THE FUTURE IS HERE

NATIONAL CENTRE FOR 3D ULTRASOUND IN SURGERY
We have been exploring new technology for better patient treatment since 1995

THINK AHEAD
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The National Centre for 3D Ultrasound in Surgery is internationally recognized for its research activity performed through the joint efforts of St. Olavs Hospital, SINTEF and NTNU. The Centre has more than 10 years of experience in interdisciplinary research and development in minimally invasive image guided therapy with focus on neurosurgery, vascular surgery and laparoscopy. Through the years we have revealed new knowledge and developed technological solutions for improved patient treatment. Based on prototype technology and scientific technological and clinical studies we have demonstrated solutions for tomorrow’s patient treatment. Intraoperative molecular imaging based on ultrasound, CT and MR technologies combined with advances in nano, micro and navigation technology are disclosing new possibilities in patient treatment - many of which have already been demonstrated by the Centre.

In 2005, two new operating rooms, equipped with the most advanced technology available, opened at St. Olavs Hospital and NTNU. “Operating Room of the Future” provides facilities for the National Centre for 3D Ultrasound in Surgery’s activity in laparoscopic therapy and endovascular treatment. In addition, the first phase of one of the most advanced university hospitals in Europe, St. Olavs Hospital, was officially opened in Trondheim in 2006. A completely new Neurocentre was opened that represents the most modern and advanced facilities for our image-guided neurosurgery activities.

Research scientists with a technological background and clinicians at the university hospital comprise an interdisciplinary team that makes future technologies possible and available for more patients. Together with industry and other hospitals and universities around the world, we join forces to develop solutions for improved future therapy.

“We invite you to join us in this inspiring work and in this enthusiastic research and development environment for achieving tomorrow’s improved patient treatment!”

Geirmund Unsgård
Professor in Neurosurgery

Ronald Mårvik
Head of National Center for Advanced Laparoscopic Surgery

Hans Olav Myhre
Professor in Vascular surgery

Toril A. Nagelhus Hernes
Professor in Medical technology
“Medical technology for better patient treatment.”

We aim to:

- Improve patient treatment through research and development of technologies for minimally invasive therapy
- Evaluate and assess medical technology through research studies and clinical trials
- Increase competence and knowledge about new technological solutions through educational activities, international collaboration and scientific publications
- Commercialize methods and technology and thereby make improved patient care available for more patients worldwide

We reach our goals by:

- Focusing our research on the needs and demands of the health sector
- Exploring future possibilities in areas such as ultrasound, MR and navigation technology, where the research environment in Trondheim is at a high international level
- Working in interdisciplinary teams of technologists and clinicians, thereby creating new ideas and prototypes that demonstrate solutions for tomorrow’s treatment of patients

Main focus areas are:

- Establishing complementary international scientific (clinical and technological) and industrial collaboration that strengthens the total scientific level, increases the flow of activity and successfully achieves its goals
- Spreading knowledge and products through scientific dissemination and commercialization making optimal solutions available for users and patients worldwide
- Diagnosis, therapy monitoring and guidance as well as follow up of patients with lesions in the nerve system, the vascular system and in the abdominal area
- Medical and molecular imaging with focus on 2D, 3D and 4D ultrasound, CT and MR used pre-, intra- and post-operatively
- Advanced navigation and multimodal visualization and display technology for accurate therapy guidance inside the patient
- Clinical research and testing of methods and medical technology in vivo and in vitro
- Laboratory set-up and experimental studies

Vision, Goals and Strategies

“Significant contributions every day, every month, every year!”
In 1995 the surgeons opened the doors of the surgical departments at St. Olavs Hospital for the technological researchers. That opened the eyes and minds of the technologists and new ideas in treatment of patients were disclosed in a close interdisciplinary research team. Funding was established by the National Ministry of Health in Norway. For more than 10 years the activity has gained increased international attention through scientific publication and demonstrations of new technology for improved minimally invasive therapy. The Centre has published more than 60 scientific papers, presented results from the activity at more than 230 conferences and 70 media/TV presentations as well as receiving 12 awards, all of which has resulted in significant scientific recognition as well as industrial interest.

