



RUB
RESEARCH SCHOOL

RESEARCH DAY

POSTER ABSTRACT BOOK

NAT_04

INVESTIGATING AND PROMOTING STUDENTS' COMPETENCIES IN ASKING HISTORICAL QUESTIONS IN AN OUT-OF-SCHOOL LAB

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The aim of this dissertation project is to investigate students' competence in asking historical research questions and to explore how student-questioning can be facilitated in the domain. The sample of this study consists of 200 students in higher secondary education who participate in a history project at the Alfried Krupp-out-of-school lab at the Ruhr-University Bochum. After receiving a method training students develop their own research questions and examine primary sources. At the end of the project students write a synopsis about their research question, inquiry results and further thoughts. In this quasi-experimental study with a 2x2 factorial design structure the learning setting is systematically varied. Students take either part in an in-depth training to define research questions or receive short instructions. Furthermore, the students receive either facsimiles of archive documents or simplified texts. The effects of the training and type of learning material on the quality of the research questions and the synopsis are examined. In addition, the learners' situational interest, epistemological beliefs, topic knowledge and the perceived authenticity are assessed.

**POSITIVE IMAGERY COGNITIVE BIAS
MODIFICATION FOR DEPRESSION AMONGST
STUDENTS IN PAKISTAN: A PILOT STUDY**

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Depression is highly prevalent amongst university students in Pakistan. However, due to stigma, and a lack of resources, trained professionals, and current treatment provision is inadequate. Computerized interventions may provide one means of overcoming barriers to receiving treatment. Recently, interest has been growing in the potential of simple cognitive training procedures as a low-intensity interventions. The present study examined the feasibility of investigating a computerized cognitive training paradigm involving repeated generation of positive mental imagery, imagery Cognitive Bias Modification (imagery CBM), as a potential brief intervention for symptoms of depression amongst university students in Pakistan. Participants scoring above a questionnaire cut-off indicating at least mild levels of depression were randomly assigned to either imagery CBM or a sham training control condition intended to provide a placebo control. Participants were instructed to complete one training session from home daily over the course of one week. Outcomes were measured at post-training and a subsequent two-week follow-up, to see the effects of CBM on depressed mood of university students.

CHALLENGING THE INTENTIONAL APPROACH TO PAIN: REPRESENTATIONALISM AND IMPERATIVISM

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My research project aims for an interdisciplinary approach towards the nature of physical pain. Based on empirical data, I attempt to defend a so-called Dynamic Pattern Theory of Pain which acknowledges the complexity and the diversity of the phenomenon while addressing essential questions of the philosophical debate, for instance whether we can define pain in terms of necessary and sufficient criteria.

**RELIGIOUS STRATEGIES IN URBAN AREAS - AN
INTERCULTURAL COMPARISON OF
CHRISTIAN CHURCHES IN GERMANY AND THE
UNITED STATES**

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Church protagonists often perceive their presence in the city as precarious. To meet the challenge, they establish so-called “city church projects”. I examine how they try to cope with urban structures, ideas, and lifestyles, by arranging special religious products, ways of communication, and aesthetic concepts “Urban Christianity” is the outcome of the dynamic contact between religious traditions, properties of the urban habitat and the social conditions of urban life. Urban religious work is defined as the production of a congruence between the religious supply and demand (Bourdieu 2011), which is in the city affected by a specific habitus of the present milieus, consumption habits, and the secular environment. The applied methods of qualitative social research are able to record and analyze communicative acts of religious work to reconstruct their underlying strategies. The analysis is operated according to a combination of objective hermeneutics (Wernet 2009) and grounded theory (Glaser/Strauss 2008). The outcome is a typology of the churches’ urban strategies. The cross-cultural stability and contingency of these strategies is examined by comparing German and American cases.

CRISPR/CAS – A REVOLUTION IN GENE ENGINEERING

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One of the topics during my doctorate is to use the so called CRISPR/Cas9 System in human cells. It is a very revolutionary gene editing technology, which can be used in vitro as well as in vivo. There are first trials, to use this system to heal diseases such as HIV or different cancers. On my poster, I would like to explain this system to the other participants in a simple way. For this, I will give a short introduction to the field of gene technology including the explanation of fundamental terms like “DNA” and “genes”. After this, I will talk about the advantages of the CRISPR/Cas technology compared to conventional gene editing methods. Last but not least, I would like to show first results of my work concerning the CRISPR/Cas system.

