Annual Report 2010

Umeå center for Functional Brain Imaging - UFBI

Content

Welcome

to the first annual report from Umeå center for Functional Brain Imaging (UFBI)

This is the first annual report from us, but UFBI has formally existed for a decade and in reality even a bit longer. In the late 1990's we made the first attempts to use the 1.5T Magnetic Resonance Imaging (MRI) scanner at Norrlands University Hospital (NUS) for registration of task-induced functional brain responses (fMRI). A few years earlier the very first fMRI publications had appeared in the scientific literature, so we were convinced that imaging the functions of the living human brain should be doable – but we quickly learned it was not easy. A more focused effort was needed.

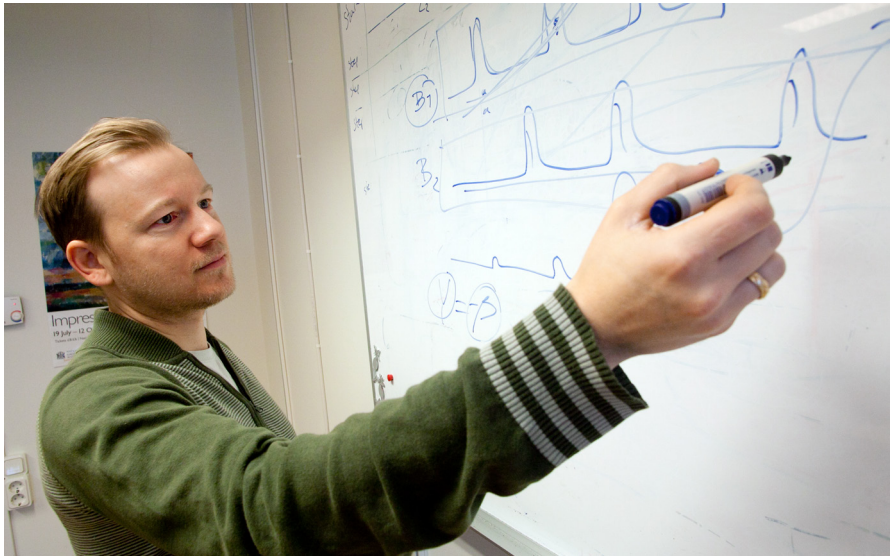
In the spring of 2001 former president of Umeå University (UmU), Inge-Bert Täljedal, invited me and Roland S Johansson to send in an application to the University Board for some seed money from the strategic funds. It remains unclear what Inge-Bert based his decision on, but our application was approved and the funds allowed UFBI to hire an MRI physicist, Anne Larsson. Later that year UFBI was officially installed at the medical faculty. Roland S Johansson and Katrine Åhlström Riklund joined me as members of the steering group.

In the years that have passed, many persons have worked hard to shape UFBI. A main purpose with this report is to provide an overview of some of the events and people that constitute the basis for the UFBI developments up to date. In forthcoming annual reports select staff, projects and events will be presented more in-depth.

January 2011
Lars Nyberg, UFBI Director (2001 - Present)

Brain imaging - real teamwork

The discipline of cognitive neuroscience emerged in the mid-1990's and is to its core a cross-disciplinary endeavor, aiming to understand how mind and matter work as one. Today, journals, text books, and university departments include "cognitive neuroscience" in their names, and it is also the central discipline of UFBI research. Functional brain imaging is often claimed to have been a driving force in the development of cognitive neuroscience, not unlikely due to the diversity of expertise required to perform neuroimaging research. Functional brain imaging is critically dependent on skills from many disciplines and some of the key players are introduced below.



Johan Eriksson sketching on the design for a future experiment.

To ensure that experiments can properly address the scientific questions, care needs to be taken when shaping the experimental protocols. In addition to controlling for possible confounding factors, specific requirements need to be met in relation to how the MR scanner works and how the measured signal develops in space and time. Thus, paradigm development is a crucial initial step and usually requires several iterations of pilot testing and evaluation, both outside and inside the scanner.

Mattias Schenkel (left) and Peter Hägglund (right).

The MR scanner is a highly complex piece of machinery that needs regular maintenance and supervision in order to work properly. Peter Hägglund and Mattias Schenkel, both engineers, are involved in the service and technical support of all MR scanners used by UFBI. Together they handle a total of four MR scanners located at Umeå University and NUS.

UFBI runs a number of basic scientific projects which require various devices to physically stimulate human senses and/or measure physical responses. The physical environment close to the MRI scanner is highly affected by the magnetic components of the scanner and any additional equipment has to be carefully designed not to be influenced by, or interfere with, the magnetic field. Further, the device should not be able to damage the MRI scanner and has to be safe for the human patient/subject. For more than a decade, additional MRI devices have been developed and used. Some are commercially available whereas others are custom made to suit specific experimental needs. Both software and hardware is developed by Göran Westling (PhD, engineer) and Anders Bäckström (engineer).