Watch us also the next 10 years to come!

The 10 most significant achievements from 10 years of activity:

- World’s first brain tumour operation assisted by navigated intraoperative 3D ultrasound (1997)
- Medical technology award for pioneering work on introduction of endovascular procedures (1998)
- Patent on blood detection device (SonoDoppler) for safer laparoscopic surgery (1999)
- First cerebrovascular operation assisted by navigated intraoperative 3D US angiography and stereoscopic visualization (1999)
- First ultrasound based temperature measurement of radio frequency ablation in an experimental set up (2002)
- Patent of stent graft with side branches for improved endovascular procedures (2002)
- Navigation with preoperative fMRI/DTI showing functional areas and nerve tracks of the brain (2004)
- European award (EAES) for best technology: Navigated video laparoscope for better laparoscopic surgery (2004)
- Micropositioning of intravascular catheters using navigation, advanced display combined with intra-operative imaging for safer and more efficient stent graft deployment (2006)
University areas are integrated in the hospital and making it possible to perform interdisciplinary technological and clinical research based on user demands.

Facilities - Operating Room of the Future and the new St. Olavs Hospital

One of the most modern hospitals in Europe is currently being built in Trondheim, Norway. St. Olavs Hospital is a truly integrated university hospital where areas for research are integrated with the clinical activity. Phase I of the hospital was completed in 2006 and phase II is to be completed in 2013. The total area is approximately 200,000 square meters of which approximately 50,000 square meters are university areas. The total budget is approximately 1.5 billion Euro.

Operating Room of the Future

At St. Olavs Hospital, Trondheim, Norway, you can experience the “Operating Room of the Future”. Two operating rooms are made for development, testing and assessment of new technology and new treatment methods, especially within minimally invasive surgery. Research to improve quality and safety in patient treatment as well as more effective logistics and architecture are among the main goals of these facilities.

The main clinical activity of the National Centre for 3D Ultrasound in Surgery in laparoscopy and endovascular therapy is performed in "Operating Room of the Future", which was opened in May 2005. "Operating Room of the Future" represents a unique laboratory for development and testing of new technology based on clinical demands. Here, the industry continuously installs prerelease technology for clinical testing. New methods and prototypes can be disclosed and explored in a true interdisciplinary collaboration between clinicians, researchers with scientific background, and industry. Research scientists with technological background are present in the operating room working together with surgeons, radiologists and nurses. This team joins forces so that clinicians can try out new solutions with technical expertise always available to ensure a safe and controlled situation. The researchers and developers, immediately get feedback from the users on optimal working solutions and on requirements for new technology and methods. This makes it possible to develop prototype solutions that can be tested in the clinic, commercialized by the industry, and hence be available for more patients.

Neurocentre

The Neurocentre was one of the first centres to be opened in the new hospital in 2006 and has advanced operating facilities for minimally invasive therapy. Advanced MR imaging technology makes it possible to perform fMRI, DTI as well as other MR techniques for optimal patient diagnostics, treatment and evaluation. The National Centre for 3D ultrasound in Surgery represents one of the core research and development activities at the Neurocentre.
Neurosurgery:

Professor Geirmund Unsgård is head of the Neuro Clinic at St. Olav Hospital and the clinical research activity within ultrasound guided neurosurgery. Together with the technologists and fellow colleagues at the hospital he has pioneered the use of intraoperative 3D ultrasound and navigation technology in neurosurgery. The technology developed in Trondheim is now in daily use at several neurosurgical centres in Europe. It has provided an instrument that improves quality of neurosurgical operations.

Main Goal:

We aim to improve neurosurgical operations by integrating intraoperative ultrasound and navigation technology.

