

SIMULA 2010 ANNUAL REPORT

Simula conducts basic research in the fields of network systems, scientific computing and software engineering. The aim is to undertake research of the highest quality, commercialise research results and educate MSc and PhD candidates in cooperation with university partners.

RESEARCH ACTIVITIES

The Certus Centre, Cardiac Modelling, Network Systems, Media Performance, Biomedical Computing, Better Estimation of Software Tasks, Computational Geosciences

DOCTORATES AND MASTER'S DEGREES

Candidates supervised throughout their PhD/MSc projects by researchers at Simula

FINANCIAL REPORT

Income statements, Balance sheet, Assets, Costs, Operating revenue, Equity, Transactions, Shares, Cash flow statement

LIST OF PUBLICATIONS

Books, Edited books, PhD-theses, Articles, in international journals, Chapters in books, Refereed proceedings, Technical reports

MANAGING DIRECTOR

As we are entering 2011, Simula is in a better condition than ever and it seems to be generally accepted and will go on as long as Simula provides good results.

DIRECTORS' REPORT 2010

During the year under review, Simula once again burgeoned itself to be a high-quality research institution burgeoning with activity.

SIMULA 2010

Key facts: Gender equality, diversity and integration
'CALIFORNIA DREAMIN'

The images of California are plentiful and strong, more often than not, — they are also dreams of opportunities.

ANNUAL

SIMULA ANNUAL REPORT 2010

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Professor Aslak Tveito, Managing Director

MANAGING DIRECTOR

SIMULA RESEARCH LABORATORY FOREVER

Simula Research Laboratory was established January 1st 2001. It was clear from the start that Simula would be closed down after five years of operation if the results were below expectation, and it was equally clear that it would be very hard to go on for more than ten years.

This background has shaped Simula in the sense that all employees have felt that their own position depends completely on the results Simula would be able to produce.

The first scientific evaluation organized in 2004 by the Research Council of Norway was indeed very positive and that was decisive for our existence. It led to an opening for ten more years since the evaluation committee suggested that Simula should be put on a “rolling 5+5 year contract”. The second evaluation took place in 2009 and the result was again very positive for us; the committee re-iterated the 5+5 year contract and gave an overall positive assessment of the entire activity.

As we are entering 2011, Simula is in a better condition than ever and it seems to be generally accepted that a 5+5 year contractual basis is implemented and will go on as long as Simula provides good results.

As illustrated by the milestones listed here, it has been ten eventful years.

MILESTONES

2001

Simula Research Laboratory is established as a project at the University of Oslo.

All employees move to Fornebu in December.

The Research Council pledge funding for 10 years on the condition that a successful international evaluation are conducted within five years.

2002

Simula officially opened by Kristin Clemet, then Minister of Research and Education.

Simula is established as a limited company owned by the Government (80%), Sintef (10%) and the Norwegian Computing Centre (10%).

Professor Aslak Tveito is appointed leader of Simula.

2003

Simula’s strategy of directed basic research is formulated.

2004

Simula is evaluated: one department is rated "excellent", the second department is well on its way to the same rating, and the third department is also most promising.

The evaluation committee recommends that Simula be put on a 5+5 year contract.

Simula researcher Dr. Joakim Sundnes is awarded the Outstanding Young Investigator Grant from the Research Council of Norway.

Simula Innovation is established (100% owned by Simula) to promote the transition of Simula research into practise.

The Norwegian government states that the funding of Simula no longer requires a location at Fornebu.

2005

In the light of the evaluation of 2004, the Research Council of Norway decides to extend its contract with Simula until 2010.

Simula and Hydro (now Statoil) begin a significant research collaboration that continues to expand up to present day.

The Annual General Meeting of Simula announces that the Ministry of Research and Education takes a positive view of Simula's collaboration with Hydro and that it encourages Simula to seek similar agreements that will contribute to innovation in industry and society.

2006

All parties present in the Parliament officially support the 10-year extension of Simula's contract.

Simula is awarded a Centre of Excellence in Biomedical Computing from the Research Council of Norway, headed by Professor Hans Petter Langtangen.

The Ministry of Transport and Communications allocates funding for the period 2006-2010 to the Resilient Networks project.

Kalkulo is established (100% owned by Simula). Its main intention is to establish a organisational distinction between commercial contract research and the basic research activities at Simula.

2007

Simula School of Research and Innovation is established. Simula Research Laboratory (56%), Statoil (21%), The Municipality of Bærum (14%), Telenor (7%), Norwegian Computing Centre (1%), Sintef (1%).

Simula researcher Dr. Anders Logg is awarded the Outstanding Young Investigator grant from the Research Council of Norway.