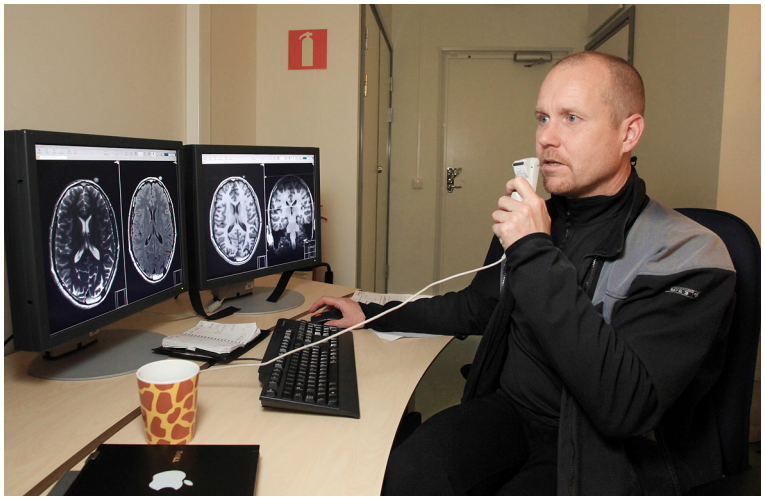
Göran Westling testing his self-made, MRI compatible, emotional touch device.

A physicist is more involved in the hardware than in the study participants. For example, data quality assessments, tests of the MR scanner, as well as testing/modifying programs and hardware associated with data collection. Anne Larsson works as a medical physicist at the Nuclear Medicine Department, NUS and was previously working with fMRI for UFBI. Her present responsibility is quality assurance and methods development of gamma camera imaging and aims to extend her field of research to dynamic PET. Anne's MR assignments have now largely been taken over by Greger Orädd. Greger has a PhD in physical chemistry, is a docent in biophysical chemistry, and has extensive experience with MR.

Greger Orädd, placing a phantom in the GE scanner.

Nurse Helen Ledin (scanner room) and Ann-Kathrine Larsson (AV-station).

Ann-Kathrine Larsson is an x-ray technician/nurse and has been involved in clinical MR imaging since 1990 and in functional MRI from the start here in Umeå in 1999. All study participants are received by Ann-Kathrine or another MR technician who goes through a protocol to ensure that no metals are present in (e.g., pacemakers) or on (e.g., hair pins) the participant. The nurse also handles most of the logistics concerning the participants, such as placing them in the scanner, setting up scanner parameters, and operating the scanner. It is also the responsibility of the scanner operator to transfer the data to the dedicated server, and to a clinical archive accessible for a radiologist.



Richard Birgander at the evaluation station at NUS.

All subjects undergoing fMRI studies are structurally imaged, using T1-weighted, T2- weighted, and FLAIR sequences, in order to exclude pathology that can influence the interpretation of fMRI data as well as to detect treatable disease. All participants are therefore evaluated by Richard Birgander, M.D., Ph.D., Senior Consultant, head of NeuroMR, NUS. Richard is a Specialist in Neuroradiology according to requirements of both Swedish National Board of Health and Welfare and European Board of Neuroradiology.

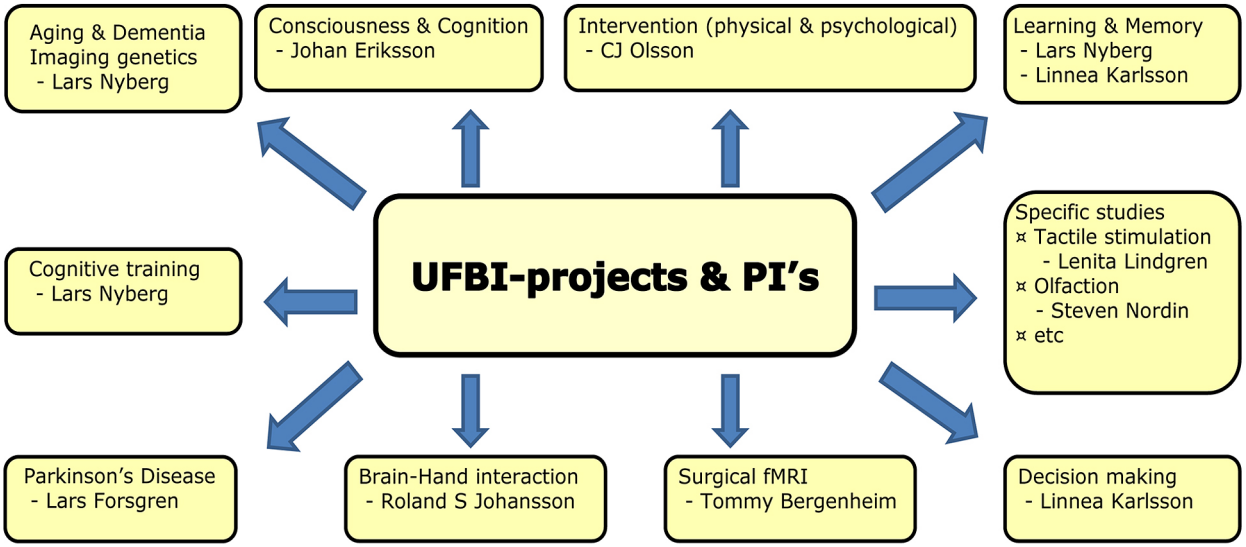
Micael Andersson examining his source-code.