Our core activity is technological research and development as well as clinical evaluation of 3D ultrasound and navigation technology in neurosurgery. The technology has been adapted for several applications in neurosurgery, including neuroendoscopic procedures, spinal cord surgery, vascular surgery and brain tumour surgery. Advanced 3D visualization techniques have been developed and are used for navigation with functional data (fMRI/DTI) and guidance in vascular surgery. Ultrasound strain imaging techniques have been developed for mapping elastic properties of brain tumours. The clinical demands are highly emphasized in our research activities. This also includes the patient’s perspective. An ongoing clinical study is evaluating the quality of life for brain tumour patients operated with intraoperative 3D ultrasound guidance.

Main clinical project activities are:

- Clinical research and evaluation of intraoperative 3D ultrasound for guidance of brain tumour surgery
- 3D guidance and control in vascular brain surgery (aneurysms and AVMs)
- Ultrasound-guided spinal cord surgery
- Clinical evaluation of new ultrasound imaging techniques such strain imaging of tumours and blood flow imaging (BFI) of vascular structures
- Clinical evaluation of multimodal visualization for optimal integration between intraoperative 3D ultrasound and preoperative MRI

Facts:

- More than 450 project operations performed with 3D ultrasound (1996 – 2006)
- Over 270 brain tumours
- Over 60 vascular lesions
- World’s first brain tumour operation assisted by navigated intraoperative 3D ultrasound (1997)
- First cerebrovascular operation assisted by navigated intraoperative 3D US angiography and stereoscopic visualization (1999)
- Navigation with preoperative fMRI/DTI showing functional areas and nerve tracks of the brain (2004)
- Technology is patented, commercialized by Mison AS, and installed at several hospitals in Europe
- Several medical-technological awards received, including: Most innovative research on spinal disorders, 2004-2005 (F. Kolstad), Norwegian Society for Spinal Research. Best research in Medical Technology, 2002 (G. Unsgård), NTNU

"Intraoperative imaging with 3D ultrasound makes it possible for me to perform more accurate and safer patient treatment."
Laparoscopy:
The unique and close collaboration between clinicians at St. Olavs Hospital and research scientists at SINTEF has resulted in new ways of using navigation technology and image-guided therapy methods in laparoscopic procedures. The internationally known surgeons at the National Center for Advanced Laparoscopic Surgery, headed by Ronald Mårvik, PhD MD, conduct several specialist courses every year. They have participated in developing laparoscopic procedures for many years. The group of researchers from the university hospital and the research institute SINTEF holds many patents related to key technology developed in Trondheim.

Main goal:
Our aim is to improve laparoscopy by applying novel solutions and methods such as navigation technology and ultrasound to improve patient outcome and allow more advanced procedures to be performed by laparoscopic techniques.

Our core activity is research and development as well as clinical testing of navigation technology in laparoscopic surgery. In addition we perform laboratory research and experimental studies to develop advanced guidance and monitoring methods based on ultrasound.

Main project activities are:
- Image guided laparoscopy using navigation technology
- Laparoscopic 3D ultrasound imaging
- Ultrasound monitoring and navigation of radio frequency ablation
- Improving ergonomics in laparoscopic surgery

Facts:
- Patent on SonoDoppler® - Technology for detecting blood vessels in laparoscopic surgery
- Award for best Norwegian invention in 1999 (SonoDoppler®)
- Award for best experimental study (ultrasound monitoring of radio frequency ablation) at annual meeting for Norwegian Society of Surgeons 2002
- Award for best technological presentation at AMIC (Arbeitsgemeinschaft für Minimal Invasive Chirurgie, Austria) 2003
- Award for best technology development in laparoscopic surgery presented at EAES 2003 (Glasgow) – Pointer for laparoscopic navigation
- Award for best technology development in laparoscopic surgery presented at EAES 2004 (Barcelona) – Video laparoscope as an advanced navigation tool
- Award for best scientific paper in medical technology 2004 - Laparoscopic pointer study

Finally! I have super vision.
Intraoperative imaging and advanced ultrasound technologies help us to improve diagnostics and treatment of patients with lesions in the vascular system.

