 1360-1369, January, 2012.
- [10] F. P. Guiomar, J. D. Reis, A. Carena, G. Bosco, A. L. Teixeira, and A. N. Pinto, "Experimental demonstration of a frequency-domain volterra series nonlinear equalizer in polarization-multiplexed transmission," *Opt. Express*, vol. 21, no. 1, pp. 276-288, Jan 2013.
- [11] F. P. Guiomar and Armando N. Pinto, "Simplified Volterra Series Nonlinear Equalizer for Polarization-Multiplexed Coherent Optical Systems," *IEEE/OSA J. of Lightw. Tech.*, vol. 31, no. 23, pp. 3879-3891, December, 2013.

SUPERCRITICAL FLUID EXTRACTION OF TRITERPENIC ACIDS FROM *Eucalyptus globulus* BARK AT DIFFERENT SCALES

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Abstract

Under the context of biorefinery, the supercritical fluid extraction (SFE) of *Eucalyptus globulus* bark has been investigated aiming at the production of extracts enriched in triterpenic acids (TTAs). Supported by previous studies of the optimization of the SFE operating conditions and subsequent modelling of extraction curves, the scale-up of the process was performed. Accordingly, cumulative curves were measured at three distinct scales (0.5, 5.0 and 80.0 L) for 200 bar, 40°C and 2.5 wt.% ethanol. The flow rate to biomass weight ratio was fixed in 10 h⁻¹ and was assumed as the scale-up criterion in view of the evidenced intraparticle diffusion resistance pointed by modelling results. The extraction yield and TTAs concentration results obtained for the three different scales evidenced good agreement, therefore confirming the validity of the adopted scale-up criterion and legitimating the technical viability of this process to be explored at commercial scale.

Keywords: Supercritical Fluid Extraction, Biorefinery, Scale-up, *Eucalyptus globulus*, Modelling

MEASUREMENT OF ADSORPTION AND THERMOPHYSICAL PROPERTIES OF ETS-10

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Abstract

Given its unique adsorption properties, the large-pore titanosilicate molecular sieve ETS-10 has increasingly gained attention for adsorption applications. The design and optimisation of adsorption systems requires the knowledge of various fundamental properties of the adsorbents, which are not available for many promising materials.

In this work, different properties of ETS-10 have been determined envisaging its use in environmentally friendly water adsorption-based processes for heating/cooling applications. The water isotherms were measured in the temperature range 25-75 °C, and from these results the isosteric heats of adsorption were determined using different approaches: the Clausius-Clapeyron equation and the adjusted parameters of the Langmuir-Freundlich model. The intraparticle mass transfer coefficient was determined by fitting a linear driving force (LDF) based model to the experimental data. The thermal conductivity and heat capacity profiles of ETS-10 are reported for the first time; these properties were measured using a hot disk sensor in the temperature range 20-140 °C.

Keywords: ETS-10, water, isotherm, adsorption, modelling, thermal properties

HEARING LOSS: EXAMINATION AND EVALUATION BY A NURSE

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Abstract

Introduction

In the human population there are an increasing number of people with hearing impairment at the present time. Reasons for this socio – pathological phenomenon are extensive; examples include environmental burden of noise (road traffic, air transport), increasing age of the population and growing industrial production with risk of occupational hearing loss. It is well known that the same hearing loss may cause different problems for different patients. Hearing loss often excludes patients from social life and causes many difficulties.

The goal of this research is identifying the significance of hearing impairment and the impact it has on the lives of humans. The results of many tests which are used for the evaluation of hearing impairment may not correspond to the real problems of patients. Some people with little loss of hearing perceive their disorder very significantly, yet someone with serious hearing impairment may not evaluate their problems as serious.

In the research there will be compared results of auditory threshold using pure tone audiometry with results of Hearing Handicap Inventory for Adults (HHIA). This questionnaire evaluates emotional and social handicaps in the life of people with hearing loss.

Research Goals

- 1) Validate Hearing Handicap Inventory for Adults for application in the Czech Republic.
- 2) Determine the relationship between the level of hearing loss according to tone audiometry examination and the subjective perception of hearing impairment.
- 3) Evaluate the contribution of nurses for investigation and evaluation of hearing loss caused by excessive noise.

