RESEARCH REPORT

1. Name: Carl Deutsch （ID No.: SP07 301 ）

2. Current affiliation: Dortmund University, Germany

3. Research fields and specialties:

Humanities Social Sciences Mathematical and Physical Sciences

X Chemistry Engineering Sciences Biological Sciences

Agricultural Sciences Medical, Dental and Pharmaceutical Sciences

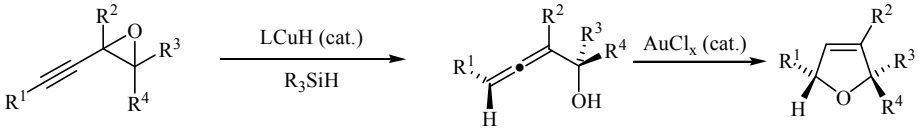
Interdisciplinary and Frontier Sciences

4. Host institution: Department of Synthetic Chemistry and Biological Chemistry, Kyoto University

5. Host researcher: Prof. M. Murakami

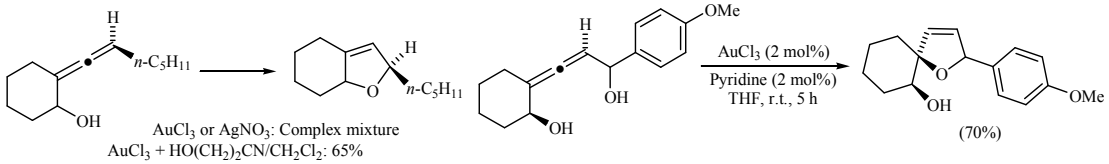
6. Description of your current research

In the course of our investigations on target-oriented synthesis using functionalized allenes, we became interested in α-hydroxyallenes since they can be easily cyclized to the corresponding 2,5-dihydrofurans, a structural motif that can be found in an abundance of natural products with intriguing biological activities. An elegant access to the required α-hydroxyallenes relies upon the S_N2'-ring opening reaction of propargylic epoxides with organometallic compounds, and in particular with organocuprates.



During my research I was able to expand the known methods to functionalized Grignard reagents and especially to copper hydride, giving the desired hydroxyallenes in good to excellent yield, usually with complete center-to-axis chirality transfer. The newly developed reductive S_N2'-substitution has a tremendous tolerance towards functional groups (alcohols, CF_3-groups, electron-rich or -deficient aromatic rings, ester groups, double and triple bonds). All reagents used are environmental friendly, non-toxic and non-mutagenic.

With these compounds in hand, we performed further studies towards the gold-catalyzed cycloisomerization to 2,5-dihydrofurans. Our optimized conditions not only allow the synthesis of 2,5-dihydofurans with complete axis-to-center chirality transfer but also the construction of fused rings as well as spirocycles.

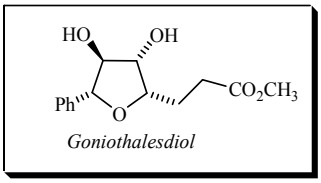


Based on these results we started to use allenes as precursor in target-oriented synthesis, especially in the synthesis of small natural products.

7. Research implementation and results under the program

Title of your research plan:

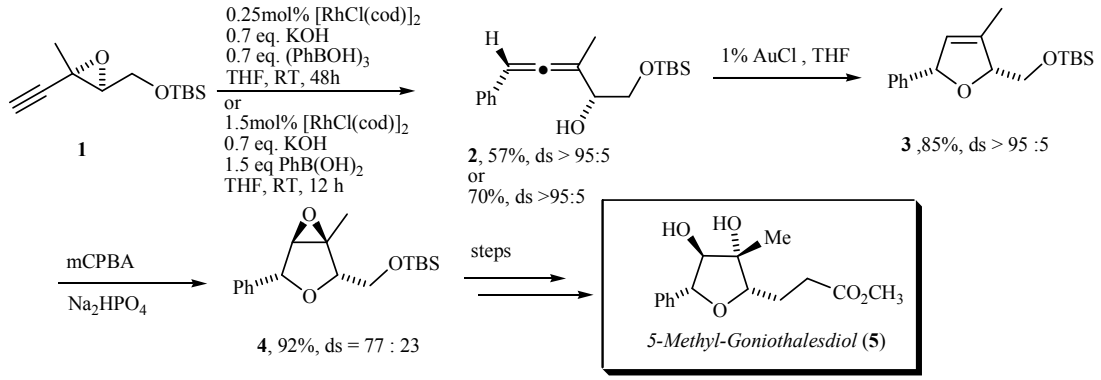
Rhodium-catalyzed synthesis of α-hydroxyallenes: Studies towards the synthesis of Goniothalesdiol



Goniothalesdiol

Description of the research activities:

Goniothalesdiol is a small natural product showing a high activity against some cancer cell lines and also as insecticide, making it to an interesting target in organic synthesis.



1

2, 57%, ds > 95:5
or
70%, ds >95:5

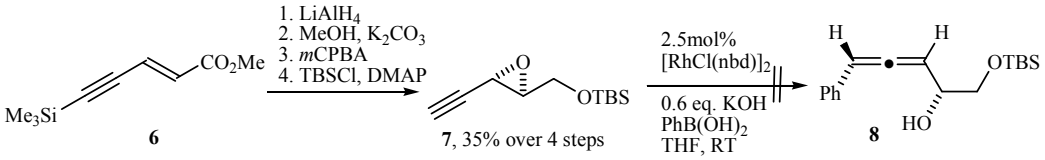
3 ,85%, ds > 95 :5

4, 92%, ds = 77 : 23

5-Methyl-Goniothalesdiol (**5**)

To test our planned synthesis we decided to synthesize 5-Methyl-Goniothalesdiol (**5**) starting from the easily available precursor **1**. One key step was the Rh-catalyzed allene formation recently developed by *Murakami* and co-workers. During our investigations we were able to optimize the reaction conditions so that only 0.5% Rh-catalyst are required (5% at the beginning) for this transformation. Gratifyingly, we preserved the mild reaction conditions obtaining the allenol **2** in good yields and excellent stereoselectivity. Gold-catalyzed Cyclization leads to the desired heterocycle **3**, which was epoxidized under substrate control to give the bicyclic intermediate **4**. Here some stereochemical information was lost so that further studies will be necessary to improve that step. The compound **4** can be easily transformed into 5-Methylgoniothalesdiol (**5**) using standard procedures.

For the original natural product we synthesized the required epoxide **7** from the readily available enynoate **6**. Reduction of the ester with $LiAlH_4$, cleaving of the TMS group leads to the enynol **7**. Epoxidation with *m*CPBA and protectoion of the primary alcohol gives compound **8** in moderate yields over 4 steps.



6

7, 35% over 4 steps

8

Unfortunately the Rh-catalyzed allene formation did not lead to the desired or any other isolable product, although the starting material was completely consumed. This was independent from the used base, the Rh-catalyst, temperature or nucleophile. Studies towards the reaction mechanism revealed that a substituent at the alkyne moiety might help to avoid this. As protecting group, a silyl substituent, which can be easily cleaved at a later stage of the synthesis, shall be introduced.

In summary, we were able to improve the reaction conditions for the Rh-catalyzed

synthesis of allenols by using boroxines instead of boronic acids allowing a lower catalyst loading. Further work will be devoted for the completion of the natural product synthesis and of its derivatives. Further work will be devoted for the completion of the natural product synthesis and of its derivatives. By using functionalized boronic acids or boroxines, compounds for structure-activity studies are easily available in an environmental friendly way using .

8. Please add your comments (if any):

Although I could not fully answer the problems with my original research experiment, I have benefited greatly from my host, Prof. M. Murakami. Beside the scientific point of view I had an incredible and unforgettable living and cultural experience while participating in this program. Therefore I would like to thank my host Prof. M. Murakami, his group, the Imai´s for a great home stay experience and JSPS for funding this program.

9. Advisor's remarks (if any):

It was with great pleasure for me to host Mr. Carl Deutsch in my group. His original research project under Prof. Krause's guidance was in a sense destined to fit in the study that had been ongoing in my group. And so fruitful our collaboration has been so far and will be in the future. I conclude that both Dortmund and Kyoto groups have benefited significantly from this summer program in terms of educational as well as scientific perspectives.