Micael Andersson is a research engineer and has been working with fMRI since 2004. He has developed the program DataZ used for batching the analysis and visualizing the results. DataZ is a Matlab-based add-on module for the analysis software SPM. Micael is also developing other programs when needed, e.g. for checking/mending data and planning/evaluating experimental designs. He has also built the computational infrastructure for fMRI data handling and is conducting the analyses on many of the fMRI experiments.

UFBI - an UmU infrastructure

In the spirit of the inter-disciplinary nature of functional imaging, scientists from several different faculties and departments are involved in the UFBI work. In that sense, UFBI may be conceived of as a major Umeå University infrastructure. Thus, even though UFBI formally is based at the medical faculty, and medical-faculty disciplines such as radiology and neurophysiology constitute a backbone in the activities, the contributions from behavioral sciences (e.g., psychology, cognitive science), physics, and statistics are vital. More recently, we have also noticed interest from areas not typically associated with brain imaging (e.g., philosophy/consciousness studies, caring sciences, and education). This exciting development will be described in more detail in forthcoming reports. In the future, we also aim at establishing close collaboration with the unique PET/CT-cyclotrone infrastructure that recently has been established by Katrine Åhlström Riklund and her team. Already, they produce several tracers, and they invite potential collaborators to contact them.

Below, some of the main UFBI-areas are sketched and Principal Investigators (PI's) are indicated.



The very first UFBI publication

UFBI-findings have been reported in several top scientific journals (e.g., Science, Brain, PLoS Biology). We are very pleased and proud over each and every publication, but as with many things in life there is something special with the first. Therefore, the word goes to Eva Elgh who at the time was a PhD student and first author of the very first UFBI-publication.

The most common cause of accelerated cognitive decline in old age is dementia. It is a devastating and costly disorder. The worldwide number of persons with dementia in the year 2000 was about 25 million. Alzheimer's disease (AD) is the most common cause of dementia. Early diagnosis is important for adequate treatment and care, but the diagnosis is complicated due to clinical similarities between early dementia and normal aging and between AD and other dementias. However, episodic memory difficulties are early symptoms of dementia.

When working as a clinical neuropsychologist in the area of dementia diseases I often heard complaints from older people regarding their bad memory regardless of whether it was dysfunctional or not. I considered myself as having a "good clinical eye" but I could never figure out who would develop bad memory and who would not. This was the starting point for my thesis project.

Over hundred persons with subjective memory complaints were tested with the so-called "7-minutes test". Based on their performance they were classified as having either high (n=8) or low (n=94) risk for AD. Six persons in each group were investigated with fMRI while performing an episodic memory test. We found that high-risk individuals performed worse than low-risk individuals. Patterns of brain activity during episodic encoding and retrieval showed significant group differences. Low-risk persons showed increased activity in prefrontal regions that previously have been implicated in episodic memory. High-risk persons showed increase in occipital-temporal regions instead. The conclusion was that lowered prefrontal activity might predict subsequent disease.

The results were stunning. Neither the high-risk persons nor the low-risk persons had any clinical diagnosis of AD. They had subjective memory complaints but to our knowledge they had no problems in their daily lives. It seemed as if the brains of the high-risk persons had totally changed patterns of activity. Some areas in the brain were activated when other areas didn´t work as they should. This was indeed exciting results!

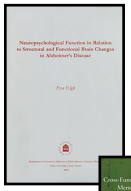
An anecdote in this context was that we learned the importance of thoroughly interrogating patients (and their spouses) regarding their life history. One of the persons in the high-risk group had a part of a screwdriver in his upper lip – it had been there for many, many years. Luckily we found out before he was examined in the MR camera.

Elgh, E., Larsson, A., Eriksson, S., & Nyberg, L. (2003). Altered prefrontal brain activity in persons at risk for Alzheimer's disease: An fMRI study. *International Psychogeriatrics, 15*, 121-133.