Vascular Surgery:
Prof. Hans Olav Myhre has many years of experience in developing new methods for treatment of abdominal aortic aneurysms (AAA). He is the clinical head of the activity of vascular surgery and has been the driving force in introducing endovascular image-guided therapy into clinical practice.

Main goal:
Our main goal is to improve diagnostics and therapy guidance of the vascular system using advanced 2D, 3D and 4D ultrasound imaging and micronavigation inside the vessels during endovascular procedures.

The team focuses on improving diagnostics and therapy of the vascular system with emphasis on carotid plaque, abdominal aortic aneurysm and endovascular procedures. Since 1995, the researchers have been joining the operating team to improve the endovascular procedures and reduce trauma and radiation for the patient. Navigation during endovascular procedures can make it easier to perform stentgraft implantation. The use of intraoperative imaging as Dyna CT makes it possible to update the map for navigation and control the procedure with satisfying quality, accuracy and efficiency.

Advanced 2D, 3D and 4D Ultrasound imaging and sophisticated signal processing methods in combination with advances in blood flow imaging and simulation can improve diagnostics of patients suffering from carotid plaque and abdominal aortic aneurysm (AAA). We have explored new methods based on strain detection in the vessel wall as well as diagnostics of carotid plaque using various ultrasound signal processing and image analysis methods.

Our main project activities are:
- Minimally invasive image-guided endovascular treatment using micropositioning sensors and navigation of stent grafts based on advanced display
- Advanced diagnostics and follow up of patients with abdominal aortic aneurysms (AAA) using new ultrasound-based technologies
- Improved diagnostics and therapy of patients with carotid plaque

Facts:
- More than 300 operations with endovascular procedures
- Medical technology award in 1998 for pioneer work in endovascular procedures
- Micropositioning of catheters using navigation, advanced display combined with intraoperative imaging for safer and more efficient stent graft deployment
- Teleradiological follow up of patients with AAA using interactive 3D visualization for more efficient and user friendly health care (2004)
- Patent of stent graft with side branches for improved endovascular procedures (2002)
- Improved diagnostics of vessel wall by development of new ultrasound-based strain imaging
- Improved diagnostics of carotid plaque by movement detection using ultrasound technologies and advanced image processing and analysis

Contact
Professor Hans Olav Myhre Clinical project leader
hans.myhre@medisin.ntnu.no
Research Scientist, PhD Rune Hansen Technological project leader
rune.hansen@sintef.no

Navigation during endovascular procedures can decrease radiation and makes it easier to perform stentgraft implantation. The use of intraoperative imaging on Dyna CT makes it possible to update the map for navigation and control the procedure.
Medical Technology and Image Guided Therapy:
The technological activity at the National Centre for 3D Ultrasound in Surgery constitutes approximately 15 research scientists with technological background at SINTEF including technological PhDs, PhD students, Post docs, MSc and students graduated from NTNU.

Main Goal:
We develop medical technology for improved patient care based on demands in the health care system.

Through 10 years of activity, the group has developed new solutions for improved minimally invasive image-guided therapy as well as for better diagnosis of patients with cancer and lesions in the vascular system. We believe that navigation inside the body may improve therapy of a broad range of diseases. We have developed our own prototype navigation system, which makes it possible to navigate surgical instruments inside the patient with the aid of various image visualization possibilities. Using intraoperative 3D ultrasound we update the map for guidance to accommodate for brain shift and changes that occur during surgery.

We perform research and development activities in order to improve each step in the therapy procedure, where the use of navigation, various imaging modalities, including therapy monitoring and display are essential features. Our research ranges from improved diagnostics to therapy planning, therapy guidance and monitoring as well as to therapy evaluation. We have also developed solutions for following up patients through broadband solutions.