Research plan

The first step is evaluating the Hearing Handicap Inventory for Adults (HHIA) for use in research. The next step is a translation by three experts in the field of otorhinolaryngology. Each of them creates one version of the translation. The linguistic expert will evaluate these three translations, and propose the final translation. In to the research will be included 40 respondents without hearing loss and 80 respondents with different levels of hearing impairment. All respondents will be examined by pure tone audiometry and everybody will complete a HHIA questionnaire. From this group 30 respondents will complete the questionnaire again after six weeks, to assess reliability. The HHIA will be used in practice after evaluating the results of the questionnaires. This is a way to gain more respondents from larger group of people.

Conclusion

The questionnaire could be practically used in the context of application of hearing aids. It is also possible to use the questionnaire as a screening method for easy examination of many people. The next possibility is to use this test before the therapy and after the therapy of hearing loss and compare gained benefits. The primary objective is to improve the living conditions of patients with hearing loss.

Keywords: Hearing loss, Hearing handicap, HHIA, occupational hearing loss.

REFERENCES

- [1] Kabátová, Z., Profant, M. (2012) *Audiológiá*. 1. vyd. Praha: Grada, 360 s. ISBN 978-802-4741-734.
- [2] Newman, C. W., Weinstein, B. E., Jacobson, G. P. (1990) The hearing handicap inventory for adults: Psychometric adequacy and audiometric correlates. *Ear and Hearing*, Vol. 11, No. 6, 430 - 433.

ANNA: SYSTEM FOR REHABILITATION OF EYES

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Abstract

Amblyopia is a children's eye disease. It is being treated by practicing forced to the affected eye. The treatment is realized an outpatient at clinic or bedded at hospital, above that these methods are often combined with several weeks to several months stays at specialized rehabilitation centers. The treatment itself is a long process that takes many years and success is not guaranteed. Our software solution provides the opportunity to access to rehabilitate the comforts of home for the disabled. It eliminates the stress of a foreign environment, the cost of commuting and save a lot of time for diseased and his family

Amblyopia is a congenital eye disease that is manifested by (depends on the severity) eg squint, closing weaker eye or refusing to close the stronger eye. It is a disease that can be treated only to ten (occasionally twelve) years of age. If the fault is not treated, it becomes permanent. The person is affected the end of life and will be partially, or complete blind on the affected eye. Conversely, if the disease is properly treated, it is possibility of completely cure. The patient can live his life entirely without consequences or the without need for subsequent treatment.

The total number of affected patients is (according to various sources) 3% - 4% of the population. In the last ten years, the majority of patients are managed to capture and treated. Only in the Czech Republic there are treats about 35,000 people at present time. Above that, each year the number of patients increase by about 4,300 people. (It must be said that the average duration of treatment is 5-7 years, while including several many weeks or several many months' hospitalization and specialized cycles at hospitals)

Software solution called Anna respects the rehabilitation process, which is currently operates by applied (mostly) electromechanical devices. Anna extra introduces new techniques of treatment. The whole principle uses a combination of tablet and stylus for control of our software. By utilizing the maximum potential of this combination of devices, we can hardware emulate older devices and moreover add new interactive features. For example, were programmed computer games. Kids are entertained by games and healing process is very friendly to them. Another benefit of our product is fact, that it can be used at home.

In general it can be said that it is not only the individual device, which is expensive, specialized on single think. These types of devices are not so interesting for the family for the economic reasons. Our solution is the only simple software. Solution still can be installed on most of today's tablet - that means, we get only software to device which is usable for families and most of them still have one. Users can get a device that replaces the healing process.

The software solution is a natural extension of Campbell visual stimulator (CAM) that is used to treat for many decades. CAM disadvantage is the fact that this is an electromechanical device, which must still be plugged into an electrical outlet. CAM is becoming prone to failure, challenging the safety (working with mains voltage) and, of course, we should also mention the fact that the number of CAM in the country is very limited and their average age to be about 40 years old, it is relative much to a medical device.

Although the first generation of system to treat of amblyopia was only the emulation of CAM, gradual development achieves possibility of applying the principles of CAM to computer games. The second generation of application itself took principles called Heal & Play and became much more interesting for the user.