Professor Lionel Briand is hired at Simula.

2008

Professor Magne Jørgensen is ranked number one in a world-wide assessment of the most productive systems and software engineering scholars published in the Journal of Systems and Software. Simula is ranked third in the same assessment on the list of the world's most productive research institutions within the field.

2009

Simula is evaluated with strong results: one department is rated "excellent in every aspect", the second department is 'excellent', and the third department is 'very good with excellent elements'.

The book Simula Research Laboratory – by thinking constantly about it is published by Springer.

Simula enters into a long-term contract under Statoil's Academia program, the only non-university institution in the program.

2010

Simula is awarded a Centre for Research-based Innovation by the Research Council of Norway: the Certus Centre, headed by Professor Lionel Briand.

Oslo University Hospital is awarded a Centre for Research-based Innovation: the Centre for Cardiological Innovation, with Simula and GE VingMed Ultrasound as equal partners. Dr. Molly Maleckar is the head of the Simula branch.

Simula proposes to establish an educational collaboration with the University of California, San Diego and the University of Oslo.

The Ministry of Transport and Communications funds the Resilient Networks project for another 5 years.

The Journal of Systems and Software ranks Simula as the world's most productive institution in systems and software research. Professor Magne Jørgensen is again ranked as the worlds' most productive researcher within the field.

The Ministry of Education and Research acquires 100% ownership of Simula.

The future location is settled and Simula enters into a new 10-year contract with IT Fornebu.

SCIENTIFIC MERIT IN NUMBERS 2001 through 2010

- 9 published books
- 22 edited books
- 383 journal papers
- 612 conference papers and chapters in books
- 46 supervised PhD theses
- 207 supervised masters theses
- 8 companies created with Simula's participation



From left: Gunnar Hartvigsen, Ola Skavhaug, Tormod Hermansen, Amund Kvalbein, Ingvild Myhre, Aslak Tveito, Ottar Hovind, Inger Stray Lien, Mats Lundqvist.

DIRECTORS' REPORT FOR 2010

Simula Research Laboratory AS is located at IT Fornebu in the municipality of Bærum. When it was founded in 2001, Simula signed a 10-year lease with IT Fornebu. A review of other options showed that Fornebu is still a good alternative, and in January 2010, Simula and IT Fornebu signed a new 10-year lease.

Administration and organisation

As from 1 September 2010, the State, represented by the Ministry of Education and Research, owns 100 per cent of the shares in Simula.

Evaluations in 2009 showed that Simula delivers impressive scientific results and is an inspiring innovation in the Norwegian research system. During the annual contact meeting with the Ministry of Education and Research, the ministry's representatives referred to the exceptionally good results of the evaluation in 2009 and expressed their confidence that Simula will continue its dedicated efforts to achieve good results. The Ministry of Education and Research's proposition for the central government budget for 2011 included the following remark about Simula: "In 2009, the Research Council of Norway evaluated Simula Research Laboratory, a mainstay of ICT research in Norway. The committee that evaluated Simula was impressed by the progress the centre had made since the evaluation in 2004 and gave it an outstanding overall evaluation*."

In June, Simula invited representatives of the Research Council of Norway, Bærum Municipality, Statoil, political circles and other stakeholders to a strategy seminar. During the introduction, a representative of the Ministry of Education and Research remarked that Simula is well-positioned to deal with the challenges and goals the Government has identified for Norwegian research and higher education.

In autumn 2010, Simula's Board appointed a new Scientific Advisory Board (SAB), consisting of prominent researchers, to provide professional advice regarding the operation of Simula. The new SAB has made six reports that give a good general impression of Simula's activities and point out important challenges facing the company.

Research-related advances

In December, the Research Council of Norway allocated more than NOK 500 million to seven new Centres for Research-based Innovation. The Board of Directors ascertains with satisfaction that Simula plays a key part in two of the seven new centres, both of which have several major partners from business and industry. Simula is the host institution for the Certus Centre whose primary goal is to contribute to value creation by developing cutting edge methods and techniques for the verification and validation of complex, business-critical software systems and solutions. Certus is headed by Professor Lionel Briand. Oslo University Hospital (OUS) is the host institution for the Centre of Cardiological Innovation (CCI), where Simula is an equal research partner. CCI is headed by Professor Thor Edvardsen of OUS and Dr. Molly Maleckar of Simula.

During the year under review, Simula once again showed itself to be a high-quality research institution burgeoning with activity. In October, the Journal of Systems and Software ranked Simula as the world's most productive research institution in the field of systems development. This was even better than in 2009 when Simula was ranked number two. As in 2007 and 2009, Professor Magne Jørgensen was ranked as the world's most prolific scientist in the field, and Professor Lionel Briand ranked 5th.