**INTERLAYER EXPANSION OF LAYERED SILICATE
RUB-36 USING CATIONS COBALT,
VANADIUM AND ZINC**

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It has been shown that ferrierite type layer silicates can be topotactically condensed to form new zeolite frameworks, among them RUB-36. Successful interlayer expansions using the cations iron and tin as linker atoms between neighbouring layers have recently been discussed. The catalytic activity of iron-containing material was successfully tested. This work focuses on the characterization of interlayer expanded RUB-36 involving the cations Co, V and Zn. The precursor material RUB-36 is synthesized in a hydrothermal reaction. In a post-synthesis treatment, the corresponding metal-acetylacetonate is added to the starting material RUB-36 in an acidic hydrothermal reaction. In contrast to RUB-36, interlayer expanded materials exhibit limited crystallinity, complicating the structure refinement, as observed by Powder X-ray Diffraction. Additional structural information is gained by the Automated Electron Diffraction Tomography, in which single nano-sized crystals are analysed individually. Energy Dispersive X-Ray analyses as well as X-Ray Fluorescence spectroscopy disclose metal contents below 0.5 wt%. Catalytic activity is investigated in the isomerization and cracking of 1-octene.

**IN SITU STUDIES OF ALCOHOL
ELECTROOXIDATION REACTIONS MONITORED
BY IR SPECTROSCOPY IN ALKALINE MEDIUM**

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Investigations of alcohol oxidation reactions in the liquid phase using a specifically designed and optimized electrochemical cell that couples ATR-IR spectroscopy with conventional electrochemical techniques. Further, a solvent engineering approach is adapted, in which the effect of altered solvent properties on the reactions of interest are investigated.

TOMOGRAPHIC RECONSTRUCTION USING ULTRASOUND

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My research focuses on new tomographic techniques for medical ultrasound and their implementation in a laboratory environment. We want to provide material information inside the body like the well known computed tomography (CT). In contrast to CT, ultrasound has the advantage of being a non-radiative and cost efficient technology. The goal is the extraction of absolute tissue parameters like the speed of sound using clinical standard hardware.

**CORPUS-BASED ANALYSIS OF LITERACY
ACQUISITION OF GERMAN PRIMARY SCHOOL
CHILDREN**

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My research project is concerned with orthography acquisition of German primary school children. Based on a collection of over 1800 texts produced by children from 2nd to 4th grade, I investigate the relationship between spelling errors and different properties of words. I want to find out what makes a word likely to be misspelled and whether/how this differs for more and less proficient spellers. The word properties I am looking at relate to statistical surface properties like the frequency of co-occurring letters as well as specific phenomena of German orthography such as doubled consonants (e.g. in “Halle”, meaning 'hall'). The hypothesis is that more proficient spellers have a good fundament of implicitly acquired orthographic skills and are therefore more sensitive to the statistical properties of orthography. Thus, I expect their errors to be more strongly connected to a word's statistical properties, e.g. to rather occur on words with infrequent letter combinations, than errors of less proficient spellers where I expect this connection to be less strong.

**IMPROVEMENT OF AN ELECTROCHEMICAL CELL
FOR DIFFERENTIAL ELECTROCHEMICAL MASS
SPECTROMETRY TO STUDY OER**

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I work in the field of electrochemistry, there I designed a cell which combined electrochemical measurements with mass spectrometry. This is not really known and that makes the topic a bit difficult to study. My focus lies in the determination of oxygen evolution during the reaction of carbon based catalysts.

A BRIDGE BETWEEN QUANTUM CHEMISTRY AND MOLECULAR DYNAMICS

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I am developing quantum chemistry methods. Using physically motivated approximations and modern programming techniques, we are aiming to simulate complex dynamics of molecules when they are excited by light.