RESEARCH REPORT

1. Name: Wolf-Dietmar Huetteroth （ID No.: SP07302）

2. Current affiliation:

PhD student at Philipps-University of Marburg

3. Research fields and specialties:

Humanities Social Sciences Mathematical and Physical Sciences
Chemistry Engineering Sciences X Biological Sciences
Agricultural Sciences Medical, Dental and Pharmaceutical Sciences
Interdisciplinary and Frontier Sciences

4. Host institution: Research Center of Advanced Science and Technology (RCAST), University of Tokyo

5. Host researcher: Prof. Dr. Ryohei Kanzaki

6. Description of your current research

The main goal of my ongoing PhD is to use standardized brain neuropil volumes of the sphinx moth *Manduca sexta* antennal lobe as a tool to measure the effects of pharmacological interference on the nitric oxide/cGMP pathway during pupal development. I already succeeded in defining these 3D brain areas (Huetteroth and Schachtner 2005), and the summarizing work is about to be published (in preparation).

Alongside I got involved in other projects of my lab and cooperations with other labs, which basically formed my personal research profile so far. This includes the timecourse of Cu,Zn-superoxide dismutase-like immunostaining in the developing antennal lobe of *Manduca* (Schachtner, Huetteroth, Nighorn and Honegger 2004), the hormone-dependent timecourse of neuropeptide-immunoreactivity like allatotropin in the antennal lobe (Utz, Huetteroth, Voemel and Schachtner, in revision), the general occurrence of neuropeptides in the antennal lobe using MALDI TOF mass spectrometry (Utz, Huetteroth and Schachtner 2007) and an ongoing interest in 3D brain morphology of insects, including *Manduca* (in preparation), the beetle *Tribolium castaneum* (in preparation), and others.

Within the framework of this second topic I already assessed intracellularly stained neurons of the *Manduca* antennal lobe and assigned their innervation pattern in cooperation with Dr. Staudacher and Dr. Daly, Morgantown, West Virginia, USA. Consequently, I was eager to learn this method by myself, combined with getting to know the brain anatomy of another well-established model insect, the silkmoth *Bombyx mori.* This also gave me the opportunity to apply some of the skills I have gained so far regarding neuropeptide immunocytochemistry.

7. Research implementation and results under the program

Title of your research plan:

Characterization of neuropeptide-containing cells found in the silkmoth antennal lobe

Description of the research activities:

In the brain, the structural organization of the insect antennal lobe (AL) is almost identical to its vertebrate counterpart, the olfactory bulb. The underlying basal olfactory information processing mechanisms are also shown to be comparable. Since the insect AL offers several methodological advantages regarding complexity and accessibility, the ALs of the sphinx moth *Manduca sexta* or the silkmoth *Bombyx mori* serve as well-established model systems for olfaction for over three decades now. So far, the general neuroarchitecture and the role of principle neurotransmitters like GABA and Acetylcholine have been revealed. But nearly nothing is known about the role of modulatory input mediated by peptidergic interneurons.

We know of certain neuropeptides being present in synaptic sites in the AL, but still our knowledge about possible input regions of these peptidergic cells remains fragmentary. If this can be resolved, we might better understand which anatomical and chemical inputs are able to modulate olfactory sensation.

Within the frame of this program, I wanted to determine the amount of immunoreactive peptidergic cells in the antennal lobe of the silkmoth *Bombyx mori* regarding the neuropeptides Allatotropin, Allatostatin, and Tachykinin.

Additionally I wanted to clarify the exact morphology of certain neuropeptidergic neurons connected to the AL followed by 3D reconstruction. Usually, depending on the antibody used, several cells are stained by immunocytochemistry, but their dendritic and axonal ramifications are not always easily detectable in fine detail. Also, their arborizations intermingle, which hinders proper assignment of cell bodies to their ramifications.

This can be overcome by intracellular filling of the cells in question. However, usually this is done in unfixed tissue, with subsequent immunohistochemical treatment. A laborious task, because these cells in question cannot be identified in advance and have to be filled “by accident”.

I wanted to overcome these problems by adapting a certain method for whole brains which was used so far in brain slices only (Wegerhoff and Breidbach 1994). In this method the immunocytochemical step is performed first omitting any detergent (which hinders proper staining, but maintains cell membrane integrity). Under optical control now one can aim with a sharp electrode for these prestained cells and subsequently fill them for proper arborization reconstruction.

Due to several staining problems I succeeded in staining *Bombyx* brains with antisera raised against the neuropeptides Allatotropin, Allatostatin and Tachykinin just in the last week. Further stainings and an assessment of the performed work will continue

both here in Japan and back in Germany. We already planned an ongoing

collaboration between our labs to solidify those preliminary results, which will eventually lead to a publication on *Bombyx* neuropeptides in the antennal lobe.

I also was able to show the feasibility of the "prestain-then-fill"-technique, although due to time limits I was not able to show this on cells I was interested in. Nevertheless, the immunocytochemical staining of *Bombyx* wholemount brains omitting any detergent yielded some preliminary, though extendable results, and also the intracellular filling of already fixed brains could be performed. I was also able to compare two different fluorescent markers for the filling task. These were the well- established Lucifer Yellow and the dextran-based Microruby, which performed slightly better due to its smaller size. Microruby had the additional advantage of being biotin-coupled, allowing for subsequent intensification of the signal using fluorophore-coupled steptavidin (which binds specifically to biotin).

Together with my lab supervisor Ryota Fukushima, another PhD student, we also established a better dye filling protocol in the Kanzaki lab based on pulsed current application instead of continuous current application. Thereby clogging of the electrode tip is highly reduced, allowing for a higher rate of successful stainings.

8. Please add your comments (if any):

First of all I'd like to thank JSPS for giving us the opportunity to come to Japan for two months "as a taster". I think this helps a lot to convince people to get a first glimpse onto this fabulous country with its fascinating culture! I also like to thank the DAAD for helping a lot during the preparation beforehand and during the stay – it made the whole trip a lot easier. Of course I'd like to thank Prof. Dr. Kanzaki who was not only willing to host me but also gave me always the feeling of being very welcomed. In this regard my special thanks goes to Ryota Fukushima, who very patiently helped me with everything during my stay in Tokyo; this starts with general lab and setup explanations and does not end with help on buying food!

Regarding my research I had to cut back on my original plans due to technical problems, but still I gained new exciting data, extended my knowledge about insect antennal lobes to silkmoths, made several good contacts, learned new techniques, and might also been of some help in the Kanzaki lab here… I really hope that our further cooperation will last beyond the already planned work.

9. Advisor's remarks (if any):

During the JSPS-summer program Mr. Wolf-Dietmar Huetteroth has been working very hard in our laboratory to achieve a technique developed by our laboratory for an insect brain research, which will be useful for progressing his Ph.D. research. I and all the members of my laboratory are very happy that Wolf has joined the laboratory with his great spirit on science and a warm heart.

Wolf really has established a good friendship with the members in my laboratory. I hope that Wolf and we would like to continue to have a great collaboration on the research again in the future. This collaboration will lead not only a good progress on the research but also a good international friendship among Wolf, members of my laboratory and me. I would like to thank Wolf for his joining to our laboratory!

RESEARCH REPORT

1. Name: **Dr. Sebastian Kiewitz** （ID No.: SP07303 ）

2. Current affiliation: **Faculty of Chemistry and Pharmacy, University of Regensburg**

3. Research fields and specialties:

Humanities Social Sciences Mathematical and Physical Sciences
Chemistry Engineering Sciences Biological Sciences
Agricultural Sciences Medical, Dental and Pharmaceutical Sciences
Interdisciplinary and Frontier Sciences

4. Host institution: **Kyoto Pharmaceutical University**

5. Host researcher: **Prof. Yoshiaki Kiso**

6. Description of your current research

The Id proteins Id1-4 form a subgroup of the Helix-Loop-Helix (HLH) protein family whose members are characterized by the presence of a HLH dimerization motif. Most of the HLH proteins are transcription factors that dimerize and bind to the DNA to activate transcription. Within this protein family the Id proteins occupy an outstanding role. Although they readily form heterodimers with the other HLH family members, these dimers can no longer bind to the DNA, as the Id proteins lack a basic region adjacent to the HLH motif. Thus, the Id proteins inhibit the DNA binding and the activation of transcription. As the Id proteins are not only involved in a wide range of tumor-related processes but are also differently expressed in tumor and normal adult cells, they represent interesting targets for the development of anti-cancer therapeutics. However, despite the success in unraveling their biological implications, not much is known about the structural properties of the Id proteins. The only information available so far stems from the crystal structures of bHLH dimers bound to the DNA. During my PhD thesis I focused on the conformational preferences of the Id HLH motif. Corresponding peptide sequences were synthesized by solid phase peptide synthesis (SPPS) and characterized structurally by means of circular dichroism (CD) and NMR spectroscopy. The results indicated that the isolated HLH motifs are highly structured and oligomerize at higher concentrations. Moreover, the analysis of HLH analogs containing various loop surrogates showed that the loop region plays an important role in the stabilization of the overall fold.