Currently the system is used for the treatment at the Pardubice Regional Hospital, has been distributed to several families. For further testing there are showed interest in many institutes from all over the Czech Republic. With the distributor there is possibility to expand device testing and development to Austria.

Keywords: Innovation, technology, research projects, Amblyopia, lazy eye, rehabilitation, tablet, heal and play, information technology, optics.

REFERENCES

- [1] JUDD, Deane B.; WYSZECKI, Günter (1975). Color in Business, Science and Industry. Wiley Series in Pure and Applied Optics (third ed.). New York: Wiley-Interscience. p. 388. ISBN 0-471-45212-2.
- [2] ZIMMER, Carl (February 2012). "Our Strange, Important, Subconscious Light Detectors". Discover Magazine. Retrieved 2012-05-05.
- [3] EL BASHITI, Enas Zaki. The effect of CAM Vision Stimulator in the treatment of amblyopia in Gaza Strip. In: [online]. [ref. 2014-05-05]. Available from: <http://dnntest.iugaza.edu.ps/LinkClick.aspx?fileticket=6Gz8R9X8r9w%3D&tabid=14284>
- [4] THIBOS, Larry N. a BRADLEY. The Use of Interferometric Visual Stimulators in Optometry. In: [online]. [ref. 2014-05-05]. Available from: <http://www.opt.indiana.edu/VSG/Library/VisStim/VisStim.html>

SYNTHESIS AND MODIFICATION OF ZINC HYDROXIDE CHLORIDE FOR NANO-COMPOSITE PREPARATION

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Abstract

Simonkolleite is a natural oxidation product of zinc, with the formula $Zn_5(OH)_8Cl_2 \cdot H_2O$ [1]. Its structure derives from the layered compound $Zn(OH)_2$ structure. Layered compounds generally offer a high aspect ratio, a high specific surface, and the possibility to intercalate different ions and organic molecules in the interlayer space, by anionic exchange [2]. They can be useful for different purposes: catalysts, water pollutant removal, separation of isomers, drug carriers, nanofillers, UV protection, flame retardants... In particular, simonkolleite and other layered zinc hydroxide salts have been studied because of their interesting catalyst support, drug carrier, UV and visible light absorption, and corrosion inhibition properties. They can be used for many applications such as filler for polymeric systems, or catalysts support.

In this abstract a simple synthesis of simonkolleite is reported using zinc chloride as raw material, low reaction temperature and short time. The synthesized particles have a disk shape with an average diameter of 70 nm and a thickness of 2-5 nm. After addition of amine reactive group via surface modification, these nanoparticles can successfully be dispersed and bonded to an epoxy matrix. The synthesized nano-composite with 1% in mass of particles is prepared and compared to the pristine epoxy matrix, via different measurements: dynamic-mechanic analysis, thermogravimetry, and solvent intake.

The dynamic-mechanic analysis showed a glass transition at 62°C for both composite and pristine matrix. The shear moduli were similar in glassy state; however, the 1% composite has 70% higher shear modulus in rubber state than the pristine matrix. Simonkolleite particles decompose into ZnO at temperature higher than 230°C. However the thermogravimetric analysis of the composite does not show this transition. The composite showed a decomposition transition around 370°C starting at lower temperature than the pristine matrix (380°C), but was slower. To assess the barrier effect of simonkolleite nanoparticles, we cut square samples of the composite and neat systems, let them soak in toluene while monitoring the weight changes along time. The geometry of the samples was both 20mm*20mm*2mm. We observe the toluene intake is proportional to the square root of the time for both systems. We also observe the intake is 28% slower for the composite system than the neat system.

As a conclusion, nanoparticles of simonkolleite were prepared via a simple sol-gel process. After suitable surface modification with amine reactive groups, they were blended to an epoxy matrix at a 1% weight fraction. Compared to the neat system, the composite showed similar thermal behaviour, an increase of 70% of the shear modulus in rubber state, as well as a decrease of toluene intake speed by 28%. The magnitude of the properties improvement for such concentration, can be only explained by a strong interaction between the polymer and the particles. These effects can be beneficial for some applications such as coatings and membranes, since the effects of simonkolleite are already significant at low concentration.