EXPLORING THE NEURAL FOUNDATION OF SCENE RECOGNITION DEVELOPMENT FROM MIDDLE CHILDHOOD TO ADULTHOOD

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Finding our way is of high ecological relevance for humans. Successful navigation of our environment is related to and partly dependent on processing our visual scenery. However, scene processing and navigational abilities are not innate, but develop with age. In middle childhood (7-12 years), children show drastic improvements in these skills. Nevertheless, the neural underpinnings of this development are still unclear. In contrast, research with adult participants has discovered a brain network that selectively responds to scenes. This network is also strongly involved in navigation, e.g. path integration tasks. So far, research on the neural foundations of scene processing and navigation has barely been conducted with pediatric populations. Therefore, in my PhD-project, I trace the functional and structural development of the scene network and investigate its areas' specific contributions to scene processing from middle childhood until young adulthood using fMRI. Additionally, I explore the neural basis for inferior path integration performance in children.

DEVELOPMENT OF A NOVEL BIOCHEMICAL ASSAY FOR DETECTION OF DEFECTS IN PEROXISOMAL MATRIX PROTEIN IMPORT

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Peroxisomal protein importers from protein import into other organelles as it facilitates import of folded and even oligomeric proteins. Despite the extensive knowledge of the peroxisomal proteome, specific details of the peroxisome biogenesis, as well as the molecular basis of pathologies that result from peroxisomal dysfunction, remain poorly understood. In order to identify and characterize novel proteins involved in peroxisomal biogenesis, we have developed a novel biochemical assay for measuring peroxisomal import of PTS1-containing proteins in yeast cells. This biochemical assay-based system utilizes plasmid-based expression of ProteinA*GFP-SKL and TEV protease. We showed that in yeast cells with import defect, ProteinA*GFP-SKL will be localized to the cytoplasm, making them available for TEV protease-mediated cleavage. The appearance of free GFP-SKL due to TEV protease cleavage, detected by western blot analysis, is directly proportional to the extent of mislocalization of PTS1 containing proteins. This is a simple, fast, reliable and high throughput assay which can be used to detect even slight import defect in yeast cells.

**JUST A MATTER OF TASTE? - THE SOCIOLOGICAL
EXPLANATIONS OF THE STREET FOOD
PHENOMENA IN GERMANY**

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I examine the street food and gourmet food truck movement in Germany and analyse (1) the driving forces which lead to its rapid spreading throughout the country and (2) the effect it has on work relations and foodscapes.

**DIE INTERAKTION DES
SEROTONERGEN SYSTEMS MIT DEM
ENDOCANNABINOID-SYSTEM BEI PATIENTEN MIT
EINER MAJOREN DEPRESSION**

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One of the most common psychiatric diseases, which lead to a reduction in the healthy-related quality of life, is the major depression disorder. There are many theories existing that aim to explain why people suffer from depression. One possible cause is a dysfunction of the serotonergic system. The primarily theory is the monoamine hypothesis. The principle of this theory is a reduction of the monoaminergic transmission in the brain. In special focus are the transmitter systems of serotonin and noradrenalin. It has already been shown that patients with depression have lower serotonin concentrations in the cerebral fluid and lower serotonergic activity in the CNS. However, it is not known whether there is any association of the serotonergic activity in the brain and the serotonin concentration in thrombocytes and serum in patients with depression.

CLAUDINS: HOW NOVEL IGLUR AUXILIARY PROTEINS ILLUMINATE THE WORKING MECHANISM OF TARPS

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Ionotropic glutamate receptors (iGluRs) are the main excitatory receptors in the vertebrate central nervous system. A functional receptor is formed as a homo- or heterotetrameric complex of receptor subunits and opens a cation-conducting channel pore upon release and binding of glutamate from the presynaptic site. The trafficking of AMPA receptors in the postsynaptic membrane is affected by transmembrane AMPA receptor regulatory proteins. TARPs are four-transmembrane domain proteins that also affect receptor currents. The closely related claudins form tight junctions that are crucial for cell-cell adhesion. Although it has been shown that TARPs can have similar tight junction-like properties, an investigation whether claudins can also show TARP-like effects on the currents of iGluRs has not been published. We thus investigated 18 rat claudins and found claudin-20 and -24 that potentiate AMPA receptor currents and are currently looking into the remaining rat claudins. This project mainly focusses on electrophysiological identification and characterization of new claudin AMPA-receptor interactions and investigating general modulatory mechanisms by domain exchange.