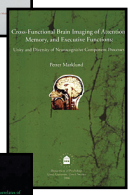
Eva Elgh, scientist
at Community Medicine and Rehabilitation

UFBI - a learning environment

Cognitive neuroscience in general and functional imaging in particular has become part of the curriculum of many different courses and programs at universities globally. This is true for Umeå University as well, and at UFBI we have since several years offered demonstrations for undergraduate and graduate students. In addition, several undergraduate theses have been done within UFBI and functional imaging has been a key ingredient in many PhD courses. Beginning in the fall of 2010, a master's course in brain imaging is offered under the supervision of Johan Eriksson. UFBI has also offered an important infra-structure for several PhD students. Below is a list of UFBI-related PhD-theses that in part were based on data acquired within UFBI. And several additional dissertations are under way.



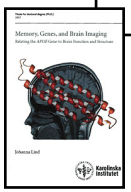
Eva Elgh (2004): Neuropsychological function in relation to structural and functional brain changes in Alzheimer's disease.



Petter Marklund (2006): Cross-functional brain imaging of attention, memory, and executive functions: Unity and diversity of neurocognitive component processes.

Johan Eriksson (2007): The conscious brain: Empirical investigations of the neural correlates of perceptual awareness.

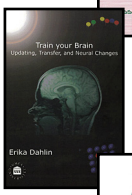
Niklas Lenfeldt (2007): Aspects of intracranial pressure measurements and advanced MRI techniques in combination with CSF volume alteration.



Johanna Lind (2007): Memory, genes and brain imaging: Relating the APOE gene to brain functions and structure.

C-J Olsson (2008): Imaging imagining actions.

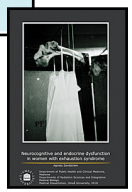
Erika Dahlin (2009): Train your brain – updating, transfer, and neural changes.



Anna Theorin (2009): To select one hand while using both: Neural mechanisms supporting flexible hand dominance in bimanual object manipulation.

Kristiina Kompus (2010): How the past becomes present: Neural mechanisms governing retrieval from episodic memory.

Agneta Sandström (2010): Cognitive and neuroendocrine dysfunction in women with exhaustion syndrome.



Thoughts from recent UFBI PhD-graduates

Photo: Göran Westling

Erika Dahlin (PhD 2009)

The years as a PhD student in UFBI have been exciting and useful for me. The UFBI lab-meetings every week were always a source of inspiration and the UFBI-team had a lot of fun together. I especially remember my first conference in Sydney, the 4th International Conference on memory 2006. Just before my speech the projector exploded and the large audience was moved to a much smaller room. Of course, the Science publication was also an unforgettable moment. An amazing sense of happiness and relief after years of work with the paper. I am glad that I have been a PhD student in UFBI and hope that this opportunity will be possible for other students in the future.

Now, I am working with cognitive assistive tools at the Swedish Institute of Assistive Technology (SIAT). I work with research and development, information and communication, and knowledge and method development. I still work with some researchers at the Karolinska Institute that I established contact with during my time as a PhD student.

Photo: René Westerhausen

Kristiina Kompus (PhD 2010)

Having completed psychology studies in my native country of Estonia, I became a member of the UFBI as a doctoral student from 2006 to 2010. My thesis concentrated on the functioning of the prefrontal cortex during retrieval from episodic memory, a research question for which the fMRI competence at the centre was integral. The atmosphere in the group supported hard and enthusiastic work, with everyone routinely putting in hours at late evenings and weekends, with an occasional training break at the sports centre across the campus. The mock fMRI scanner, which we used for familiarizing our study participants with the scanner environment, was reported to be a great place for a power nap to remain productive throughout the late night work.

Currently I am a postdoctoral fellow at the University of Bergen, Norway, in the group where I spent a semester as a visitor during my doctoral studies. The research skills I acquired at UFBI have weathered the challenges of novel projects.

UFBI - a collaborative research environment

Functional brain imaging with fMRI is done world-wide and UFBI is happy to have several national and international collaborations. Internationally, key collaborators include Randy Buckner at Harvard University, USA; Roberto Cabeza, Duke University, USA, Reza Habib, SIU, USA; and Ulman Lindenberger, Max Planck Institute, Berlin, Germany. Nordic collaborations have been developed within the framework of a Nordic Center of Excellence network led by Lars Nyberg (2005-2010). This network includes some 15 independent research groups and key collaborators include Matti Laine, Åbo, Finland; and Kenneth Hugdahl, Bergen, Norway. Nationally, we have a strategic neuroscience collaboration with the Karolinska Institute (KI), and brain imaging is a major component of this collaboration. Key collaborators at KI / Stockholm Brain Institute include Lars Bäckman, Martin Ingvar, and Lars-Göran Nilsson.