Keywords: Nanocomposite, layered zinc hydroxide, nanodisks, surface functionalization, barrier effect.

REFERENCES

- [1] F. C. Hawthorne, E. Sokolova, Simonkolleite, $Zn_5(OH)_8Cl_2(H_2O)$, A decorated interrupted-sheet structure of the form $[M\Phi_2]_4$, The Canadian Mineralogist, 40 (2002) ; 939:946
- [2] F. Cavani, F. Trifirb, A. Vaccari, Hydrotalcite-type anionic clays: Preparation, properties and applications, Catalysis today, 11 (1991) ; 173:301

RAIL AND ROAD TRANSPORT POSITIVE EXTERNALITY ASPECTS AND THEIR VALUATION METHODS

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Abstract

There are many studies dealing with the negative externalities of transport, but only a few ones available dealing with the economic evaluation of positive externalities. The question is how to use the methods used for the evaluation of negative externalities in the economic evaluation of the benefits of transport and what are the practical applications of these methods. The aim is to comprehensively describe the issue of positive externalities in the Czech Republic and to create a model case including direct and indirect positive externalities in the overall economic evaluation of the transport projects.

The assessment of wider economic benefits is beyond conventional project appraisal. Therefore these possible wider economic benefits need to be properly described and better shown on the practical example of British High-Speed Rail project. The research and dissertation are focused on wider economic benefits mentioned in the study. The conclusion of this research is to show methods and recommendation how these benefits can be measured if it is possible.

Keywords: external costs, positive externalities, benefits of transport

REFERENCES

- [1] GOODWIN, P., PERSSON, S. et al. (2001). Assessing the Benefits of Transport. ECMT.
- [2] LITMAN, T. (2001). Evaluating Public Transit Benefits and Costs, Best Practices Guide. Victoria Transport Policy Institute.
- [3] MVA Consultancy. (2009). High-Speed Rail Development Programme 2008/9. Evaluation Methodology, Final Report for Workstream 3, pp. 46-69.

APPLICATION OF ELECTRODIALYSIS WITH HETEROGENEOUS BIPOLAR MEMBRANE FOR RECOVERY OF Na₂SO₄ TO NaOH AND H₂SO₄

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Abstract

Sodium sulfate is a common contaminant in industrial wastewater. It is generated by neutralization of the acid by base or vice versa in many different processes such as fiber bleaching, beneficiation of uranium ore, etc. [1] Electrodialysis with bipolar membrane is an ecological method for recovery of sodium sulfate to sodium hydroxide and sulfate acid. This fact allows reuse the products of electrolysis back in industrial process and due to that fact reduce the cost of operating chemicals. [2] In this work, the effects of configurations and operation parameters, such as temperature, flow rate, acid and base concentration were investigated in feed and bleed of electrodialysis system. The capacity of the system was studied in dependence on membrane configuration, product concentration, temperature and circulation flow rate. The results showed that the three-compartment configuration allowed produce acid and base with higher concentration compare to two-compartment configuration. Furthermore, increase of base and acid concentration caused an increase of energy demands of the entire process. Nevertheless increasing of temperature and flow rate had opposite effect, it means that energy demands of entire process decreased. A preliminary economic evaluation of electrodialysis with heterogeneous bipolar membrane and possibility of re-using sulfate acid and sodium hydroxide in uranium ore mining wastewater treatment plant were also carried out.

Key words: electrodialysis, bipolar membrane, heterogeneous membrane, recovery

REFERENCES

- [1] Garrett D.E., Sodium Sulfate Handbook of Deposits, Processing, Properties, and Use. San Diego: Academic Press, 2001.
- [2] Huang C., XU T., Electrodialysis with Bipolar Membranes for Sustainable Development. Environmental Science & Technology, 2006, vol. 40, no. 17. pp. 5233-5243.