7. Research implementation and results under the program

Title of your research plan

Improved solid-phase peptide synthesis of Id protein fragments

Description of the research activities

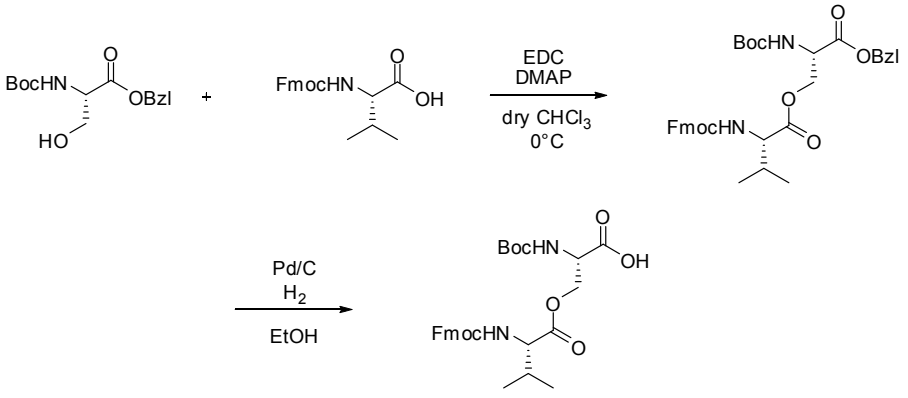
The structural analysis of peptides by 2D-NMR spectroscopy necessitates the access to a large amount of sample material. Due to difficulties encountered during the conventional solid-phase peptide synthesis (SPPS) of the Id HLH motifs, only a limited amount of the peptides could be obtained so far.

In recent years, several methodologies to overcome the poor synthetic outcome of SPPS caused by "difficult" sequences were developed, one of them being the O-acyl isopeptide methodology introduced by Kiso and coworkers. Their strategy is based on the incorporation of an ester bonded hydroxy amino acid in place of an amide bond, which leads to an improved efficacy of coupling and deprotection steps by preventing unfavorable interactions between the growing peptide chains. After completion of the synthesis the native amide bond is formed by an *O-N* intramolecular acyl migration at a slightly basic pH value. As the involved esterification step can lead to racemization when performed on solid-phase, the O-acyl bond is introduced *via* a previously synthesized dipeptide unit.

With several serine and threonine residues throughout their HLH motifs, we envisioned that the O-acyl isopeptide methodology might be suitable to improve the synthesis of the HLH motifs of Id1 and Id2. Furthermore, as the intended position for the dipeptide unit is situated at the loop region of the HLH motif, a structural comparison of the O-acyl isoforms and the native peptides might be worthwhile.

Accomplished research

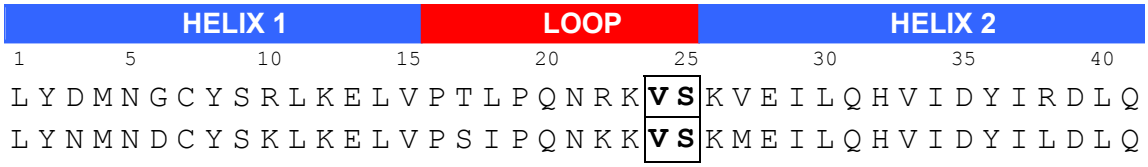
At first, the required Boc-Ser(Fmoc-Val)-OH dipeptide unit was synthesized in solution corresponding to the standard procedure used in the Kiso laboratory (Scheme 1).



Scheme 1. Synthesis of the Boc-Ser(Fmoc-Val)-OH dipeptide unit.

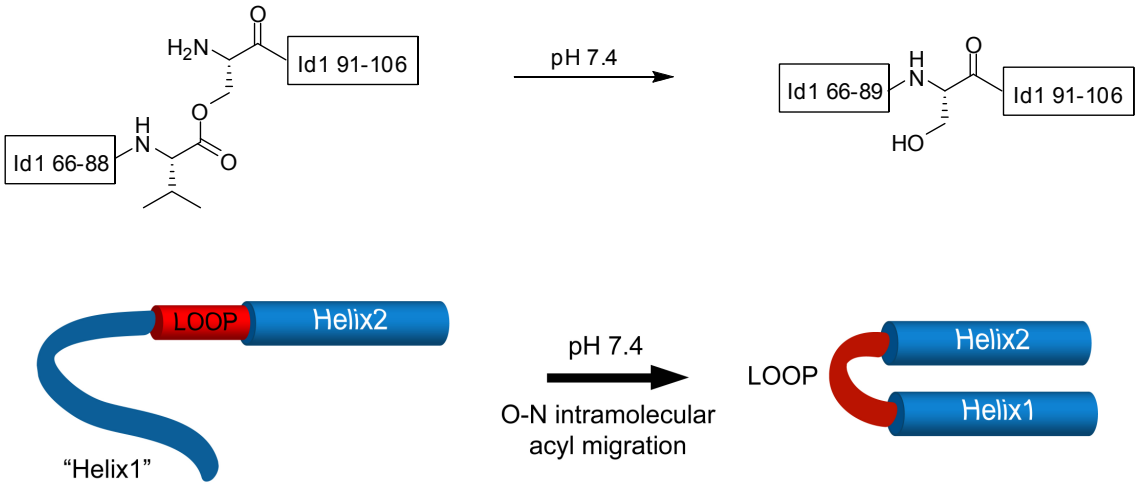
Subsequently, the dipeptide unit was introduced at the N-terminal part of the second helices of the HLH motifs of Id1 and Id2 on the solid-phase (Rink Amide MBHA resin), which had been already prepared in Germany (Table 1).

Table 1. Synthesized peptides representing the HLH motifs of Id1 (first sequence) and Id2 (second sequence), respectively. Both peptides were N-terminally acetylated and C-terminally amidated. Boxed amino-acids indicate the position of the isoacyldipeptide unit.



After the manual elongation using a standard SPPS protocol (5 equiv. amino acid, 5 equiv. HOBt and 5 equiv. DIPDI in DMF for two hours), the two peptides were cleaved from the resin and purified by preparative HPLC. Unfortunately, two unprecedented side products were observed after the introduction of the isoacyldipeptide unit, which could not be identified yet, but might provide information about the scope and limitations of the O-acyl isopeptide methodology.

As the occurrence of side products impaired the yield of the desired peptide the initial goal of improving the synthesis of the Id HLH motifs could not be achieved. Nevertheless, the two obtained peptides will prove valuable for the elucidation of the underlying principles of the Id HLH structure: as the isoacyl unit is located within the loop region of the HLH motifs, the *O-N* intramolecular migration, triggered by slightly basic conditions, could induce a conformational switch of the peptide from a rather unordered state to its correctly structured native form (Scheme 2). Using circular dichroism (CD) the progress of this structural transition could be monitored.



Scheme 2. Anticipated conformational "switch" triggered upon the O-N intramolecular acyl migration.

8. Please add your comments (if any):

Despite its short length, the JSPS Summer Program provided me not only an invaluable experience in science, but also allowed me an insight into the Japanese culture. Therefore, I would like to thank the JSPS for the fellowship, my PhD supervisor Dr. Cabrele for encouraging me to participate in this program and Professor Kiso for accepting me as research fellow in his laboratories. Furthermore, I want to thank family Tsurudome for the nice home stay experience in Kamakura as well as Dr. Kakizawa for her help in the laboratory.

RESEARCH REPORT

1. Name: Tanja Gabriele Klein （ID No.: SP07304）

2. Current affiliation: Justus-Liebig-Universität Gießen

3. Research fields and specialties:

Humanities X Social Sciences Mathematical and Physical Sciences
Chemistry Engineering Sciences Biological Sciences
Agricultural Sciences Medical, Dental and Pharmaceutical Sciences
Interdisciplinary and Frontier Sciences

4. Host institution: Kwansei Gakuin Daigaku, Nishinomiya Campus

5. Host researcher: Prof. Takehiro Fujihara

6. Description of your current research

When talking about aggression and violence at schools, the discussion usually focuses aggressive behavior of students directed at other students and – occasionally –at their teachers. What has been largely ignored in empirical research is the fact that teachers also behave aggressively against students – with potentially important implications for class climate, students' self esteem, and student aggression. In winter 2006/2007, a nationwide survey including more than 1,000 German eighth-graders was conducted, which included not only observed teacher aggression (O-TAGG) and victimization through aggressive teacher behavior (V-TAGG), but also positive teacher behavior, class and school climate, self esteem, and student aggression.