Our main goal is to act as a research and development partner for hospitals, universities and industry, and thereby improve outcome of therapy, scientific research as well as commercial exploitation of new technology and solutions.

Our main research and development activities and core competence areas are:
- 2D, 3D, and 4D ultrasound, CT and MRI for improved diagnostics, therapy guidance and monitoring and follow up of patients
- Positioning technology including optical, magnetic and micropositioning of instruments, pointers, probes and surgical tools inside the body
- Navigation technology for controlling the display and for accurate guidance of therapy
- Registration of patients and image volumes for improved guidance (brain shift correction)
- Signal processing, image analysis and segmentation
- Advanced volume and surface rendering, multimodal visualization technologies
- Protocol set up and clinical testing and assessment of new technology
- Statistical analysis, data handling and publication
- Information and communication technology: teleradiology and telesurgery
- Prototyping and software development of various modules necessary in image-guided and interventional radiology and ICT in hospitals

Contact:
Professor Toril A. Nagelhus Hernes
Technological research director
toril.n.hernes@sintef.no
Navigation system for minimally invasive therapy - CustusX:
One of our main activities is the development and clinical testing of navigation technology for improved minimally invasive therapy. Our system comprises a computer, a position tracking system (various can be used) and our own navigation software developed for image-guided surgery. The system can be used both with preoperative and intraoperative images, including intraoperative 3D Ultrasound. The images can be visualized in 2D and 3D (and 4D) and the view can be interactively controlled by the surgical instruments, ultrasound probes and endoscopes. This helps the surgeon to obtain a better overview and understanding of the anatomy. The navigation system provides the surgeon with a ‘super’ vision, which makes it possible to see inside the patients using 3D visualization technologies such as advanced rendering techniques, stereoscopy and virtual reality technologies. We also offer multimodal display solutions, where images acquired before surgery can be viewed together with images acquired intraoperatively, although the data are from different imaging modalities, for example from MR and ultrasound. 3D ultrasound images give updated descriptions of the anatomy so that the surgeon can navigate equipment with high precision and accuracy inside the patient for improved safety and patient outcome.

We perform research and development for various clinical applications such as:
- Cranial neurosurgery
- Spine
- Laparoscopy
- Endovascular therapy
- Orthopedics
- Radiation therapy
- ENT
- Other related areas

We aim to develop solutions in collaboration with the clinicians in order to:
- Make it easier to locate a lesion
- Improve the removal of a lesion
- Improve the accuracy and safety of the procedure using intraoperative imaging and navigation technology
- Cause less damage to normal tissue
- Avoid severe bleedings by accurate and precise localization of vessels

Contact:
Senior Research Scientist, PhD Jon Harald Kaspersen CustusX project leader
jon.h.kaspersen@sintef.no
Professor Taril A. Nagelhus Hernes Technological research director
taril.h.hernes@sintef.no
Publications and scientific output:
The National Centre for 3D Ultrasound in Surgery has a broad range of scientific activity including publication in scientific papers, conference participations as well as education of students at various levels. The publication rate has increased considerably in recent years due to our strategic focus on scientific technological and clinical research activity. In the early years, software development of new technology was one of the core activities. Although this is one of the most important activities today, more emphasis is also on integrated clinical and scientific research on specific measures for improving the overall solutions. We perform studies both in the laboratory in a controlled set up and in the operation room, where we test our solutions in the true environments and on patients. We experience that other groups regard ultrasound as an interesting technology for the future. This is confirmed by the significant increase in citations of our publications in recent years, also from our early work. This shows that our research is receiving increased attention and that many other research groups consider our approach and research results both interesting and as an example worth following.