MASS SPECTROMETRIC ANALYSIS OF PHOSHOPEPTIDES FROM IN VITRO PHOSPHORYLATED TAU PROTEIN

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Abstract

Dysfunction of tau protein, which is associated with Alzheimer's disease, can be influenced by posttranslational modifications, including increased level of site-specific phosphorylation. Hyperphosphorylation of the tau protein can result in the self-assembly of tangles of paired helical filaments and straight filaments, which are further involved in the pathogenesis of Alzheimer's disease [1]. This work was focused on *in vitro* phosphorylation of tau protein with soluble mitogen-activated protein kinase-1 (MAPK-1), glycogen synthase kinase 3 β (GSK-3 β) and cAMP-dependent protein kinase (PKA) and on detection and description of phosphorylated sites using MALDI-MS. Mixture of tau protein and used enzymes was digested with trypsin followed by TiO₂ affinity purification and microscale RP LC separation. Instead of the application of highly sophisticated LC instruments, sample purification and microscale separation were done in a simple and fast protocol suitable for improved MALDI-MS detection and analysis of phosphorylated peptides.

Phosphorylation was performed in HEPES buffer pH 7.2 environment using combination of soluble kinases MAPK-1 with GSK-3 β and PKA with GSK-3 β . After induced phosphorylation, the protein mixture was digested with trypsin. This mixture contained high number of more abundant and better detectable nonphosphorylated peptides, and that is why enrichment of phosphopeptides was applied. Enrichment of phosphopeptides was based on affinity separation of phosphopeptides on TiO₂ microparticles (10 μ m). Elution fractions were split into two parts. First half were desalted and directly analyzed by MALDI-MS. The second half was fractionated by microcolumn RP LC separation onto MALDI target plate using nonlinear gradient of acetonitrile-water mixture (2 – 27%) containing 0.1% TFA using Ascentis® Express Peptide ES-C18 stationary phase with 2.7 μ m diameter of particles. All samples were analyzed by MALDI LTQ Orbitrap XL instrument and mass spectra were processed using Xcalibur software (Thermo Scientific).

A few singly and multiply phosphorylated peptides were identified in the nonseparated part of phosphopeptide sample using comparison of accurate mass with *in silico* digest of tau, where phosphoserine and phosphothreonine were set as variable modification. Additionally, in mass spectra search for specific neutral losses of HPO₃ and H₃PO₄ was performed. Phosphorylated peptides were also analyzed by tandem mass spectrometry (MSⁿ) technique in linear ion trap and by high-energy collision dissociation (HCD) followed by manual *de novo* sequencing. Separation of phosphopeptide mixture revealed further undetected phosphopeptides and the overall sensitivity of sample analysis was improved. The current chromatographic setup enabled also separation of phosphopeptides with same amino acid sequence differing only depending with number of phosphorylated sites.

In summary, after *in vitro* phosphorylation of tau protein many phosphorylated peptides were detected and identified. Simple and fast separation on home-made microscale RP LC column substantially improved MALDI-MS analysis of phosphorylated peptides originating from *in vitro* phosphorylated tau protein.

Keywords: phosphoproteomics, mass spectrometry, reversed-phase liquid chromatography, Alzheimer's disease.

REFERENCES

- [1] del C Alonso, A., Zaidi, T., Novak, M., Grundke-Iqbal, I. and Iqbal K. (2001). Hyperphosphorylation induces self-assembly of τ into tangles of paired helical filaments/straight filaments. *Proceedings of the National Academy of Sciences of the United States of America*, 98(12) pp. 6923–6928.

CHROMATOGRAPHIC ANALYSIS OF FATTY ACIDS IN HUMAN PLASMA

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Abstract

Objectives: Obesity is currently a serious health problem. The consequences of obesity are known to increase blood glucose levels, LDL-cholesterol and triglycerides in pathological intervals development of metabolic disturbances and intrusions diabetes mellitus, cardiovascular disease and metabolic syndrome. It is expected that these diseases may have a common pathogenesis and multiorgan involvement indicates severe metabolic disorder accompanied by insulin resistance. Given that during the last twenty years could not be found compelling evidence linking the hormonal effect of adipose tissue insulin resistance, but that in obese completely actually exists, it is believed that an important cause of insulin resistance may be an enzymatic abnormality in the metabolism of fatty acids.