This study pursued the following goals: (a) In how far do Japanese teachers behave aggressively, and (b) in how far do they differ from German teachers? With Japan as a collectivistic and Germany as an individualistic society (Markus & Kitayama, 1991), group cohesion – and, as a consequence, also the pressure to behave conformly with the group (e.g. Davies & Ikeno, 2002) – is assumed to play a significant role in Japan, but to a lesser extent in Germany. In terms of aggression, open forms of aggression question the group's identity more than indirect forms of aggression, which still allow maintain the outward appearance that everything is all right. As to the role of the teacher, class management in Japan is as important – sometimes even more important – than conveying knowledge; thus, teachers are often regarded as a "parent" of their class, whose role is to encourage students and to integrate everyone into the group (Qi, 2004). As little is known about the subject, one further purpose of this study is to use the results to generate hypotheses for further studies and to gain experience with possible pitfalls of conducting survey research with Japanese junior high school students.

7. Research implementation and results under the program

Title of your research plan:

Teacher Aggression in Japan: A Cross-Cultural Study

Description of the research activities:

I. Translation and Modification of the German Questionnaire

The German questionnaire was first translated into English by a German psychologist with several years of experience as a translator in order to create a common working base. As the German sample had encountered difficulties evaluating the behavior of "teachers in general", we added three scales concerning the behavior of the teacher they liked least to make it easier to grasp what the questions were aiming at. Other modifications concerned the assessment of the students' aggression level (from open-ended questions about absolute figures to a Likert-type scale) and an enhancement of the explanations of aggressive behaviors according to the definitions used by Björkqvist et al. (1998) in their *Peer-Estimated Conflict Behavior* (PECOBE) scales. This version was then translated into Japanese through communicative validation by a team of four Japanese psychologists, with the German translator being present for explanations and clarifications.

After comparing different Japanese versions of the Rosenberg self-esteem scale, a recently validated translation by Mimura and Griffiths (2007) was obtained through personal contact with the first author. The questionnaire was then laid out in a manga-like style to make it more appealing to the students. The final version was submitted to a professor of German language and literature and, after only minor modifications, was pre-tested with a sample of 11 junior high school boys from an adjacent school, upon which the sequence of the scales was changed once again.

II. Sample

Due to summer holidays, only one school in Hiroshima participated in the study yet; however, a continuation is planned for autumn this year. Unfortunately, the 2nd-year Junior High School students (equivalent to the German eight-graders) were not allowed to participate (tellingly, because of their high aggression levels). Instead, we questioned 1st- and 3rd-year students (three classes each, n=186 altogether; 53% girls, compared to 63% in the German sample) who showed a substantial overlap in age to our original sample (D: M=13.63, SD=0.60; J: M=13.39, SD 1,17); however, we would like to point out that the present results are preliminary and that the final ones, based on an appropriate comparison group of similar size, may differ from the ones presented here.

III. Results

a) Quality of the Questionnaire: Consistency of the questionnaire scales could be shown in the Japanese sample, with excellent Cronbach's α ranging between .92 and .94 for all teacher behavior scales; the four-item climate scale still yielded a satisfactory α of .67.

Teacher Aggression Scale:
0 = not at all
1 = 1-2 times/6 months
2 = 3-5 times/6 months
3 = about once a month
4 = about once a week

b) Form and Frequency of Aggressive Behaviors: Yelling at students is the most frequent aggressive teacher behavior (J: 2.22, G: 3.10; see box for interpretation of the figures). In Germany, this is followed by unfair questions (2.38) and sexually insinuating comments (1.91); in Japan, by slight physical disciplinary measures (1.30) and condescending behavior (1.17), respectively. For the Japanese sample, the order is identical for victimization; all means were <1 (with being yelled at coming close with a mean of .99), thus occur even more seldomly than once or twice in half a year. In the German sample, students are victimized by unfair questions (1.35), being overlooked (1.20), and being yelled at (1.08), the rest of the victimizing behaviors all attaining values <1.

c) Differences Between Japanese and German Students: As both age and gender showed different distributions in the two groups, yet can be assumed to play a significant role, these factors were statistically controlled for. In all cases, the group (Japanese vs. German) was more important than age or gender with respect to effect size.

All aggregated indicators (sums of scales) revealed significant differences between the two groups: overall, German students observe more teacher aggression directed at their fellow students and are victimized more frequently by their teachers. Furthermore, the two groups were also compared according to the aggression subscales. Apart from PAGG, VAGG and IAGG, two subscales for sexualized aggression and power abuse were computed (each differentiated for O-TAGG and V-TAGG). Contrary to our expectations, Japanese students rated their teachers higher with respect to PAGG (both observed aggression and victimization); as to victimization through teacher VAGG, no significant differences were found. In all other scales, German teachers scored significantly higher than their Japanese counterparts.

IV. Limitations and Further Analyses

The subscales were constructed on a theoretical rather than an empirical base and comprised only three to four items each, which might partly account for the unexpected findings. However, we did not control for the raters' status within the group: It is therefore conceivable that those students who are not well integrated anyway may be bullied by their teachers in an even more obvious way than in Germany to state an example (出る杭は打たれる); further studies should therefore take this factor into consideration.

We want to state again that the results presented here are preliminary; they will be completed by further data in autumn so that more reliable comparisons can be made.

RESEARCH REPORT

1. Name: Krause, Vanessa （ID No.: SP07305 ）

2. Current affiliation:

Heinrich Heine University Düsseldorf, Department of Neurology, MEG-Laboratory

3. Research fields and specialties:

Humanities Social Sciences Mathematical and Physical Sciences
Chemistry Engineering Sciences Biological Sciences
Agricultural Sciences Medical, Dental and Pharmaceutical Sciences
X Interdisciplinary and Frontier Sciences

4. Host institution: National Institute for Physiological Sciences, Department of Cerebral Research, Section of Cerebral Integration

5. Host researcher: Professor Dr. Norihiro Sadato

6. Description of your current research

Sensorimotor synchronization - the temporal coordination of perception and action - plays a crucial role in various contexts of everyday life. Though synchronization of the own movement to a temporally predictable structure of events seems to be a simple task, subjects systematically falsely anticipate the pacing signal in tasks of sensorimotor synchronization. More precisely, despite the subjective impression of synchrony finger taps typically precede an external auditory pacing signal by several milliseconds (‘negative asynchrony’).

Furthermore, the same bias on a perceptual level became evident. The cross-modal discrimination threshold is dependent on the order of cross-modal stimulation. Apparently, the order of the tactile stimulus preceding the auditory one is rather tolerated than vice versa - indicated by a higher discrimination threshold. It is suggested, that a behavioural advantage in terms of synchronization is accompanied or even caused by a perceptual advantage. If the often observed negative asynchrony can indeed be explained by an asynchrony already on a perceptual level, cannot distinctly be proved on the basis of previously existing data.

7. Research implementation and results under the program

Title of your research plan:

The underlying cerebral network of cross-modal discrimination: An fMRI-study

Description of the research activities:

The purpose of this study is to examine the components of the underlying network of cross-modal discrimination using functional magnetic resonance imaging (fMRI). Of particular concern are the brain structures involved in the processing of two cross-modal stimuli, which are (i) objectively and subjectively distinct, (ii) objectively distinct but perceived as a single event and (iii) objectively isochronous. The question is followed, to which extent the brain networks underlying these states differ. Cross-modal stimuli are presented in two combinations (tactile – auditory (TA) vs. auditory – tactile (AT)). The auditory stimulus consists of a binaural click. The tactile stimulus is applied to the right index finger tip by means of an electrical collar. The experiment is divided into two parts – (i) behavioural determination of the cross-modal discrimination threshold and (ii) determination of the underlying cerebral network using fMRI.

Experiment 1. First, the individual perceptual discrimination threshold is determined in two cross-modal stimulus combinations (TA vs. AT). In the first trial of each combination, the interval between the two cross-modal stimuli (stimulus onset asynchrony (SOA)) is being reduced by 5 ms, respectively, starting with an SOA of 150 ms. In the second trial of each combination, the interval is being increased by 5 ms, respectively, starting with objective simultaneity (SOA = 0 ms). Accordingly, the individual perceptual discrimination threshold is defined as the mean value of the last correctly discriminated pair of stimuli (trial 1) and the last simultaneously perceived pair of stimuli (trial 2).