Several scientists have paid UFBI longer or shorter visits during the last years. We give the word to international post-doc Gregoria Kalpouzos:

I spent two years at UFBI as a post-doctoral fellow between 2008 and 2010. I visited for the first time the UFBI lab in Umeå in 2007 while I was still a PhD student in France. Studies and upcoming projects were really attractive. My aim was to be involved in these projects and learn in the same time how to work on functional neuroimaging data. Each person of the lab was essential to me, and contributed to the achievement of my postdoc. My roommate, Johan Eriksson (post-doc) and I used to work together on several projects, including when we had to go very early in the morning from the neuroimaging department via the tunnels connecting the lab to the hospital for data acquisition. The next step consisted in analyzing the data. Micael Andersson, engineer at UFBI, was always available when a problem occurred, from the simplest program crash to the most sophisticated statistical issue. The final step was to give a meaning to the results. This constituted my favorite part of the work, and I liked to go to Lars Nyberg's office and discuss our results in relation to theories. Overall the environment was stimulating, with competent people, including the PhD students, with whom it was very enriching to share ideas and knowledge. At the end of my postdoc, one article was published, a book chapter as well, two articles are under consideration for publication, and several others are in preparation. I also had the chance to present works of the lab to several international congresses. Last but not least, my search for a position following my postdoc has been facilitated at UFBI by providing me reliable leads, completed by a success.

Photo: Private

Gregoria Kalpouzos, Junior Research Professor at Aging Research Center, Stockholm.

New scanners, new opportunities

The first UFBI fMRI studies were done on the old, by now replaced, 1.5T Philips Gyroscan Scanner. In 2006, a 3T Philips Achieva scanner was installed and most fMRI studies were then directed to this more powerful scanner. From the start of UFBI we were allotted about 4 scan hours per week. This was crucial for getting things going, but it was also soon quite apparent that we had "outgrown our costume" and were in need of more scan time (the increased pressure on scan time is illustrated in the figure below, which outlines the close to 2000 performed fMRI research examinations to date).

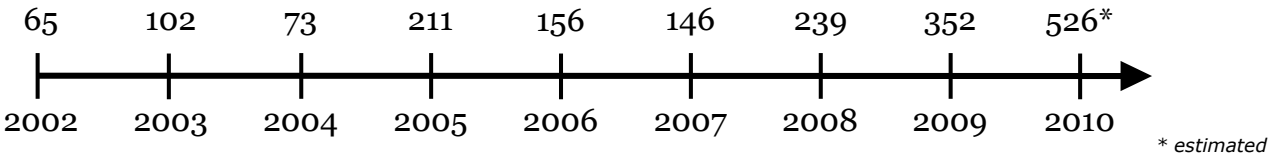
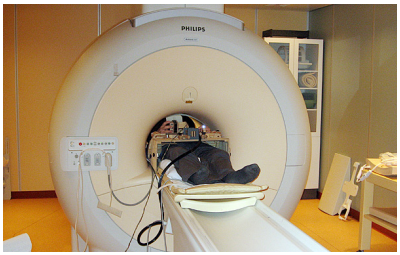


Photo: Göran Westling

Philips Gyroscan, 1.5T.

Photo: Göran Westling



Philips Achieva, 3T.

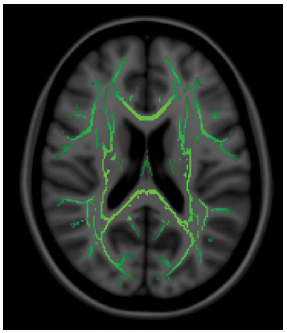
GE Discovery MR 750, 3T.

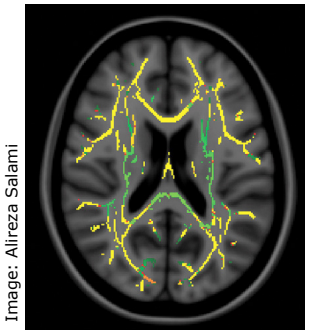
Attempts to secure funding for a scanner devoted to research studies were initiated as early as in 2003, but it was not until 2007 that the work gained momentum. Lars Nyberg had been awarded the Göran-Gustafsson prize in medicine and was therefore invited to lunch at Sävargården by former president of Umeå University, Göran Sandberg. When Göran learned that scan time was a limiting factor for research, he simply stated "so let's secure funding for a research scanner". Encouraged by this support, Lars Nyberg and co-applicants Roland S Johansson, Katrine Åhlström Riklund, Tommy Olsson, and Lars Forsgren, approached the Knut and Alice Wallenberg Foundation and managed to get an 18.5 million SEK grant to buy a new scanner – a 3T GE Discovery MR 750. A formal agreement concerning conditions for ownership and use was signed between UmU and Västerbotten County Council (VLL) in 2008, and with the help from a number of people with different expertise a new MRI lab was built in the basement of NUS and formally opened in November 2009.