Methods: Lipid extracts from deproteinated plasma samples were separated by preparative thin-layer chromatography into five fractions (phospholipids, diacylglycerols, free fatty acids, triglycerides and cholesterol esters). All fractions were isolated and after the addition of internal standard (cis-13,16,19-docosatrienoic acid, 10 µg / ml) hydrolyzed and converted to corresponding methyl esters of fatty acids. Thus prepared samples were analyzed using a gas chromatograph.

Results: 10 anonymized plasma samples randomly selected type 2 diabetic patients were processed in this study. These samples of biological material were also used for verification of analytical method. Furthermore, there were used 4 healthy blood donors plasma samples as a control group. For purposes of the study, samples were categorized into three groups according to level of glycosidic hemoglobin (Hb). This indicator appears to be most reliable because it is affected by poor conditions (such as non fasting) prior to collection, and highlights the development of blood glucose in the last 4 to 6 weeks.

Conclusions: Lipid metabolism diabetes 2 is only slightly different from the healthy population - the changes are found only in fraction triglyceride (TG) and free fatty acids (FFA). The TG fraction produced by the liver, reduced concentration of unsaturated fatty acids , mainly oleic and palmitic oil and increased concentration of saturated fatty acids , especially stearic and palmitic. All of this is attributed to the diminished activity of hepatic stearyl -CoA desaturase. Slightly increased content of saturated fatty acids , mainly palmitic prolonged exposure reduces the production of insulin by the beta cells of pancreas , induces resistance to insulin , and increased hepatic steatosis. Relation activities of stearyl -CoA desaturase and reliance on insulin resistance and fatty liver disease in obese people is *already detectable before the onset of type 2 diabetes - is therefore expected that the activity of this enzyme may be a marker of type 2 diabetes*. Our proposed experimental methodology is very accurate and can be made to determine changes in the concentration of fatty acids in the order of µg / ml.

Keywords: diabetes mellitus, lipids, desaturase, elongase, gas chromatography, thin layer chromatography.

THE QUALITY OF PERIOPERATIVE CARE FROM THE PERSPECTIVE OF NURSING

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Abstract

Introduction: Quality management of operating theatres should become part of modern health care. This fact is determined by the legal regulations of the Czech Republic. The legislation describes the minimum level of quality and safety standards and indicators of the health care. The legislation also describes the methods how to track them. The legislation is the main reasons but not the only one, why the management of operating rooms should define such rules. To minimize any risk for patients, staff or hospital must be part of perioperative management anyway. The topic is a part of the framework project of the student grant competition and is a continuation of the master thesis [1].

The objectives of the work: The dissertation aim is to analyse and evaluate the quality of perioperative care. Important output is the analysis of theatre nurses work during the nursing perioperative process. The main focus is on perioperative process because there might be many risky areas for the patients, staff, and technical facilities in this process.

Methods: The dissertation began as a quality research in five of hospitals in Pardubice region. Research methods were: observation of care in theatres, semi-structured interviews and audits of nursing care. Analysis of critical points has been implemented during nursing care for a client in the operating room. The analysis started with the patient's admission to the hall of theatres and ended by transport of client to the department. However, the emphasis was mainly on the detection and prevention of risks before the surgery. Respondents of interviews were nurse managers, who work in the operating rooms. The interviews were taped on a recorder. After the interviews were transcribed by verbatim. Audits were focused on the detailed assessment of nursing care. The criteria for observation respected the internal directive of the hospital. The results were recorded in a control checklist.

Results: Only the results of the interviews will be presented for the purposes of this poster. Based on subjective opinion of all respondents the biggest risk is the patients might be burnt as a result of the use of coagulation.

Discussion: Partial results from a qualitative research, describes the potential risks for patients. Description of processes using agreed standards is necessary. It will help to prevent potential adverse events, which can arise in the operating theatres.

Conclusion: The search of potential perioperative risks and preventive measures minimizes the risk mainly for patients. Based on subjective opinion of respondents the biggest attention should be paid to understand and prevent the risk related to burns.

Keywords: The quality, perioperative care, nursing care, theatre (operating room), perioperative nurse.