Experiment 2. Second, the cerebral network involved in cross-modal discrimination is investigated using fMRI. Based on the previously determined discrimination threshold, a randomized order of cross-modal stimuli, which are (i) objectively and subjectively distinct (supra-threshold = threshold + 30 ms, …, + 50 ms), (ii) objectively distinct but perceived as a single event (sub-threshold = threshold - 30 ms, …, - 50 ms) and (iii) objectively isochronous (SOA = 0 ms) is presented to the subjects. Furthermore, unimodal (tactile only (T) and auditory only (A)) conditions as well as nullevents are presented. The subjects are required to press one of two

buttons with their left middle finger following the impression of synchrony and T-condition and with their left index finger following the impression of asynchrony and A-condition. So far, data of 10 subjects have been collected. Further fMRI data analysis will be conducted using statistical parametric mapping (SPM5, Functional Imaging Laboratory, Wellcome Department of Imaging Neuroscience, London, UK) implemented in Matlab (Mathworks, Sherborn, MA). Differences in activation patterns between distinctly and isochronously perceived pairs of stimuli are supposed to be found. In dependency on these results further investigations are needed in order to adjust cerebral structures associated with cross-modal discrimination and sensorimotor synchronization. Using Magnetoencephalography (MEG), a cerebello-thalamo-cortical network was found to be associated with unimanual synchronization in healthy subjects (Pollok et al., 2006). A combination of fMRI data about cross-modal discrimination and complementary MEG data may shed further light on neurophysiological foundations of sensorimotor synchronization.

8. Please add your comments (if any):

I would like to thank JSPS and DAAD for giving me the opportunity to conduct research at a Japanese host institute within the framework of the JSPS Summer Program 2007. I had a very valuable time in Japan and gained many new and positive impressions. The results which will be due to this study will support my further research work.

Also I wish to thank Professor Dr. Norihiro Sadato and all my colleagues at the Institute for welcoming me in such a friendly way and making my stay in Japan a very precious experience.

RESEARCH REPORT

1. Name: Jan Küntzer （ID No.: SP07306）

2. Current affiliation: Center for Bioinformatics Saar, Saarland University, Saarbrücken

3. Research fields and specialties:

Humanities Social Sciences Mathematical and Physical Sciences
Chemistry Engineering Sciences Biological Sciences
Agricultural Sciences Medical, Dental and Pharmaceutical Sciences
X Interdisciplinary and Frontier Sciences

4. Host institution:
Bioinformatics Center, Institute for Chemical Research, Kyoto University

5. Host researcher: Prof. Dr. Susumu Goto

6. Description of your current research

Over the last years I focused on systems biology, especially the development of a biological information system which was designed to be usable by both, software developers and biologically oriented users.

For this purpose we developed the biochemical network library BN++ (www.bnplusplus.org). This system is based upon an object-oriented data model, called BioCore, which is powerful enough to model most known biochemical processes and at the same time easily extensible to be adapted to new biological concepts. We first implemented BioCore in a C++ framework which is further extended by additional classes providing functionality for data integration as well as for data analysis. BioCore classes can be automatically mapped onto a mathematical graph structure offering the possibility to analyze and simulate the data. Therefore, the C++ framework provides convenient means for rapid software prototyping of complex applications in systems biology. We have implemented a broad range of importers for widely used biochemical databases and for standard data exchange formats. The software framework contains classes for the integration of the Pathway and Genes databases from the Kyoto Encyclopedia of Genes and Genomes. Futhermore, we implemented importers for sequence databases (SwissProt, RefSeq), pathway databases (BioCyc, TransPath), protein interaction databases (DIP, MINT, IntAct, and HPRD), transcription factor databases (TransFac), gene expression databases (GEO), and protein annotation databases (InterPro, CAP). For the persistent storage of data modeled with BioCore, we developed a database called the biochemical network database BNDB. We fully integrated this database into BN++, our data warehouse system. We implemented in cooperation with the university of Tuebingen for the visualization of the biochemical data a sophisticated graphical user frontend, called BiNA. The interface allows complex queries to the data warehouse and conveniently visualizes the results of these queries using automated graph drawing. In addition, with its powerful plugin structure BiNA gives the opportunity to integrate own modules into the frontend. BiNA allows for example the mapping of expression data onto graph attributes by changing the node/edge colors.

7. Research implementation and results under the program

Title of your research plan:

Structural analysis of regulatory and metabolic networks by using and expanding the Biochemical Network Library BN++

Description of the research activities:

The idea behind the project was to extend the functionality of the biochemical network library and use it for structural analysis of regulatory and metabolic networks. We wanted to improve the integration of new features into existing importers and integrate new analysis routines in the C++ framework. We hoped to find, e.g., differences between pathogenic and non-pathogenic bacteria, especially in their biochemical network. We wanted to find a reason why these bacteria are pathogenic and hoped to see significant differences in their regulatory and metabolic network. Furthermore, we wanted to combine this analysis with expression data to improve the results.

Therefore, I started to embed the statistical programming language R into our visualization system BiNA. The full integration in BiNA gives the possibility to analyze, e.g., expression data. R contains a huge number of different numerical stable routines for all different kind of applications, which can now be easily used in BiNA for various analyses. This part of the project is finished, however some improvement in the graphical user interface could be still implemented.

After fruitful discussions with colleagues at the institute, I integrated the data of the NCBI HIV Interaction database into BN++. Starting from that point we want to take a closer look at the interaction network of HIV and human. Therefore I started to integrate a network motif recognition algorithm in the C++ framework of BN++. However, it turned out to be not as simple as thought to be, since all currently available algorithms are quite time consuming. Therefore, I decided to think about another algorithm, which however could not be finished during the short time.

8. Please add your comments (if any):

At first, I want to thank Prof. Goto who provided me with all his help and scientific advise. Without his excellent organisation my stay would not have been such a good experience. Furthermore, I would like to thank Prof. Kanehisha for giving me the chance to stay at his institute and inviting me to join the IBSB conference in Tokyo.
In addition, I want to thank all the students in the Kanehisha laboratory for the wonderful time and the discussions about research, japanese language, and japanese culture.
Finally, many thanks to JSPS for giving me the opportunity to have a great insight into japanese research and daily life. The time in Kyoto was a wonderful experience I would not like to miss.

RESEARCH REPORT

1. Name: **Andreas ORTH** （ID No.: **SP07307**）

2. Current affiliation: **Researcher at the University of Bonn**

3. Research fields and specialties:

Humanities Social Sciences Mathematical and Physical Sciences **X**
Chemistry Engineering Sciences Biological Sciences
Agricultural Sciences Medical, Dental and Pharmaceutical Sciences
Interdisciplinary and Frontier Sciences

4. Host institution: **Kyushu University, Faculty of Engineering Sciences, Department of Electrical and Material Science, Hamamoto Lab; Fukuoka**

5. Host researcher: **Prof. Kiichi Hamamoto**

6. Description of your current research

We are using positron annihilation spectroscopy (PAS) to better understand the micro- and nanostructure of alloys and multi- component materials.

It is not only the composition, but rather the microscopic arrangement of atoms of different elements that determine physical properties of a substance.

In my inland research, I am currently investigating aluminum alloys which are commonly used in the aircraft and automobile industry. The durability of these metals is highly sensitive to the duration and temperature of the different stages of the manufacturing sequence. Through trial and error, certain procedures have been found to yield the desired results, although little is known as too why these work.

We hope to shed some light on this, and possibly find new components to create even superior alloys.

But the use of PAS is not restricted to bulk material. Positrons in any crystal lattice are attracted to vacancies, and are therefore probes for deficiencies of all kind, dislocations, impurities and so on.

7. Research implementation and results under the program

Title of your research plan:

Bi- stable MMI (Multi Mode Interference) devices for optical flip- flops

Description of the research activities:

Laser- active materials radiate coherent light when accordingly supplied with some sort of power, so called "pumping". Special geometries and materials (MMI's) can enable multiple lasing modes to be emitted simultaneously.

These modes can be e.g. two laser beams with different wavelengths (unfavorable for application in telecommunication, because different wavelengths are already used here to achieve higher bandwidths), or different pathways inside the MMI if it has more than one output waveguide.

For a stable operation of either one of the modes, the two have to compete, suppressing the other when active themselves. This is called "cross- saturation". By injecting a short pulse into the active MMI, timed just right, one can induce a switch between the active and the suppressed mode. We plan to use this as an optical flip- flop, storing one bit of data.

The setup we have developed allows the two beams to only differ in the order of their optical modes (spatial light field distributions), but propagate in the same waveguide. Therefore, the cross- saturation is extremely high, due to the fact that both modes share the same spatial region when propagating. This allows us to decrease the size of the MMI to around 200 x 10 microns. Such a device is sufficiently small for employment as computer data storage.