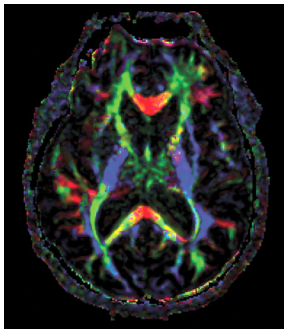
Seminars and meetings

A multidisciplinary research environment, a multifaceted research agenda, and a growing research group makes structured interaction platforms indispensable. To this end we have weekly lab meetings where project plans, experimental designs, analyses strategies, and results are discussed in an informal setting to take benefit from the whole brain trust of UFBI. These meetings also work as a "journal club" for discussing relevant findings from other labs. We are about to celebrate the 100th UFBI lab meeting. In October 2008 UFBI organized an fMRI conference entitled Methods and Applications of DTI and fMRI. This conference was sponsored by the Swedish Science Council and Umeå University. Several international and national speakers participated, and the conference was well attended. Local organizers were Bror Alstermark, Roland S Johansson, and Lars Nyberg.

While the core research data consists of fMRI images, the MR scanner is highly versatile and can also produce high-quality structural images of the brain. Integration of structural data can add a dimension of information to many research questions. To facilitate the use of Diffusion Tensor Imaging (DTI) data collection at UFBI a brief DTI course was given by General Electric staff in November 2010. This course focused on DTI data collection issues, while analysis and interpretation of DTI data was treated at the 8th DTI tractography workshop in Stockholm (led by Marco Catani), where several UFBI members attended.







DTI-skeleton (left), group-statistics on the same skeleton (middle), primary directions of the white matter fibers on a single subject (right).

To increase the interaction among, and to inform people around UFBI of lab activities, we have arranged annual meetings. These meetings have been given to provide feedback and to present and discuss completed, ongoing, and future UFBI projects. UFBI is also frequently privileged with requests to give presentations of lab activities aimed at the general public, as well as participating in TV and radio shows.

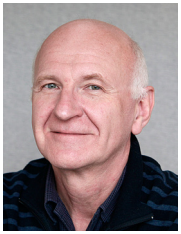
UFBI members*

Name: Micael Andersson
Position: Research engineer
Research and work: Micael is a diploma engineer and has been working with fMRI since 2004. He makes the in-house program DataZ, which is a Matlab-based add-on for the analysis software SPM and is used for batching the analysis and visualizing results. Micael is also performing the fMRI-analysis for several of the research projects.

Name: Kerstin Englund
Position: X-ray technician/nurse
Assignments: Kerstin has been working with MR for about 10 years. When the new MR-scanner was installed in November 2009, she got the opportunity to start working part time with fMRI. Her other workplace is the Interventional Neuroradiology lab at Norrlands University Hospital.

Name: Johan Eriksson
Discipline: Cognitive Neuroscience
Research and work: Johan is an Assistant Professor and uses fMRI to study the neural correlates of consciousness, several forms of memory, brain plasticity and learning, and to perform pre-operative mapping of brain functions.

Name: Peter Hägglund
Position: Master of Science in Engineering
Assignments: Peter is involved in the service and technical support of the MRI scanners at Umeå University and Norrlands University Hospital.



Name: Roland Johansson
Discipline: Sensorimotor control in humans
Research and work: Roland is a professor of physiology working with analysis of neural mechanisms supporting planning and control of dexterous object manipulation with emphasis on sensory, mnemonic and predictive mechanisms. Roland is a member of the Swedish Royal Academy of Sciences.

Name: Hans-Olov Karlsson
Position: X-ray technician/nurse
Assignments: Hans-Olov worked with MR between 1993-98, and since 2003 onwards. He started working part time with fMRI in the autumn of 2009 when the new MR scanner was installed at Umeå University Hospital. When he is not at MR, he works at the Interventional Neuroradiology lab.

Name: Linnea Karlsson
Discipline: Psychology/Cognitive Science
Research and work: Linnea is a post-doc using brain imaging together with cognitive modeling to test theories of judgment and decision making. She is also investigating practical learning processes from a cognitive neuroscience perspective.

Name: Karolina Kauppi
Discipline: Imaging genetics
Research and work: Karolina is a PhD student studying the genetics underlying human episodic memory function by using large-scale behavioral and brain imaging data from the Betula project. For example, allelic variations of the KIBRA gene are investigated in association with brain activation during memory retrieval.

Name: Ann-Kathrine Larsson
Position: X-ray technician/nurse
Assignments: Ann-Kathrine has been working with MR since 1990, and started working with fMRI in 1999. She is currently a research nurse, running logistics for the different studies including method development, creating protocols and making sure that the contacts between the different parts involved in the project are working.

Name: Anne Larsson
Discipline: Radiation physics and nuclear medicine
Research and work: Anne is a Medical physicist with a PhD in radiation physics. The research has been directed to improve the quantitative accuracy of single photon emission computed tomography (SPECT), and will now be extended to dynamic positron emission tomography (PET).

