3rd PhD conference

The social responsibility of science and scientists

07.06.2018, Freiberg

organised by:

Promovierendenrat
der Technischen Universität Bergakademie Freiberg

ProRat
PromovierendenRat
der TU Bergakademie Freiberg

and

VMPV
Verbund mitteldeutscher Promovierendenvertretungen

This abstract book is published at http://tubaf.qucosa.de

Overview of lectures

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Presentations

Corruption prevention at Universities

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Transparency International (https://www.transparency.de) is a non-profit association, founded 1993 in Berlin and has chapters in more than 100 countries. Their target is to fight and prevent corruption in all countries worldwide. The german chapter has about 1200 members. Many of them are engaged in different projects and working groups to discover and make proposals to avoid corruptive conditions. Corruption can be defined as “a behavior of persons entrusted with public or private responsibilities who neglect their duties to achieve unjustified benefits”.

Bribery or unlawful acceptance of benefits in international or national business, or venality in politics or by gaining advantages by paying lubrication fee: these corruptive behavior causes not only financial damages but endangers the foundation of society. It destroys mutual trust and undermines ones own integrity.

In Germany bribery and illegitimate acceptance of benefits is also present in civil services. “66% of all bribery cases are performed by civil servants.” (Bundeslagebild Korruption 2011) But also in higher educational establishments and academic research organizations you can find conditions which could promote dishonorable behavior or even bribery. The rising influence of politics and economic conditions enhance stress to academic education and research.

They are more and more forced to follow expectations by external influences which may rise temptation to dishonorable behavior. “Corruption risks include illicit payments in recruitment and admissions, nepotism in tenured postings, bribery in on-campus accommodation and grading, political and corporate undue influence in research, plagiarism, ‘ghost authorship’ and editorial misconduct in academic journals.” See: “Emerging Corruption Risks in Higher Education”, in “Global Corruption Report: Education 2013”, (https://www.transparency.org/gcr_education)

To fight corruption in education systems, Transparency International Deutschland (TI-D) has edited and distributed 2017 a "Checkliste für 'Self-Audits' zur Korruptionsprävention an öffentlichen Hochschulen" (Checklist for self-audits to prevent corruption at public universities): https://www.transparency.de/fileadmin/ Redaktion/Publikationen/2017/Checkliste_SelfAudits_Hochschulen_2017_web.pdf
This should enhance the sensibility to conditions which could lead to dishonorable behavior. It posts about 80 questions about the resources, the independence, the transparency, checks and balances and integrity of academic and administrative departments in universities. The answers differentiate between "Fully established", "Partially established" and "Not at all established".
These checks should improve prevention of corruption in higher education organizations. Further Proposals for preventing corruption in the education system can be found in: https://www.researchgate.net/publication/315685849_PREVENTING_CORRUPTION_IN_THE_EDUCATION_SYSTEM
With another TI-D project "Hochschulwatch", the third-party funds of private enterprises and their sponsoring are documented for all german universities. This makes the percentage of external funding of universities transparent and gives hints for possible conflicts between academic rules and economic forces. To make these more transparent, TI-D demands:

- Publication of all third-party contracts between public universities and supporting enterprises
- Regular sponsoring reports of all universities
- Extending the german freedom of information act (Informationsfreiheitsgesetz) to all universities

This is necessary to grant the independence of academic readings, researches and publications from external political or economic pressure.

Current EOR techniques for heavy oil and bitumen: A brief review

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Worldwide demand for oil is growing on yearly basis in spite of all the renewable resources, which increase their share to the global energy. The reason is population growing and low cost of oil compared to renewable energy.
As it is well known that light oil resources are depleting, the share of heavy oil and bitumen in worldwide production increases dramatically. In the last two decades, new technologies have emerged to produce heavy oil and bitumen at low costs and to extend the life of light oil reservoirs as well. This is driven by the high prices of oil in the eighties of the last century and the urging need from developed countries to secure their energy by producing from their natural resources, which were at most unconventional fossil fuel like heavy oil and bitumen.
In this paper, we will discuss enhanced oil recovery techniques (EOR) to produce heavy oil and bitumen. A special focus will be given to the thermal methods since they are the most efficient methods in such reservoirs. The applicability of each method with its merits and deficiencies will be visited along with screening criteria for various EOR methods. At the end, the novel techniques which are still at laboratory scale will be reviewed.

Empiric Analysis of Performance Problems at Code Level

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Source code changes affecting the software performance often introduce performance problems or revert them. Structured knowledge about classes of changes and their relation to introduced or reverted problems could guide software developers in avoiding and reverting performance problems. Unfortunately, there is currently no comprehensive knowledge base of introduced and reverted performance problems.