The proposed MMI's had already been ordered when I arrived in Japan, but unfortunately took some time to be delivered. We wanted to confirm the theoretical simulations with real measurements. The substrate of the MMI's was very thin, so quite a few broke during the experiments. We had about 100 MMI's, varying slightly in their geometry and always three identical ones of each design. With our instruments here, we could only apply pumping current, and measure the output intensity. This way, we will determine the optimal dimensions for the MMI.

Upon returning to Germany, I will try to examine some of the devices with PAS, possibly uncovering minor impurities which can have a tremendous impact on the efficiency of the laser. Hopefully, this will result in vital support in the construction of future MMI- models.

RESEARCH REPORT

1. Name: Christoph Raetzsch （ID No.: SP07308 ）

2. Current affiliation: Technical University of Berlin – Department of Media Studies

3. Research fields and specialties:

Humanities x Social Sciences Mathematical and Physical Sciences
Chemistry Engineering Sciences Biological Sciences
Agricultural Sciences Medical, Dental and Pharmaceutical Sciences
Interdisciplinary and Frontier Sciences

4. Host institution: Doshisha Daigaku, Kyoto

5. Host researcher: Prof. Kenichi Asano

6. Description of your current research

I am currently a graduate student in Media Studies at Technical University, Berlin. My Master thesis is situated in the field of Media Theory, where I try to analyse the writings of French media critic Jean Baudrillard. He draws a crucial distinction between symbolic cultures and semiotic cultures, which largely refers to the way in which media influence the workings of public discourse. For my future research I plan to isolate Baudrillard's paradigm of “Symbolic Exchange” and apply it to a comparative analysis of journalism in various media and across different cultures. I decided to look more closely at Japanese Mass Media because they operate in a largely different fashion and with different objectives than Western Media. I see an indication that the comparison of Japanese Media and Western Media could prove crucial since both face a transition to greater use of digital networking resources. My research during the JSPS Summer Program served the purpose of establishing a sound collection of reference literature on the subject for the formulation of my PhD Thesis. I have submitted this thesis proposal in the meantime. I further wanted to make contacts with researchers in the field and observe the workings of Japanese mass media in their social environment first-hand.

7. Research implementation and results under the program

Title of your research plan:

"The Challenge of Networks to Newspapers"

Description of the research activities:

A large part of the publishing world in countries like the United States, Germany or Great Britain, is currently faced with the dilemma of declining readerships of newspapers and changing information habits. As information retrieval becomes an indivualized, every-day practice, search engines, data banks and social networking sites seem to render professional "gatekeepers" almost obsolete. Parallely, many advertisers steer away from classical mainstream media and try to reach narrowly targetted audiences online. Rather than plastering the city with posters or booking large scale advertising space, advertisers see the Internet as a chance to reach audiences on an almost one-on-one basis. The Internet as a "narrowcasting" channel, as opposed to "broadcasting", seems to be more flexible and efficient, yet the means to reach audiences have still to be tested. Changing habits of media use and the economical pressure from advertisers both influence the difficulties newspapers face today. This is indicative of an altered communicational environment, which has been termed in Japan as "joho gakkai" or information society. How are the biggest newspapers of the world effected by this development? I tried to analyse, whether they face the same problems as newspapers in other countries. The question is whether there is a real challenge coming from networks to Japanese newspapers.

I took my time in Japan as a chance to gain inside knowledge of the curiously different position of Japanese news media in society when compared to Western nations. I was especially interested in the function of journalists for the news process since I worked for the office of Sankei Shimbun in Berlin for more than a year now. I thus investigated mainly newspaper journalism, since it remains conspicuously influential in Japan. For this purpose I compiled the available English literature on the subject and conducted interviews with experts in the field at Doshisha University. Sociological research does not progress along a linear axis; a lot of resource is necessary to compare and become aware of certain bodies of knowledge. Especially in the media studies field, examinations of Japanese media remain confined to either the Japanese studies department, political science or economical reports. A greater integration of these results into mass media discourse is still wanting. Doing first

hand observation along with the critical literature exclusively available in Japan has put me in a state to further encourage the comparative study of journalism. As a preliminary result I can state that the presumed challenge of networks to newspapers, a dominant movement in Western countries, does not exist in Japan. The reasons for that lie in the economical strength of media corporations and the vastly higher credibility of sources close to political power. Citizen journalism does have and will have a hard stand in Japan, which brings up the question whether other means of negotiating identity prevail in Japan apart from the political definitions of subjectivity. "Symbolic Exchange" may provide a key tool for a deeper understanding of the workings of mass media in the Digital Age.

Since my background is not in Japanese Studies, I also took the time as a chance to learn more Japanese. Luckily, Doshisha University provided me with a private teacher and access to advanced Japanese classes. For my future research, this will be of great advantage since I plan to come back to Japan as a researcher for a longer period of time.

8. Please add your comments (if any):

Given that I had neither met Prof. Asano before nor had any contact to Doshisha University, the result of my stay is very satisfactory. Prof. Asano suggested to publish my final paper in the University Bulletin for Social Sciences. Since I don't have any academic publications yet, this is a first step in my academic career. Prof. Asano was also interested in coming to Germany to do more research on the German ombudsman and press system. A stronger integration into the faculty would have been desirable but for a first introduction, 2 months are a short time. I hope that in the future, stays in Japan can help to further my research as well as establishing closer ties between German and Japanese media scholars.

RESEARCH REPORT

1. Name: Hendrik Steigerwald （ID No.: SP07309）

2. Current affiliation: Rheinische Friedrich-Wilhelms-Universität Bonn, Germany

3. Research fields and specialties:

Humanities Social Sciences X Mathematical and Physical Sciences
Chemistry Engineering Sciences Biological Sciences
Agricultural Sciences Medical, Dental and Pharmaceutical Sciences
Interdisciplinary and Frontier Sciences

4. Host institution: Kyushu University

5. Host researcher: Prof. Kiichi Hamamoto

6. Description of your current research

I conducted research in the field of applied optics in medical science for my recent diploma thesis at the Center of Advanced European Studies and Research (caesar). My research group was focused on holography for ultrafast three-dimensional facial imaging medical diagnosis, ablation of human body tissue with Laser Pulses for medical treatment and trace gas analysis of human breath by cavity-ringdown spectroscopy for medical diagnosis.

My research was focused on developing an online feedback system for tissue differentiation during tissue ablation with a short-pulsed CO_2-Laser. Frequency Analysis of the acoustic and optical signal generated by the ablation process was used for differentiation, since the composition of different sorts of tissue yields different ablation processes.

For my current PhD research I have stayed in the field of applied optics but shifted the focus. Currently as PhD student in the Institute of Physics of the University of Bonn I am in a group that mainly focuses on the applications of lithium niobate crystals. Due to their anisotropic structure, lithium niobate crystals can be used as nonlinear crystal for optical frequency doubling.

In my current research I am investigating the ferroelectric properties of lithium niobate with the goal to tailor the size of the ferroelectric domains inside the crystal by using strong electric fields and UV-light. These nonlinear crystals could then be used for the generation of blue laser light.

7. Research implementation and results under the program

Title of your research plan:

Integrated optical circuits for compact a breath-sensing system

Description of the research activities:

During my current research, I am designing an integrated optical circuit for breath sensing. This compact device will be used to analyze human breath and detect trace gases that are disease markers. Breath contains diagnostic information, such as gas molecules indicating lung cancer and oxidative stress. Such breath sensing has already been realized with large cavity-ring-down devices. The sensor I am designing, though it is based on the same principle of optical absorption of the trace gases, is much more compact. The light propagates through a double waveguide structure with a thickness in the micrometer regime. Due to their special structure a strong light field exists inside the gap between the waveguides and is exposed to the trace gas. So the absorption of the light by the trace gases can be measured and the concentration of the trace gases can be determined. For precise measurements, a long a long optical interaction pathway is desired. Therefore the loss inside the waveguide has to be minimized. To maintain the compact structure of the sensor, many bends of the waveguide are required. But these bends yield a significant part of the optical loss. So an optimized waveguide structure, based on theoretical analysis and computer simulation of the propagation of the light field inside the waveguide is designed.