In summary, our scientific activity up to June 2006 counts:
- 62 scientific papers in refereed journals.
- 230 conference and seminar presentations
- 70 media (newspaper, magazine, TV) contributions
- 12 scientific awards
- 6 patents
- 2 completed technological PhDs
- 2 completed technological Post Docs
- More than 33 Master/project theses
- 8 ongoing PhDs in Medical Technology (5 technological, 3 clinical)

“We disclose new knowledge and scientific-based research results.”
Scientific activity and key personnel

**Neurosurgery:**
- Hans Olav Myhrén, MD, PhD, Professor of Surgery, NTNU, Trondheim, Norway. Specialist in general, thoracic and vascular surgery and has been Chief of Department of Surgery, 1982 – 2002, Medical Director, St. Olavs Hospital, Trondheim. First president of the European Society for Vascular Surgery. Main research topics clinical research in endovascular surgery and application of new technological methods in diagnosis and treatment of vascular diseases. At present Chief of the Scientific advisory board for the project “Operating Room of the Future”.
- Additional clinical key personnel in vascular therapy are: Asbjørn Ødegård, MD, Consultant interventional radiologist, asbjorn.odegard@stolav.no 
  - Conrad Lange, MD, Vascular surgeon, conrad.lange@stolav.no 
  - Staal Hatlinghus, MD, Consultant Interventional radiologist, staal.hatlinghus@stolav.no, and a ongoing PhD students (Page 27).

**Neurosurgery:**
- Additional clinical key personnel in neurosurgery are: Tomm Muller, MD, PhD, Neurosurgeon, tommy.muller@stolav.no 
  - Frode Kolstad, MD, Neurosurgeon, frode.kolstad@stolav.no, and 1 ongoing PhD student (Page 27).

**Laparoscopy:**
- Ronald Mårvik, MD (1976), PhD (1999). Specialist in General Surgery (1977) and Gastrointestinal Surgery (1995). Consultant surgeon at the Surgical Department of Trondheim University Hospital, now St. Olavs Hospital, (1987-1999). Since 1995 Head of Department of National Center for Advanced Laparoscopic Surgery at St. Olavs Hospital. Entrusted various positions in Norway and Europe, Secretary General of Steering Committee for Norwegian Thoraco-Laparoscopic Forum (since 1995). Member of the Scientific Committee, Executive Committee, Administrative Board and a Treasurer for the European Association for Endoscopic Surgery. Mårvik has led more than 70 specialist courses including 15 international within laparoscopic surgery at the National Center for Advanced Laparoscopic Surgery. He has received Norwegian and European awards for his research and innovative development of laparoscopy and published more than 50 papers in international peer review journals. His research in laparoscopy covers topics such as surgical robots, Doppler ultrasound, microcirculation, cybernetics used to develop tactile feedback, 3D navigation technology, and development for the “Operating Room of the Future” for laparoscopic surgery.
- Additional key personnel in laparoscopic surgery are: 
  - Gjermund Johnson, MD, surgeon, gjermund.johnson@stolav.no, Brynjulf Tøtland, MD, surgeon, brynjulf.totland@stolav.no, Yumus Yavuz, MD, laparoscopic surgeon, y Yusuz@online.no, Kirsten Rønning, Bioengineer, kirsten.ronning@stolav.no