**CALCAREOUS NANNOFOSSILS FROM LATE
CRETACEOUS SHALLOW-MARINE SEDIMENTS
OF THE RUHR AREA - IMPLICATIONS FOR
PALEOECOLOGY AND STRATIGRAPHY**

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The Late Cretaceous period (100 - 65 ma) was characterized by an increase of atmospheric CO₂, climatic greenhouse conditions and a significant sea level rise of +200 m. Vast continental areas were flooded and northern Germany became a shallow sea, with the coastline positioned close to the Ruhr Area. Marine sediments accumulated between Duisburg and Dortmund. The global oceanographic conditions favored the radiation of ancient calcareous nannoplankton, a group of marine unicellular algae of 5 - 20 µm in size, producing an exoskeleton made of CaCO₃. Their widespread occurrence and high fossil preservation potential has an impact on the global carbon cycle. In today's oceans, calcareous nannoplankton is far less diverse and limited to the open ocean. Rare marginal marine deposits from the Cretaceous can be studied by 12 recently drilled boreholes located in the Ruhr Area. In order to understand the evolution and the paleoecology of ancient nannoplankton, we analyzed the nannofossil assemblages for age determination and diversity patterns. The rock samples yield diverse nannoplankton remains, which formerly may had a stronger preference to coastal settings than to the open ocean.

THE BRAIN SIGNATURE OF EMOTIONAL INTELLIGENCE, MOTIVATION, AND VOLITION: AN INTEGRATIVE NEURAL NETWORK PERSPECTIVE

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Individuals differ in their emotional intelligence, motivation, and volition. This is not only interesting for psychological research it is also directly associated with personal and professional success. Within the scope of my dissertation, I plan to analyse the structural and functional signatures of these interindividual differences. Here I use magnetic resonance imaging as a non-invasive technique to detect various anatomical parameters of the human brain. Different recording sequences are planned to capture the nature of the brain (structure and microstructure as well as structural and functional connectivity). Subsequently, the different properties of the brain will be compiled within an integrative neuronal prediction model to predict individual differences in emotional intelligence, motivation, and volition.

TOWARDS AN EPIGENETIC UNDERSTANDING OF HEMISPHERIC ASYMMETRIES

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Hemispheric asymmetries, i.e. structural and functional differences between the left and right half of the brain, are a fundamental principle of brain organization, but their molecular determinants are not well understood. For handedness, the most widely investigated form of hemispheric asymmetries in humans, single gene explanations have been the most popular ontogenetic model. However, molecular genetic studies revealed only few genes that explain a small fraction of the phenotypic variance. In contrast, family studies indicated heritability of up to 0.66. It has been suggested that the lack of recognizable genetic heritability is partly accounted for by heritable epigenetic mechanisms. We could show that DNA methylation in candidate genes for handedness predicts handedness direction in healthy human adults. Moreover, DNA methylation in KIAA0319, a gene involved in dyslexia and ciliogenesis, predicts language lateralization in the dichotic listening task. An integration of genes and environment is essential to fully comprehend the ontogenesis of hemispheric asymmetries.

SYNTHESIS OF A METALATED YLIDE AND ITS USE AS A UNIQUE CARBON BASE

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Metalated ylides, the so-called yldiides, can be viewed as anionic congeners of the bis-ylides. While yldiides have been poorly investigated, bis-ylides have received a considerable attention for the last years, due to their special properties and their electronic structure. Closing the gap, here we show the synthesis, isolation and characterization of the lithium, sodium and potassium cyanido-stabilized yldiide. The compounds were investigated by NMR spectroscopy and X-Ray diffraction. DFT calculation were used to investigate the electronic structure. Lastly, reactivity studies were carried out to show the nucleophilicity of the yldiide and its σ - and π -electron donation.