RESEARCH REPORT

1. Name: Sandra Utz （ID No.: SP07310）

2. Current affiliation: Philipps-University of Marburg / Animal Physiology /Germany

3. Research fields and specialties:

Humanities Social Sciences Mathematical and Physical Sciences
Chemistry Engineering Sciences X Biological Sciences
Agricultural Sciences Medical, Dental and Pharmaceutical Sciences
Interdisciplinary and Frontier Sciences

4. Host institution: School of Advanced Sciences, Department of Evolutionary Studies of Biological Systems, Hayama, Kanagawa, 240-0193, Japan

5. Host researcher: Prof. Dr. Kentaro Arikawa and Assistant Prof. Dr. Michiyo Kinoshita

6. Description of your current research

The main aim of my recently completed PhD thesis was the localization and identification of several peptides in the developing olfactory system of the lepidopteran species, *Manduca sexta*. Indispensable prerequisites for a good understanding about the functional role of neuropeptides during CNS ontogeny are 1) their identity (neuropeptidome), 2) their temporal and 3) spatial occurrence. Based on these findings, expression patterns of identified neuropeptides can be correlated with defined events during development. Corresponding experiments shed light on the function and regulation of these molecules. The following results were obtained:

(1) Using MALDI-TOF mass spectrometry, ion signal profiles of lateral cell groups from the ALs were recorded during development. These profiles revealed the presence of twelve chemically identified neuropeptides, as well as the patterns of their temporal occurrence (UTZ et al. 2007).

(2) Immunocytochemical staining was used to detect peptides of the A-type allatostatin family (AST-A) and *Manduca sexta* allatotropin (Mas-AT) in cells of the developing AL and allowed a detailed analysis of their cellular localization and temporal appearance (UTZ and SCHACHTNER 2005; UTZ et al. 2007).

(3) Manipulation of the hemolymph titer of 20-hydroxyecdysone (20E) showed, that peptide expression in different neuron types of the AL is controlled by levels of 20E during development (UTZ and SCHACHTNER 2005; UTZ et al. 2007).

The results of these studies, together with the knowledge of the well-established events during AL-development in *M. sexta* (TOLBERT et al. 2004), can serve as a basis to propose some functions of neuropeptides during AL development. Initial experimental results

lending support to these hypothetical roles of the peptides in question have been obtained at this point in time. One could speculate that mentioned peptides may act as signal molecules involved in shaping the neuronal wiring within the developing neuropil. In order to functionally investigate whether these peptides are involved in synapse formation, electrophysiology appeared to be the most direct approach for future experiments. Therefore, main goal during my stay in Japan was to learn this well-established method in another lepidopteran species, the butterfly *Papilio spec*.

7. Research implementation and results under the program

Title of your research plan:

Intracellular recordings: a suitable tool to study processing mechanisms within sensory systems of butterflies

Description of the research activities:

First aim was to become acquainted with the electrophysiological setup. During experiment, a glass microelectrode was inserted in the eye of the butterfly *Papilio polytes*. Different receptors have been penetrated in a stepwise process. All receptor potentials were preamplified, visualized with an oscilloscope, and recorded. Then monochromatic light stimuli were provided through several narrow band interference filters with maxima ranging from 300 to 700 nm. After the spectral type of the photoreceptor was determined by a series of non-polarized monochromatic flashes, stimulus intensity-response (V-log I) function was measured at the peak wavelength of the given receptor (λ_{max}). The e-vector orientation was initially set parallel to the animal´s dorso-ventral axis – this angle was defined as 0°. Finally, both, spectral and polarization measured response curves were converted into sensitivity curves.

In the course of this study, at least five classes of spectral receptors could be identified. The polarization sensitivities (θ_{max}) of the UV and blue receptors were around 0°, whereas that of the green receptor was around either 90°, 35° or 145°. For the red receptor we determined a θ_{max} at around 35° or 145° and the broad band receptor seemed to be around 40°. In comparison to *P. xuthus*, *P. polytes* do not have photoreceptors with spectral sensitivities peaking in the violet at 400 nm. Instead we encountered two different types of UV receptors peaking at 360 nm, with one type responding to light of a wider spectral range, something never encountered in *P. xuthus* so far.

Secondly, the verification of interneurons in the midbrain of *P. xuthus* was aspired since very little is known about the central processing in this butterfly. First experiments revealed a variety of interneurons responding to different visual stimuli including flash light. Most of them seem to be sensitive to motion stimuli; in addition some are even selective for the motion direction. After each recording, neurobiotin was iontophoretically injected into the cells. The brains were then dissected out and processed for immunohistochemistry to visualize the injected neurobiotin, i.e. the morphology of the neuron. Once established, this is an easy way to stain neurons but since this was an unknown brain area for dye injections in this insect, we first had to adjust electrodes for this purpose. Due to those limitations and limited time I was not

able to do any reconstructions of the morphology of several injected neurons for identification. Nevertheless and although proper recordings from interneurons are difficult to obtain by now, several different types of interneurons could be successfully recorded. For instance, one of these neurons showed an inhibitory response upon a horizontal stripe pattern moving upwards, but showed an excitation when the movement was performed downwards. This neuron did not show any response to flash light.

The obtained preliminary data gives a general overview about different types of interneurons in the central brain of *P. xuthus* and will be continued in near future.

8. Please add your comments (if any):

My special thanks go to Assistent Prof. Dr. M. Kinoshita. The work in her lab was well organized, so a scientific outcome was achieved, and all my expectations have been fulfilled. During this study, I was allowed to obtain interesting insights into her current research and I appreciate the excellent introduction in the electrophysiological technique. A further cooperation regarding this project but also other topics is planned. All members of the working group have been very helpful to me and contributed to a great time in Japan.

Last but not least I wish to thank the "Japan Society for the Promotion of Science" (JSPS) giving me the opportunity to have a great insight into Japanese research and daily life - I am very grateful for this unforgettable time.

9. Advisor's remarks (if any):

Dr. Sandra Utz came to my lab to learn about electrophysiological techniques, in special intracellular recordings in the butterfly optic system. She quickly managed to handle the setup and soon began to produce usable data during the two months' period, which will hopefully be further extended in an ongoing collaboration and finally published. Besides her efforts regarding the JSPS summer program research we greatly appreciated her skillful methodological and scientific input about ongoing research in our lab. Besides her outstanding scientific skills she easily integrated into the all-Japanese lab group and contributed to an enjoyable working atmosphere.

RESEARCH REPORT

1. Name: Nora Vetter （ID No.: SP07311）

2. Current affiliation: University of Cologne

3. Research fields and specialties:

Humanities Social Sciences Mathematical and Physical Sciences

Chemistry Engineering Sciences Biological Sciences

Agricultural Sciences Medical, Dental and Pharmaceutical Sciences

Interdisciplinary and Frontier Sciences X Neurosciences

4. Host institution: Laboratory of Perceptual Dynamics; Brain Science Institute (BSI), RIKEN

5. Host researcher: Ph.D. Cees van Leeuwen

6. Description of your current research

At the group “Neuroimaging” of the University Hospital of Cologne (head: Prof. Dr. Dr. Kai Vogeley) we conducted a functional Magnetic Resonance Imaging (fMRI) study about the Neuronal Correlates of Gaze Sequences. The study concentrated on the social perception of eye gaze which stands in the field of social cognitive neuroscience. We created male and female 3D-characters with different gaze sequences. The influence of these gaze patterns on the rating of likeability was investigated. As another measure the neuronal correlates were detected with the imaging technique fMRI. We found a gender effect in brain activation when male subjects attended to the female stimuli as well as an effect of the shift of eye gaze in brain regions for biological motion.

7. Research implementation and results under the program

Title of your research plan: Perceptual Grouping with Gabor Patches – Global versus Local Interactions

Description of the research activities: With our study about Gabor patches we wanted to discover the influence of local orientation on the perception of dot lattices. The phenomenon of visual grouping is closely related to the Gestalt law of proximity. With the local orientation of the Gabor patches we tried to strengthen the perception against that classical Gestalt law. First of all we created different types of stimuli using Matlab 7. We checked for different parameters and aspect ratios of the dot lattice. Then we varied the gained parameters systematically and achieved a stimulus set with different local angles of Gabor patches and different aspect ratios. We conducted two studies: The first one contained a fixed variation of local angle and the second one a random variation. In these studies we let the subjects rate (after a very short stimulus presentation) in which angle they perceive the dot lattice by means of a keyboard button press. This is classically expected to be influenced by the law of proximity but in our case we found a strong influence of local orientation of Gabor patches in both studies. The aspect ratio also played a crucial role: in the cases where the aspect ratio is higher and thus strengthens the perception against the Gabor patches, they still strongly influence the global orientation ratings of the subjects. We found this striking effect very interesting and will continue in further studies to explore more about this special phenomenon of interactions during low-level visual perception.

8. Please add your comments (if any): I thank JSPS for the excellent organization of the Summer Program and my lab at RIKEN BSI for their support. The experience in Japan - both for the research and the country - was an outstanding opportunity for me.