In order to build up such a comprehensive knowledge base, Performance Analysis of Software Systems (PeASS) is defined. PeASS is a method for identifying performance changes in the version history of a software repository using its unit tests, i.e. small tests assuring correctness of parts of a program. PeASS is based on a method for determining significant performance changes between two unit tests by measurement and statistical analysis. Since the measurement of all code changes proves to be time-consuming, a second essential part of PeASS is a method for regression test selection for performance tests.

Software performance and software performance changes have a high impact on society: Critical infrastructure can not be operated without software responding in realtime, business processes can not be implemented without proper response times and the use of natural resources, both power and hardware, increases with non-performant software.

The talk will give an overview about PeASS and the potential social impact of empiric software performance research.

The knowledge transfer of commodity topics to adolescents through the project SOCIAL NATURE as an example of the social responsibility of scientists

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In German society there is an apparent tension between fundamental resistance to the raw materials and energy sector, especially with new mining and construction projects, and social necessity. This potential for conflicts can be at least partially resolved by imparting knowledge secured by research, increasing transparency at the companies as well as communication measures adapted to the project situation.
In terms of the level of knowledge, for example, a survey of 9th and 10th grade pupils in a high school, conducted in February 2018, showed that participants rated their knowledge of commodities and energy at 68 percent as rather low or low. Interest in these topics is also rather low or low at 68 percent (see Figure 1, Social Nature 2018a). In this survey, students were also asked about their interest in social and digital media. More than 81 percent of respondents desired an increase in knowledge in this sector (see Figure 1, Social Nature 2018a).

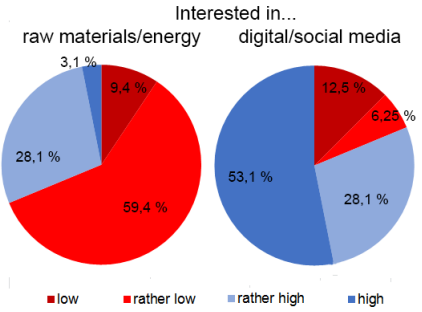

Figure 1: Interest in commodities/energy and digital/social media (own illustration, based on Social Nature 2018a)

The use of social media by adolescents, which is over 172 minutes a day in this age group (DAK Health 2018: 8), respondents' self-esteem as well as the identified gaps in interests between the topics of commodities materials/energy and digital/social media, were used to design the project "SOCIAL NATURE - the whitethroat goes viral" (Social Nature 2018).
In this project, the adolescents accompany the life of a bird with the help of personalized storytelling. All social media posts are written by the students from the bird's perspective, the whitethroat. The elaboration is based on their own research, on-site observations and expert interviews. Thus, it is informative and entertaining, whereby the existing knowledge gaps are reduced, taking into consideration target group specifics. The participants are deeply sensitized and motivated by the research (especially at the quarry site), because they work together and thereby put themselves in the position of the bird. They are therefore trained in two areas (commodities/energy and digital/social media), which results in an increased educational value.
The various work packages and questions included in the project were selected because, in the opinion of the project manager, it is the responsibility of the scientists not only to provide information about the use but also to present and discuss the underlying and sometimes highly complex problems in a way, which is adapted to the group of addressees.
It is not the purpose of the project to influence the opinion of the participants or the opinion of the users of the information provided online in a certain direction, but to impart knowledge enabling them to express their own opinion and, if appropriate, to argue.
"SOCIAL NATURE - the whitethroat goes viral" shows that it is possible from an economic, ecological and social point of view, to motivate participants in the fields of commodities/energy management and social media in a motivated and sustainable way without influencing their own opinion.

Acknowledgment
The doctoral project of the author is funded by the Free State of Saxony and the European Social Fund (ESF). Cooperation partners are the Technical University Bergakademie Freiberg (Institute for Mining and Special Civil Engineering), the University of Applied Sciences Mittweida and the MIBRAG Neue Energie GmbH. The SOCIAL NATURE project will be conducted by the author as part of the Quarry Life Award from 1 January to 20 September 2018.

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Redressing the nexus of human rights and mining in Kenya using geospatial modelling

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As an early adopter of trending data-driven technologies, the mining industry draws considerable attention, particularly from the viewpoint of policy and technology development. On the policy front are crucial questions that must involve all the relevant stakeholders and the location of mining activities to ensure sustainable solutions. The convergence in positioning, navigation and remote sensing technologies avails the advanced geospatial toolsets and workflows which, when applied within a Geographic Information System (GIS), enable the derivation of suitable visuo-spatial metrics and developing an integrated decision support model.