REFERENCES

- [1] BÁRTLOVÁ, S. et al. (2008). Role sestry specialistky: učební text základního modulu specializačního studia pro sestry a porodní asistentky. Brno: Národní centrum ošetrovatelství a nelékařských zdravotnických oborů.
- [2] LEINONEN, T. (2002). The quality of perioperative care: Developing a Patient-Oriented Measurement Tool. Turku: Painosalama Oy, pp. 11.
- [3] JEDLIČKOVÁ, J. et al. (2012). Ošetrovatelská perioperační péče. Brno: Národní centrum ošetrovatelství a nelékařských zdravotnických oborů.

- [4] WORLD HEALTH ORGANIZATION, WORLD ALLIANCE FOR PATIENT SAFETY. (2008). Implementation manual surgical safety checklist. Switzerland: WHO Press, pp. 3 – 4. <http://www.who.int/patientsafety/safesurgery/ss_checklist/>.
- [5] PAVLOVÁ, P., HOLÁ, J. (2013). Řízení kvality v perioperační péči. Pardubice: Diplomová práce na Fakultě zdravotnických studií Univerzity Pardubice, na katedře porodní asistence a zdravotně sociální práce, pp 114.

RESPECT OF CULTURAL DIVERSITY DURING THE PROVISION OF NURSING CARE TO MONGOLIAN CLIENTS HOSPITALISED IN GYNECOLOGICAL-OBSTETRICIAN DEPARTMENTS

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Abstract

Increasing migration of population is a worldwide trend and is still continuing. The Czech Republic, as a final destination for migrant people, must be prepared for meeting people from culturally diverse backgrounds. Nowadays it isn't unusual that Czech hospitals are visited by patients from different countries. They have different habits, moral principles, cultural values etc. Cultural diversity has marked implications for health professionals and the clients they serve. Cultural competence in health care services requires cultural responsiveness. By noting variability within cultural groups and seeing each person as an individual, midwives are most likely to commit to culturally identical care of culturally diverse clients.

This thesis has two main aims. The first aim is to know a measure of information about multicultural nursing care and we use non-standardized questionnaire for midwives. The second aim is to know how satisfied Mongolian clients are with nursing care in Gynecological-obstetrician departments, using the Purnell Model for Cultural Competence.

The Purnell Model for Cultural Competence is based on multiple theories and a research base gained from organizational, administrative, communication, and family development theories as well as anthropology, sociology, psychology, anatomy and physiology, biology, etc. This model was created by Larry Purnell for the needs of both students and staff, in order to have a framework for learning about their cultures and the cultures of their patients and families. Comments from staff and students made it dear that ethnocentric behaviour and lack of cultural awareness, cultural sensitivity, and cultural competence existed. The Purnell Model was designed as a holistic organizing framework with specific questions and a format for assessing culture that could be used across disciplines and practice settings.

The model is a circle with an outlying rim representing global society, a second rim representing community, a third rim representing family, and an inner rim representing the person. The interior of the concentric circles is divided into 12 areas depicting cultural domains and their concepts. Domains do not stand alone. Each domain relates to and is affected by all other domains. The domains are: overview/heritage, communication, family roles and organization, workforce issues, biocultural ecology, high-risk behaviours, nutrition, pregnancy and childbearing practises, death rituals, spirituality, health care practice, health care practitioner. The model is intended for use by all health care providers and for clients or patients from different cultural background.

Our research is inspired by The Purnell Model for cultural competence. The goals set out for our research are:

1. To find out the level of satisfaction of Mongolian clients with nursing care
2. To know cultural specifics of Mongolian clients during provision of nursing care
3. To translate The Purnell Model for cultural competence to the Czech language
4. To know how informed the midwives are regarding Mongolian culture
5. To find out, which nursing documents Czech midwives use.

In this work we inform only about interviews with Mongolians clients.