TRANSFORMATION BEHAVIOR AND STABILITY OF TI-TA BASED HIGH TEMPERATURE SHAPE MEMORY ALLOYS

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The development of Shape Memory Alloys with transformation temperatures above 100 °C has been strongly motivated in the last years due to their potential applications in different markets. Ti-Ta alloys are considered good candidate material, exhibiting reasonable shape memory effect and excellent cold workability. An important deleterious effect that remains to be solved refers to the stability of the material against the formation of Omega phase. The transformation behavior and the stability of Ti-Ta (30 wt.% Ta, 3-5 wt.% Al) against Omega phase decomposition are assessed. Ti-Ta ingots have been produced by arc melting. Ingots were then subjected to homogenization and cold rolling to produce 1 mm thin sheets. Electrical resistivity and DSC have been employed to characterize forward and reverse transformation temperatures. The stability against the formation of the Omega Phase as a function of transition cycle number, heating/cooling rates and holding times at different temperatures has been evaluated.

**CLAUDINS: AN UNEXPECTED SOURCE FOR MORE
TETRASPANNING PROTEINS ACTING AS
TRANSMEMBRANE AMPA RECEPTOR
MODULATORY PROTEINS**

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Although ionotropic glutamate receptors (iGluRs) are able to function on their own, many interacting and modulating auxiliary subunits have been found that either influence biophysical properties of iGluRs or modulate their trafficking to the plasma membrane. The most commonly known proteins are the transmembrane AMPA receptor regulatory proteins (TARPs), cornichon homologs (CNIH), and neuropilin- and tolloid-like proteins (NETOs). I show that certain subunits of the claudin family, which have high structure and sequence homology with the TARP proteins, act as AMPAR modulators. Claudins are generally known as tight junction proteins that seal passageways within and in between plasma membranes. Of the 29 different claudin genes identified in rat, few have been functionally characterized. I show that claudin-20 and claudin-24 potentiate the current amplitude and modulate the desensitization of certain AMPA receptors.

STUDIES ON CARBON DIOXIDE REFORMING OF METHANE AT ELEVATED PRESSURE

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Investigation of synthesis gas production from methane and carbon dioxide via the so-called dry-reforming reaction. The focus is set on experiments at elevated pressure, using nickel-based catalysts with controlled metal dispersion. The studies are supported by means of kinetic modeling using appropriate software.

CONDUCTING POLYMER BASED ANTICORROSION COMPOSITE COATINGS WITH FULL-SCALE SELF- HEALING ABILITY ON ZINC AND GALVANISED STEEL

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My research topic is about the development of smart coatings for corrosion protection of galvanized steel and zinc. Whereas the corrosion protection is based on the release of corrosion inhibitors from the coating on demand. Thereto organic inhibitors are encapsulated in microcapsules, whose shell is switchable with respect to permeability of inhibitors induced by instating corrosion. This means that the inhibitors are stored within the microcapsules under passive/intact coating conditions, while a release is initiated upon onset of corrosion. Corrosion changes specific properties of the local environment, such as pH, electrochemical potential or ionic strength. The microcapsules used in this work response to changes in electrochemical potential and pH, so that these properties act as a trigger signal for the release of inhibitors. This work focusses on the acceleration of the trigger signal velocity and improves the addressability of microcapsules under practical relevant conditions, resulting in enhanced release properties of inhibitors.

**THE BISHOP DIES. 'GOOD' AND 'BAD' DEATHS (6TH
TO 12TH CENTURY)**

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In my PhD-project I analyse episcopal death reports in historiographical and hagiographical sources from the 6th to the middle of the 12th century. In the first step all cases have to be documented. Furthermore, these cases shall be examined with refer to their intentions, their connotations in political, social and mental history. Is there only a differentiation between a “good” and a “bad” death? Alternatively, is it possible to find “normal”, almost “realistic” circumstances leading to death without any moral implications? Bishops, as a social group, are perfectly suited for this analysis due to several reasons: their office’s continuity from the late antiquity to the middle ages, their position as mediators between the profane and clerical sphere and the ideal connected with their office. This ideal offers the possibility to identify norms and values of their time.