**Technology:**
- Taral A. Nørgaardh, Hernes, Professor in Medical Technology at Instit of Circulation and Medical Imaging, DMF, NTNU (since 2006), Research Director Dept Medical Technology, SINTEF Health Research (since 1998). Head of technological research and development at the National Centre for 3D Ultrasound in Surgery (since 1998), PhD Medical Technology, NTNU (1992), MSc Biophysics and Medical Technology, NTNU (1992).
  - Mobil: +47 93 02 83 45, e-mail: taral.n.hernes@sintef.no
- Jon Harald Kaspersen: Senior Research Scientist at Dept Medical Technology, Key-Account Manager in the ICT-Health area (since 2001), PhD Mechanical Engineering NTNU (1996), MSc Aero- and Gas Dynamics NTNU (1993)
  - Mobil: +47 93 03 65 90, e-mail: joro.h.kaspersen@sintef.no
- Thomas Lange: Research Scientist at Dept. Medical Technology, SINTEF Health Research (since 1996), Project leader for technology research and development in Laparoscopic surgery at the National Centre for 3D Ultrasound in Surgery (since 2002). PostDoc in Medical Technology assessment (SINTEF/NTNU, 2003), PhD Medical Technology (NTNU, 2000), MSc Biophysics and Medical Technology (NTNU, 1999), Lectures in Image processing and analysis (NTNU, 2004).
  - Mobile 130 62 76 13, e-mail: thomas.lange@sintef.no
- Frank Lindseth: Research Scientist at Dept Medical Technology, SINTEF Health Research (since 1996), Project leader for technology research and development in Laparoscopic surgery at the National Centre for 3D Ultrasound in Surgery (since 2002). PostDoc in Medical Technology assessment (SINTEF/NTNU, 2003), PhD Medical Technology (NTNU, 2000), MSc Biophysics and Medical Technology (NTNU, 1999), Lectures in Image processing and analysis (NTNU, 2004).
  - Mobile 130 62 76 13, e-mail: thomas.lange@sintef.no
- Rune Hansen: Research Scientist at Dept. Medical Technology, SINTEF Health Research (since 2006), Project leader for technology research and development in vascular surgery at the National Centre for 3D Ultrasound in Surgery (since 2006), PostDoc in Ultrasound signal processing (2006), PhD Ultrasound contrast imaging (NTNU, 2004), MSc (NTNU, 1998).
  - Mobile 130 62 76 13, e-mail: rune.hansen@sintef.no
  - Mobil +47 90 54 74 74, e-mail: tommod.solbakk@sintef.no
- Olav Haraldseth: MD, PhD Professor in medicine (MR technology) at the Dept. of Circulation and Medical Imaging (NTNU) since 1997. Dean of research at the Faculty of Medicine since 2006. Head of Trondheim part of National Centre of Competence in Functional MR (since 1992) and the national technology platform Molecular Imaging Centre (MIC) since 1993.
  - Mobil +47 98 46 89 40, e-mail: olav.haraldseth@ntnu.no
  - E-mail hans.torp@ntnu.no
- 5 ongoing technological PhD students (page 27)
Graduates and PhD programs
On going PhD projects:

- Arild Wollf: Accelerated multimodal volume visualization with graphics hardware for use on the Operating Room of the Future. M.Sc. (Doctorate student at SINTEF Health Research, Medical Technology M.Sc. Computer Engineering, HiN (2001). Mobile: +47 90 97 03 33, e-mail: arild.wollf@sintef.no
- Reidar Brekken: Ultrasound signal processing for improved diagnostics and image guidance. Research Scientist Dept Medical Technology, SINTEF Health Research (since 2004). Research activities related to diagnostic ultrasound imaging, specially related to vascular diseases. MSc Engineering Cybernetics, NTNU (2002). Mobile: +47 93 05 96 51, e-mail: reidar.brekken@sintef.no
- Erik Harg: Image guided therapy, correction of tissue changes during therapy. Software Engineer, SINTEF Health Research (since 2003). MSc Computer Science, NTNU (2005). Mobile: +47 92 49 85 41, e-mail: erik.harg@sintef.no
- Frode Hulaas Christiansen: Navigated endovascular procedures. PhD-student at Inst of Circulation and Medical Imaging, DMF, NTNU (since 2005). Medical Doctor, University of Wuerzburg (2002). Internship, St. Olavs Hospital/Trondheim University Hospital (2003-2004). Dept of Medicine and Dept of Surgery, St. Olavs Hospital/Trondheim University Hospital (2004-2005). Mobile: +47 92 82 66 30, e-mail: frode.hulaas.christiansen@ntnu.no

Post Docs:

- Frank Lindseth: Multimodal visualization and navigation accuracy. NTNU (2002)

Finished PhD, post docs

PhD:

- Frank Lindseth: Multimodal visualization and navigation accuracy. NTNU (2002)

Post Doc:

- Thomas Lange: Evaluation and improvement of accuracy in ultrasound based minimally invasive image guided surgery. NTNU (2005)
“Products based on our research activity are now being used world-wide.”