REFERENCES

- [1] Blundenová, J. (2009). *Mongolsko*. 1.vyd. Brno: Jota, 2009, 469 s. ISBN 978-80-7217-640-3.
- [2] OLMSTED, A. (2012). Mongolian Women's Voices: A Case Study on Maternal Healthcare, Pregnancy, and Birth in Ulaanbaatar's Public Hospitals [online] In *Independent Study Project 234 Collection*. 2012 [cit. 2014-04-24]
URL: http://digitalcollections.sit.edu/cgi/viewcontent.cgi?article=2478&context=isp_collection
- [3] Purnell, L. 2002. The Purnell Model for Cultural Competence. In *Journal of Transcultural Nursing* [online]. 2002,13(3), [cit. 2014-04-24] 193-196.
URL:[http://www.europeantransculturalnurses.eu/resources/The%20Purnell%20Model%20for%20Cultural%20Competence\[1\].pdf](http://www.europeantransculturalnurses.eu/resources/The%20Purnell%20Model%20for%20Cultural%20Competence[1].pdf)
- [4] Purnell, L. 2005. The Purnell Model for Cultural Competence. In *The Journal of multicultural nursing and health* [online].2005, 11(2). [cit. 2014-04-20]
URL: <http://web.a.ebscohost.com/ehost/pdfviewer/pdfviewer?sid=ebc10bf6-bb4c-4969-8774-e26b285fb0b5%40sessionmgr4003&vid=6&hid=4109>.

KUNDERA'S NOVEL AS A SOURCE OF KNOWLEDGE

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Abstract

A man by nature craves the cognition and the knowledge, said more than two thousand and five hundred years ago Aristotle [1] and no one will object that this statement is still true today. The objects of the cognition, that is all that a man seeks to know, are innumerable. This work, thereby, limits its field of study on the supposition that there is an inherent fundamental desire in the nature of man, and that is the desire of a self-knowledge. A man wants to know who he is, why is he made the way he is and thus wants to give a sense to his existence and the things that happen to him. The means to reach this knowledge and the places to find the answer are again many. This is the reason why this work focuses only on one of many sources of knowledge, on literature. And as the literature is also a very broad term, the interest is narrowed on the fiction wrote in prose and focused on the novel as one of its genres. The research is based on the presumption that a novel may be considered a relevant source of knowledge as well as the means that leads a man to the self-knowledge. However, to avoid a lifetime research, as the novels are many and time is little, the field of study is narrowed here even more. The main focus is only on one writer and his work – on Milan Kundera. The choice of this author was governed by a challenge for the research is philosophically based and the Kundera's work is looked at from the philosophical point of view while all the main up to now works about Kundera in the Czech cultural background give the literary-scientific, linguistic or cultural-political point of view [2].

The study concentrates on the *raison d'être* of the Kundera's novel which consists in discovering of the yet unknown aspect of the human existence. The characters of the Kundera's novels have the lifetime secret which the novels then try to reveal. During the revelation process we reach the cognition (the wisdom of the novel) on which this work tries to look at theoretically as well as it tries to highlight its existential basis. The research thus oscillates around the key terms of the human life and these are: *the existence, the sense, the truth*. It presents these terms in Kundera's specific interpretation and the novelistic representation to point out not so much the similarities but the differences that are typical for the novelistic research of the human existence unlike the philosophical one.

The key part of the study focuses on the exploration of the "man's life" in the novel. The study depicts the Kundera's novel as a laboratory where the experiments with the existence are made and then it shows the results. It thus offers a reflection on a human being which is based on the concrete stories, and it underlines its specificity. The result that the study offers is not, however, the always valid theory of the cognition and self-knowledge. Rather, as Kundera does in his novels, it opens a discussion and invites to the new concretizations and critical points of view on the existential topics and questions. The conclusion of this study is, nevertheless, the realization that the Kundera's novels provide the reader with some kind of cognition. The cognition that does not reveal and explain completely the secrets of human life but that helps us with its understanding, that is with the understanding of our selves.

Keywords: Kundera's novels, question of knowledge, human existence.

REFERENCES

- [1] Aristotelés. *Metafyzika*, Kniha I. Rezek, 2003.
- [2] Chvatík, K. *Svět románů Milana Kundery*. Atlantis, 1994; Kosková, H. *Milan Kundera*. H & H, 1998; Le Grand, E. *Kundera aneb Paměť touhy*. Votobia, 1998; Kubíček, T. *Vyprávět příběh*. *Naratologické kapitoly k románům Milana Kundery*. Host, 2001; Čěška, J. *Království motivů*. Togga, 2005; Kubíček, T. *Středoevropán Milan Kundera*. Periplum, 2012.

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