Name: Helen Ledin
Position: X-ray technician/nurse
Assignments: Helen has been working with MR for about 10 years. She started working part time at the new research MR-scanner in January 2010. When she is not at MR, she is working at the Interventional Neuroradiology lab at Norrlands University Hospital.

Name: Lenita Lindgren
Discipline: Nursing
Research and work: Lenita is a PhD student investigating human touch from an affective neuroscience perspective using fMRI.

Name: Per Nordmark
Discipline: Physiology
Research and work: Per is a PhD student as well as doing his internship at Norrlands University Hospital. In his research he uses MRI to study functional and structural changes of the central nervous system in persons that has suffered from traumatic peripheral nerve injury.

Name: Lars Nyberg
Discipline: Cognitive neuroscience
Research and work: Lars is a professor of Neuroscience and the Director of UFBI. PI for work on cognitive training and imaging within the longitudinal Betula project. Lars is a member of the Swedish Royal Academy of Sciences. In 2007 he received the Göran Gustafsson award in medicine, and in 2009 he became a Wallenberg scholar.

Name: Carl-Johan Olsson
Discipline: Exercise neuroscience
Research and work: Carl-Johan is a researcher / assistant professor whose main interest is brain plasticity in relation to training and physical exercise. He studies how the motor representation changes after motor and/or mental training, how the brains function and structure changes after cardiovascular exercise both in patient and healthy participants.

Name: Greger Orädd
Position: MR physicist
Assignments: Greger is among other things doing quality assessment and tests of the MR scanner, control/backup of the huge amount of data generated, as well as testing/modifying programs and hardware associated with data collection.

Name: Sara Pudas
Discipline: Psychology
Research and work: Sara is a PhD student at Stockholm University working with relating functional and structural brain imaging data to longitudinal episodic memory performance, using data from the Betula project. Specifically, she is comparing groups with stable or declining memory over 15-20 years with respect to brain activation and structure.

Photo: Samuel Bengtsson

Name: Katrine Åhlström Riklund
Discipline: Radiology and nuclear medicine
Research and work: Katrine is a professor/consultant doctor that works with movement disorders (parkinsonian diseases), imaging of dopamine function, dementia, imaging of brain function, and PET/CT - oncologic applications.

Name: Alireza Salami
Discipline: Computational neuroscience
Research and work: Alireza is a PhD student doing research that concentrates on implementing different multivariate techniques (e.g. PLS, ICA) to different imaging modalities to extract features that are inaccessible using univariate methods.

Name: Agneta Sandström
Discipline: Biological Psychology
Research and work: Agneta is a PhD investigating cognitive and neuroendocrine dysfunctions in patients with exhaustion syndrome and major depression. Brain imaging is used to explore structural differences, memory processing and potential differences between groups.

Name: Matthias Schenkel
Position: Master of Science in Engineering
Assignments: Matthias is involved in the service and technical support of the MRI scanners at Umeå University and Norrlands University Hospital.

Name: Daniel Sjölie
Discipline: Human-Computer Interaction
Research and work: Daniel is a PhD student investigating how an increased understanding of the brain and brain measurements can be used in conjunction with reality-based interaction (such as virtual reality) to improve interaction with computer applications for optimized training, rehabilitation, etc.

Name: Mikael Stiernstedt
Position: Project Manager
Assignments: Mikael has been collecting fMRI data the past year for the Betula study. He is also a part of the group that are processing behavioral data and handling general matters concerning the imaging part of the Betula study.

Name: Anna Theorin
Discipline: Physiology
Research and work: Anna received her PhD in 2009 on studying goal-directed bimanual coordination with the use of EMG, TMS and fMRI. She has also been managing a project where the focus is a novel method for rehabilitating hand functions after stroke.

Name: Carola Wiklund-Hörnqvist
Discipline: Psychology
Research and work: Carola is a PhD student who is investigating how different learning methods are related to successful learning. The main focus is to identify the cognitive processes, particularly memory processes, related to pedagogical methods including elements of testing. The effects will be examined using brain imaging and behavioral data.

* = The list of UFBI members is not exhaustive. Several past members, currently working outside Umeå, are still involved in UFBI-activities (e.g., Johanna Lind, Petter Marklund, Jonas Persson). In addition, many group leaders and their teams at UmU (e.g., Bert Jonsson, Johan Lithner, Xavier de Luna, Anna Neely, Steven Nordin) and at NUS (e.g., Tommy Bergenheim, Lars Forsgren, Niklas Lenfeldt, Jan Malm, Tommy Olsson) are involved in various fMRI projects.

Publications 2001 - 2010

The list below is restricted to journal articles, book chapters, and doctoral theses that in fact were based on structural and functional MRI data collected within UFBI.

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A Selection of UFBI Presentations

Eriksson, J., & Nyberg, L. (2010, Nomvember). On the complexity of consciousness: An fMRI study of the intersection between auditory conscious perception, working memory content, and task difficulty. Poster presented at 40th Annual Meeting of Society for Neuroscience, San Diego, USA.