Patents and commercialization
The National Centre for 3D Ultrasound in Surgery aims to commercialize research and development results and thereby offer technology for improved patient care for more patients. The Centre has several patents, some of which have resulted in commercialization and market introduction of new technology.

In 1998, the establishment of the company MISON AS evolved from the research activity performed at the National Centre for 3D Ultrasound in Surgery in Trondheim. One of the core products of MISON is the neuronavigation system SonoWand®, which is a versatile, single-rack intraoperative imaging system that integrates 3D ultrasound and navigation. MISON is the first company to offer a compact integration of high quality 3D ultrasound and neuro-navigation technology that improves guidance of neurosurgical procedures by solving the brain shift problem.

The National Centre for 3D Ultrasound in Surgery also collaborates with industry and other universities in order to commercialize results from research activities. Our role is to meet challenges through research and development activities and ensure exploitation of research results through our own commercialization activities or through other industrial companies.

The National Centre for 3D Ultrasound in Surgery has made several patents:
St. Olavs Hospital, the Norwegian University of Science and Technology (NTNU), and SINTEF have together built up the highest level of competence in the field of minimally invasive technologies for improved neurosurgery, vascular therapy and laparoscopy. St. Olavs Hospital contributes with integrated clinical research, SINTEF with its competence in applied research and development and testing of medical technology, and NTNU as the main partner in research and training activities, and the education of students.

Technologists and clinical staff work together in interdisciplinary teams. Research scientists from SINTEF join the surgeons in the operating room where they get ideas for further development of new technology based on needs and demands. As of 2006, the Centre consists of approximately 15 research scientists with technological background and 5 clinicians in each clinical area, in addition to nurses and radiologists. PhD and MSc students with both technological and clinical background are being educated at the Centre. This gives a total number of approximately 40 persons involved in the Centre on a yearly basis.

The activity is organized in three main clinical research areas: Neurosurgery, Vascular surgery and laparoscopy, each with a technological and a clinical project leader. Technological research is partially carried out at SINTEF; PhD and Master students are educated by the Department of Circulation and Medical Imaging as well as by other faculties at NTNU. In this way, an optimal team of technologists can be assembled at any time to perform the task at hand. A board, with representatives from St Olavs Hospital (Research Manager), NTNU (Leader, Dept. of Circulation and Medical Imaging) and SINTEF Health Research (Director), meets yearly and defines budget and points of research. In addition, a reference group with representatives from other academic organizations as well as from other hospitals is established in order to follow up the research activities as well as to recommend priorities for the Centre’s further research activities.

Teams of organizations and teams of people together all play important roles in this successful collaboration of users, clinicians, researchers, developers and teachers.
Since it was established, The National Centre for 3D Ultrasound in Surgery has received a yearly basic funding for its research activities. In 2006 approximately 1.15 mill Euro was allocated by Health Mid Norway. This funding is essential for maintaining a high international level of competence which includes research scientists with PhD and post docs. In addition to the basic funding, each of the three core organizations contributes both their significant efforts and resources by financing equipment and personnel resources. Funding for the Centre’s activities and related research and development projects are received as follows:

- Own personnel resources at St Olavs Hospital
- Own strategic funding from SINTEF
- Strategic research program for Medical Technology at NTNU
- The Research Council of Norway
- EU

In addition, the Centre collaborates with
- GE Vingmed Ultrasound
- MISON
- Siemens, Sony and Olympus (Operating Room of the Future)
- Universities and hospital nationally and internationally

The Centre maintains confidentiality regarding its respective partner and collaborator in the projects as agreed upon by those respective partners. The Centre welcomes academic research scientists as well as industry to discuss new and ongoing research activities with clinical and technological focus.

“Your contribution brings our research and technological solutions forward, obtaining optimal patient treatment.”