* Our translation.

In 2010, Professor Hans Petter Langtangen was elected the new editor-in-chief of the SIAM Journal on Scientific Computing, a highly respected research journal in this field. The Resilient Networks Project was continued in 2010. NOK 31 million in funding will be granted over the next five years by the Ministry of Transport and Communications through the Research Council of Norway. Dr. Amund Kvalbein heads the project to cooperate with the Ministry of Local Government and Regional Development/E-election and UNINETT, as well as a series of universities and colleges.

Several Simula projects received large-scale grants from the Research Council of Norway during the year. Headed by Dr. Kent-Andre Mardal, the project "PaSpMath" was granted an allocation of NOK 6.9 million over five years, and the project "In Silico Heart Failure", led by Dr. Joakim Sundes, was granted NOK 7.7 million over four years. Under the FRITEK programme, Dr. Shiva Nejati was granted funding amounting to NOK 6.6 over four years for the project "ModelFusion: Model Management for Distributed Software Development". Dr. Sam Wall was granted a postdoctoral fellowship for the project "Modeling the Engineered Heart" for NOK 1.4 million over 18 months under the FRIBIO programme.

Dr. Molly Maleckar was assigned an important role in a pilot project for the development of an initiative for Future Emerging Technologies (FET) under the EU's 7th framework programme.

Simula Graduate School of Computing

The Norwegian Government would like to raise the level of internationalisation in higher education and research. In 2010, Simula proposed to contribute to this by establishing a programme entitled the "Simula Graduate School of Computing", which can lead to a double or joint PhD degree at the University of Oslo (UiO) and the University of California San Diego (UCSD). The main objective is to encourage more students to take doctorates by offering a joint international educational programme at the best ICT research communities in the USA and Norway. The ambition is to produce 20 doctoral candidates annually that will graduate with a specialist background that will make them coveted in the world of academia as well as in business and industry.

Bringing the Simula Graduate School of Computing to fruition will call for stable, long-term State funding. In December 2010, Simula submitted a proposal to the Minister of Research. During the strategy seminar in June, it was stated that the Ministry is positive to the plans, and Simula's Board hopes the ministry will fund the initiative over the central government budget for 2012.

Society and dialogue

Once again in 2010, Simula and its subsidiaries cultivated contact with political circles, business and industry, other institutions of higher education and society-at-large. The Simula School founded the school project "Prepare", where a group of female bachelor's and master's degree students from the University of Oslo were recruited as role models to boost interest in science and technology by visiting selected lower and upper secondary schools. The project is supported by the municipalities of Oslo, Asker and Bærum, as well as Akershus County Municipality.

In 2010, Simula's partnership with Valler Upper Secondary School was continued and expanded to include Nesbru Upper Secondary School. Altogether, some 100 pupils visited Simula in the autumn semester.

Minister of Transport and Communications Magnhild Meltveit Kleppa visited Simula in February at the head of a high-profile delegation from the Ministry that contributes a total of NOK 16 million in basic subsidies and programme support each year. Minister Kleppa and the delegation expressed a great deal of interest in Simula's research and plans for the future.

Lividi AS, a spin-out from Simula Innovation, received good publicity in August when 14 researchers from the University of Oslo excavated fossils on Svalbard (Spitsbergen) while the research portal Forskning.no broadcast the TV images live to a broad viewing audience. Simula and Lividi delivered the technology that made the direct broadcast from the excavation site possible.

Employment, equal opportunity and integration

At the end of 2010, Simula Research Laboratory had 35 full-time employees and 14 part-timers and staff members in secondary positions, for a total of 49 employees. Of that number, there were 42 men and 7 women, while 34 were Norwegian and 15 were foreign nationals.

The Simula Group's aggregate staff of 114 at year end comprised 88 full-time and 26 part-time employees. Of that number, there were 90 men and 24 women, while 65 were Norwegian and 49 were foreign nationals.

Simula's Board has adopted an ambitious plan of action to raise the proportion of female employees in scientific posts to 25 per cent by 2015. In 2010, appointments raised the proportion from 13 to 17 per cent.

Absence due to illness is extremely low throughout the Simula Group. No work-related illnesses or accidents were reported during the year.