Nordmark, P., & Johansson, R. S. (2010, November). Frequency dependent activation of auditory cortex during a tactile task. Poster presented at 40th Annual Meeting of Society for Neuroscience, San Diego, USA.

Kompus, K. (2010, September). The low route to episodic memory: the neural systems that trigger incidental retrieval. Talk at the 15th World Congress of Psychophysiology, Budapest, Hungary.

Kalpouzos, G., & Nyberg, L. (2010, January). Is brain atrophy responsible for functional differences in normal aging? Poster presented at the Aging and Cognition Conference, Dallas, USA.

Nyberg, L., Salami, A., Andersson, M., Eriksson, J., Kalpouzos, G., Kauppi, K., Lind, J., Persson, J., Pudas, S., & Nilsson, L.-G. (2010, January). Longitudinal changes in memory-related fMRI activity: Data from the Betula Study. Talk at the Aging and Cognition Conference, Dallas, USA.

Kalpouzos, G., Eriksson, J., Sjölie, D., & Nyberg, L. (2009, October). Which neurocognitive systems are engaged when doing errands downtown? An fMRI study of prospective remembering using virtual reality and eye-tracking. Poster presented at the Society for Neuroscience, Chicago, USA.

Dahlin, E., Stigsdotter Neely, A., Einwich, A., & Nyberg, L. (2009, May). Training of task shifting – design and pilot testing of an upcoming fMRI study. Poster presented at the 4th annual meeting of Nordic Center of Excellence in Cognitive Control, Tartuu, Estonia.

Sjölie, D., Bodin, K., Eriksson J., & Janlert, L.-E. (2009, April). Using brain imaging to assess interaction in immersive VR. In Challenges in the Evaluation of Usability and User Experience in Reality Based Interaction. Talk and workshop paper at the CHI 2009 Workshop, Boston, USA.

Nyberg, L. (2008, October). Imaging of hippocampal mnemonic functions. Talk at the Conference of Methods and Applications of Diffusion Tensor and Functional Magnetic Resonance Imaging, Umeå, Sweden.

Pesonen, J., Dahlin, E., Aalto, S., Stigsdotter Neely, A., Normandin, M., Morris, E., Laine, M., Bäckman, L., Nyberg, L., & Rinne, J. (2008, September). Does the increased striatal BOLD signal during working memory updating reflect dopamine release? - evidence from fMRI and ntPET. Poster presented at the 3rd annual meeting of Nordic Center of Excellence in Cognitive Control, Reykjavik, Iceland.

Dahlin, E. (2008, July). Process-specific training in young and old age: Striatal mediation of learning and transfer of an executive skill. Talk at the International Congress of Psychology, Berlin, Germany.

Dahlin, E. (2008, June). Training Updating of Working Memory. Talk at the 16th European Congress of Physical and Rehabilitation Medicine, Brugge, Belgium.

Olsson, C.-J. (2008, June). Learning and relearning of executive functions. Talk at the 16th European Congress of Physical and Rehabilitation Medicine, Brugge, Belgium.

Olsson, C.-J., Jonsson, B., & Nyberg, L. (2008, April). Cerebellum underlies transfer to untrained task following a combination of mental and physical training. Poster presented at the Cognitive Neuroscience Society annual meeting, San Francisco, USA.

Dahlin, E., Nyberg, L., Sandberg, P., Bäckman, L., & Stigsdotter Neely, A. (2007, November). Long-term effects after executive training in elderly people. Poster presented at the 2nd annual meeting of Nordic Center of Excellence in Cognitive Control, Stockholm, Sweden.

Dahlin, E. (2007, August). Striatal Mediation of Learning and Transfer of an Executive Skill. Talk at the 9th Nordic Meeting in Neuropsychology, Gothenburg, Sweden.

Dahlin, E., Nyberg, L., Sandberg, P., Bäckman, L., & Stigsdotter Neely, A. (2007, August). Long-term effects after executive training in elderly people. Poster presented at the 9th Nordic Meeting in Neuropsychology, Gothenburg, Sweden.

Dahlin, E., Stigsdotter Neely, A., Larsson, A., Bäckman, L. & Nyberg, L. (2006, November). Training of executive functions: similar brain regions underlying post-training performance. Poster presented at the 1st annual meeting of Nordic Center of Excellence in Cognitive Control, Copenhagen, Denmark.

Dahlin, E. (2006, July). Effects of training on brain activity during memory executive function tasks. Talk at the 4th international conference on memory, Sydney, Australia.

Neely Stigsdotter, A., Dahlin, E., Johansson, A-K., Bäckman, L., & Nyberg, L. (2006, April). Working-memory plasticity in young and old adults: similar gains and minor transfer. Poster presented at the Cognitive aging conference, Atlanta, USA.

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