Kenya is among the African countries with a young and growing mining sector. Mining has since 2013 been gaining increasing and strategic significance in Kenya's national development agenda. Bolstered by a modern and arguably the most progressive mining law in the region, the government has placed a high priority on developing the nascent mining sector to contribute at least 10 % to the GDP, up from 1 %. High expectations of what mining should contribute to the economy on the one hand, and sustainable management of mining activities with respect to effects on the society and environment on the other, are causing a clash of interests and positions. Claims to the use of space for mining, agriculture, urban development, and ecosystem services have been competing and conflicting. Violations of human rights due to mining activities have been frequent and spatially widespread, giving the problem a strong spatio-temporal dimension.

Critical policy and planning questions subsequently emerge from this observation, invoking a rethinking of research approaches to purposefully accommodate the missing link of geographical precision and provide a broad knowledge base for enhancing transparency and inclusivity in mine planning and benefit-sharing. This scenario causes an unrelenting need for informed multi-stakeholder dialogue between mining companies, investors, civil society, governments, and the affected local communities.

Using confirmed examples from Taita Taveta County, Kenya, this study demonstrates the critical value of precise spatial metrics in helping to map out and analyse the changing geography of mining-related human rights with time. GIS, satellite imagery and system dynamics are together used for integrated analyses involving mining hotspots across the county, population statistics, land use dynamics, and environmental impacts within detectable resolutions. The approach directs a strategic focus to the larger social and physical environment, where questions of exactitude and spatial precision influence the spatial integrity of the mining cadastre, the mining blocks as defined in the law, and the sensitive issues on the security of land and property rights across the mining areas. The ultimate goal is to enhance mine planning and policy implementation by developing a multi-criteria spatial decision support system, which must be adaptable to changes in data, location characteristics and time horizons – for well-planned and socially responsible mining.

From the fossil to the process of petrification towards new materials

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Even the people of the Stone Age collected the beautiful fossils that existed in their environment and processed them into art [Zotz1926]. The ancient scholars recognized the principle of natural petrification of wood by the waters of mineral springs as early as 50 AD. Pliny the Elder, who lived from 23 to 79 AD, recorded this in the "Naturalis Historiae" in the chapter on "Rivers and Sources" [Plinius79AD], [Winkler1997]. Georgius Agricola coined the term "fossil" in 1549 in "De Natura Fossilium" [Agricola1546], [Fraustadt1958].
The principle of fossilization of wood with soluble silicates was recognized by the experiment, based on nature, applied and systematically developed [Glauber1658], [Hooke1665], [Fuchs1857],[Drum1968], [Muraishi1989], [Byrne1997]. It was also tried to petrify wood by natural volcanic ash and fluids [Murata1940a], [Muraishi1989], [Ballhaus2012], [Laebe2012], [Hellawell2015]. Gradually, the mechanisms that lead to petrifaction were investigated. For example, the self-preservation process of silicification after the formation of quartz nuclei [Belov1974], [Landmesser1986], the hydration of cellulose [Goetze2009], the mechanism of the solution of quartz and silicate glasses in aqueous solutions [Crundwell2017].
The field of science that uses natural templates for the production of synthetic materials is called Biotemplanierung [VanOpdenbosch2013], [Adam2016]. This branch of research has exciting and promising applications [VanBommel2003], [Fratzl2007], [Fan2009], [Li2012]. Da Vinci once said, "Those who are inspired by a model away from nature, the mistress of all masters, are striving in vain."
The hierarchical structure of wood inspires material technology to imitate it. The replication of the wood structure by silica and other substances has already been described [Drum1968], [Byrne1997], [VanBommel2003], [Qian2004], [Zollfrank2004], [Fratzl2007], [Fritz-Popovski2013], [Rambo2013], [VanOpdenbosch2013], [Adam2016], [Trogadas2016], [VanOpdenbosch2016], [Zhou2016].

When researching biotemplates, a work on cellulose as a template for hydroapatite was conspicuous. The product of cellulose with hydroapatite is a bioceramic [Hou2012], [Li2012]. The beginning of bioceramics was in the 70s. Hench is one of his pioneers [Hench1971], [Hench1973], [Hench1991], [Hench2000], [Hench1991], [Hench2000], [Hench2001], [Hench2004], [Hench2009].

The current research is to develop bone implants that are completely absorbed by the body and eventually undergo the same growth process as a separate part of the body, which all other bones undergo [Nandi2016], [Fernandes2017], [Gao2017].

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