9. Advisor’s remarks (if any): Nora Vetter has worked in our lab with great skill and enthusiasm. It was a great pleasure to host her and her contribution is really valued; thanks to JSPS for making this possible.

RESEARCH REPORT

1. Name: Jakob Vogel （ID No.: SP07312）

2. Current affiliation: Technische Universität München (TUM), Munich, Germany

3. Research fields and specialties:

Humanities Social Sciences Mathematical and Physical Sciences
Chemistry X Engineering Sciences Biological Sciences
Agricultural Sciences Medical, Dental and Pharmaceutical Sciences
Interdisciplinary and Frontier Sciences

4. Host institution: Graduate School of Information Science, Nagoya University

5. Host researcher: Assoc. Prof. Kensaku Mori, PhD

6. Description of your current research

In general, I am working on several fields connected with medical computer science. We are focusing to provide programs facilitating intervention planning and treatment to the medical community.

In recent times, I worked on the integration of tracking devices into a real-time software framework. These devices are able to acquire the position and orientation of surgical tools. This information can be used to create powerful operating room navigation systems.

During the summer program, I worked on a different problem. In order to make diagnoses and plan interventions, three-dimensional images of the patient are acquired routinely at hospitals, for instance by using Computed Tomography (CT) scanners. I was seeking to automatically “cut out” important abdominal organs (such as liver and spleen) from these volumetric images. This process is known as segmentation. Its results can be used for many applications, such as intervention simulation, computer aided diagnosis and navigation systems as mentioned above, among many others.

7. Research implementation and results under the program

Title of your research plan:

Organ segmentation for a medical navigation system

Description of the research activities:

Fellow researchers at Nagoya University developed a method to reliably segment abdominal organs using four mutually aligned CT volumes. Three of the volumes have been acquired after a contrast agent was administered to the patient.

This method works extremely well but has two important drawbacks:

1) During the acquisition of the four volumes, the patient is exposed to a significant amount of radiation.

2) Due to the long acquisition time, the patient is very likely to move. The alignment of the volumes takes a lot of time and can only correct smaller changes.

The aim of the project was to alter the method in a way such that it can be used with two contrasted volumes only. As considerably less data is available, new approaches to the problem needed to be devised.

In the first part of the project, similar regions (with respect to their color) were identified using automatic statistical analysis. The results were used to assign labels to image regions. Prominent clusters within these classes correspond to certain organs.

In a second part, morphological and statistical operations were applied to extract the individual organs from the classes. These volumes were finally enhanced using proper mathematical tools in order to create a smooth and realistic surface.

8. Please add your comments (if any):

Working in a Japanese university laboratory was an intriguing and extremely interesting experience for me. It has been a very big pleasure to do research among Japanese colleagues, to exchange opinions and ideas with them, and to find friends in Japan. With its Summer Program, JSPS found a wonderful way to make this adventure possible for foreign researchers.

9. Advisor's remarks (if any):

Mr. Jakob Vogel has worked very hard on his research project. Although organ segmentation from CT volumes is new research area for him, he has tried to solve many problems by himself under supervision or suggestions from our colleagues. His has outstanding research ability and I would like to thank JSPS for giving us opportunity to host such researcher.

RESEARCH REPORT

1. Name: Dr. Melanie Wurm （ID No.: SP07313）

2. Current affiliation: Heinrich Heine University Medical Center Duesseldorf

3. Research fields and specialties:

Humanities Social Sciences Mathematical and Physical Sciences
Chemistry Engineering Sciences X Biological Sciences
Agricultural Sciences Medical, Dental and Pharmaceutical Sciences
Interdisciplinary and Frontier Sciences

4. Host institution: Central Institute for Experimental Animals, Division of Laboratory Animal Science, Kawasaki

5. Host researcher: Ph.D. Erika Sasaki

6. Description of your current research

Transduction of adult and embryonic stem cells from marmosets with foamyviral, lentiviral and gammaretroviral viruses and comparison of transduction efficiency.

7. Research implementation and results under the program

Title of your research plan:

Embryonic stem cells from nonhuman primates (*Callithrix jacchus*):
Comparison of the transduction efficiency of foamyviral and lentiviral vectors with different promoters

Description of the research activities:

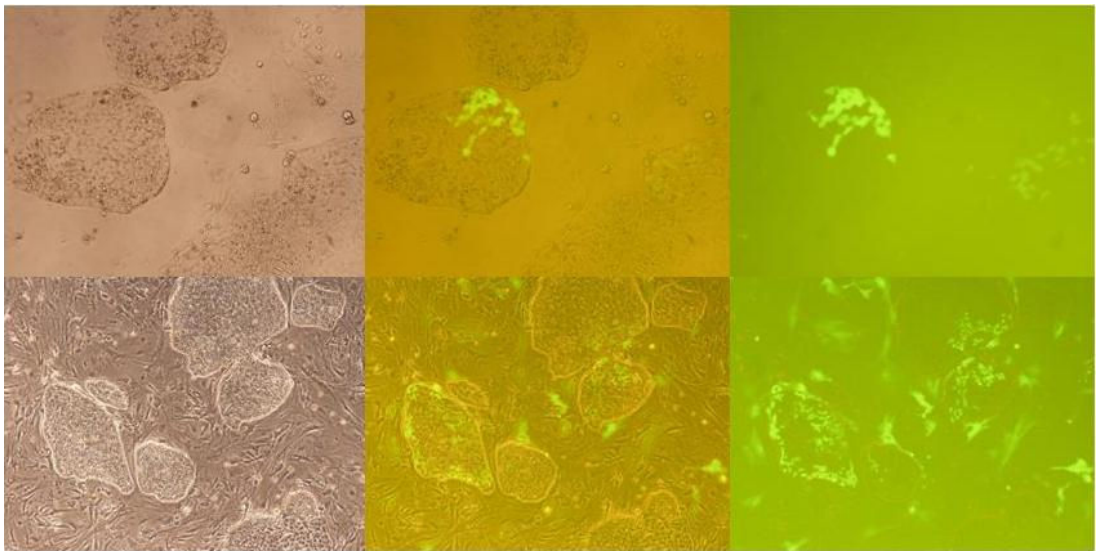
In the experiments, vector systems derived from HIV and from Fomyvirus (FV) have been compared regarding their efficiency in gene transfer. For a direct comparison identically designed lentiviral and foamyviral vector constructs expressing a green fluorescent protein (GFP) have been used. In each case gene expression was under control of a different promoter. First of all, the virus production of FV was established in the laboratory. It has to be said that producing sufficient amounts of FV for the ES cell transduction takes a long time. On the other hand, the production of the Lentivirus is less laborious.

In order to compare the transduction efficiency the quantity of each virus was calculated by infection rate of fibroblast cultures. Two different ES cell lines from marmosets were transduced by the lentiviral and the foamyviral viruses. Integration and expression of the transgene GFP was detected by fluorescence microscopy and a quantitative analysis of gene transfer was conducted by counting cells with flow cytometry. For this procedure the ES cells were labelled with an antibody that is targeting an antigen only expressed by non-differentiated ES cells.

GFP positive cells were detected by fluorescence microscopy in both, ES cell lines transduced by lentivirus and those transduced by foamyvirus. In each case GFP positive cells were seen and counted. In the lentivirus context, two promoters were found working whereas in the foamyvirus context only one promoter was working.

The pictures in the upper row show ES cells infected with FV. The GFP is expressed under control of an EF1α promoter. Only ES cells are GFP positive. The reason why no fibroblast is expressing GFP is that feeder layer of mice fibroblasts, was treated and the proliferation was inactivated. FV not integrate into non dividing cells.

The pictures in the lower row show the control with Lentivirus. An EF1α promoter expresses the GFP transgene. Lentiviruses are able to transduce non-dividing cells and thus GFP is not only expressed in ES cells but also in the fibroblasts used as feeder cells.



The results of the flow cytometry showed that the viruses do not have any impact on the differentiation of the ES cells.

In all cell lines virus constructs produced GFP positive ES cells. Those that were transduced with lentivirus show a higher level of GFP positive cells than the cells transduced with FV.

Further research will focus on further optimization of gene transfer to non-human primate embryonic stem cells and evaluation of the stability of transgene expression over time.

8. Please add your comments (if any):

It is absolutely necessary to do more experiments with FV and ES cells. FV show the highest gene transfer rate two weeks after transduction, but until now, data from other time points are missing and have to be analyzed regarding the transduction efficiency.

The fact that compared to lentivirus the FV can only transduce ES cells and not the feeder layer may be a particular advantage. There will be no background in the results of the actual gene transfer rate and therefore the experiments will be more accurate and precise.