Ethics

Simula follows a code of ethics that is described in a separate document, "The Simula Code of Ethics". The document also deals with research ethics, based on the fact that Simula is an institution dedicated to truth and the quest for truth. The institution's reputation depends on third parties being able to trust that its research results are accurate and that they have been produced in a verifiable, ethically responsible manner. In questions relating to research ethics, Simula's researchers are to observe the guidelines issued by the National Committee for Research Ethics in Science and Technology in Norway. In addition, Simula employees are to observe Simula's own guidelines for scientific publication. These guidelines are based on the Vancouver Convention.

The Simula School

In 2010, the administration of the Simula School of Research and Innovation AS (the Simula School) put tremendous effort into developing the plans for the Simula Graduate School of Computing. The Simula School's other activities were continued at the same level in 2010. A communications course in the spring semester also attracted students from Campus Kjeller and the Norwegian Computing Centre. Bærum Municipality has renewed the agreement under which it provides NOK 1 million in annual support for Simula for four more years. The support is linked to a research fellowship named after Leif Tronstad, a Norwegian scientist and WW II hero who grew up in Sandvika in Bærum. Simula had one doctoral thesis defence in 2010. At year end, Simula had 41 PhD students, 17 of whom should be ready to defend their theses in 2011.

Simula Innovation AS

In 2010, Simula Innovation AS (SI) established collaboration with Campus Kjeller with a view to the commercialisation of Simula research and funding under the Forny (Renew) programme from the Research Council of Norway.

The company Testify AS, created to supply software testing services, was established as a spin-out from the Software Engineering Department.

In the municipal and county elections in 2011, 10 municipalities are to have an opportunity to vote electronically. SI and researchers from Simula and Kalkulo have carried out the "eValg" project commissioned by the Ministry of Local Government and Regional Development.

SI's Innovation Prize for 2010 was awarded to the Statoil project conducted by Kalkulo AS.

Kalkulo AS

Kalkulo AS had stable staffing and a growing turnover in 2010. The SPT Group, which develops and sells the world's leading software for the simulation of three-phase flows (oil, gas, and water), signed a contract for a feasibility study for testing a method for simpler interaction with the simulator.

Statoil increased the scope of the project "Compound Modeling" from NOK 3 million to NOK 4.85 million. Kalkulo mainly used to deliver core algorithms to the project, but it has now been assigned responsibility for larger parts of the project.

Cooperation with Kongsberg Defence Systems on the development of applications for sonars increased in scope in 2010, and Kalkulo delivered services valued at more than NOK 2 million. Cooperation with the state-owned power company Statkraft continued through the establishment of a new joint venture for the visualisation of snow depth measurements.

Finances

Simula's aggregate operating revenues in 2010 came to NOK 89 million. External project financing totalled NOK 40 million. The net profit for the year was NOK 3.5 million, which was transferred to equity.

The Simula Group's operating revenues added up to NOK 109 million in 2010, and the net profit for the year was NOK 5.1 million after minority interests. A profit of NOK 2.5 million had been budgeted for 2010.

The Simula School's aggregate operating revenues in 2010 came to NOK 32 million and the profit came to NOK 1.2 million.

Kalkulo AS had total sales revenue of NOK 1.1 million in 2010, and the net profit (after taxes and write-downs) was NOK 1.3 million.

Revenues for Simula Innovation AS totalled NOK 14 million, and the result for 2010 was a deficit of NOK 500 000. The going concern assumption applies and the annual accounts have been submitted on that basis. The company has a satisfactory operating structure. No situation has arisen since year end that has had a material impact on the accounts as presented.

Environmental issues

Simula's activities do not pollute the outdoor environment. As part of the wage settlement for 2010, each employee was offered a cash settlement of NOK 6 000 to give up his/her parking space. A total of 62 employees accepted the offer in 2010.

Board work

Simula's Board had five meetings and dealt with a total of 38 items in 2010. There is good cooperation between the directors and the administration. The evaluations in 2009 have not entailed major changes in Simula's strategy to 2015, and the Board of Directors hereby extends its gratitude to all employees for their sterling efforts throughout the year.

KEY FACTS

Simula Research Laboratory is a limited company owned by the Norwegian government.

Scientific Advisory Board

The Scientific Advisory Board (SAB) is appointed by Simula's Board to provide focused professional advice on Simula's operation. Simula Research Laboratory has appointed to the SAB internationally recognized researchers, which cover all the scientific fields represented at Simula.

- Klara Nahrstedt, University of Illinois at Urbana-Champaign
- Roch Guerin, University of Pennsylvania
- Andrew McCulloch, University of California San Diego
- David Keyes, KAUST
- Deborah Wood, DNV
- Victor Basili, University of Maryland
- Ina Schieferdecker, Fraunhofer
- Abigail Barrow, Massachusetts Technology Transfer Center

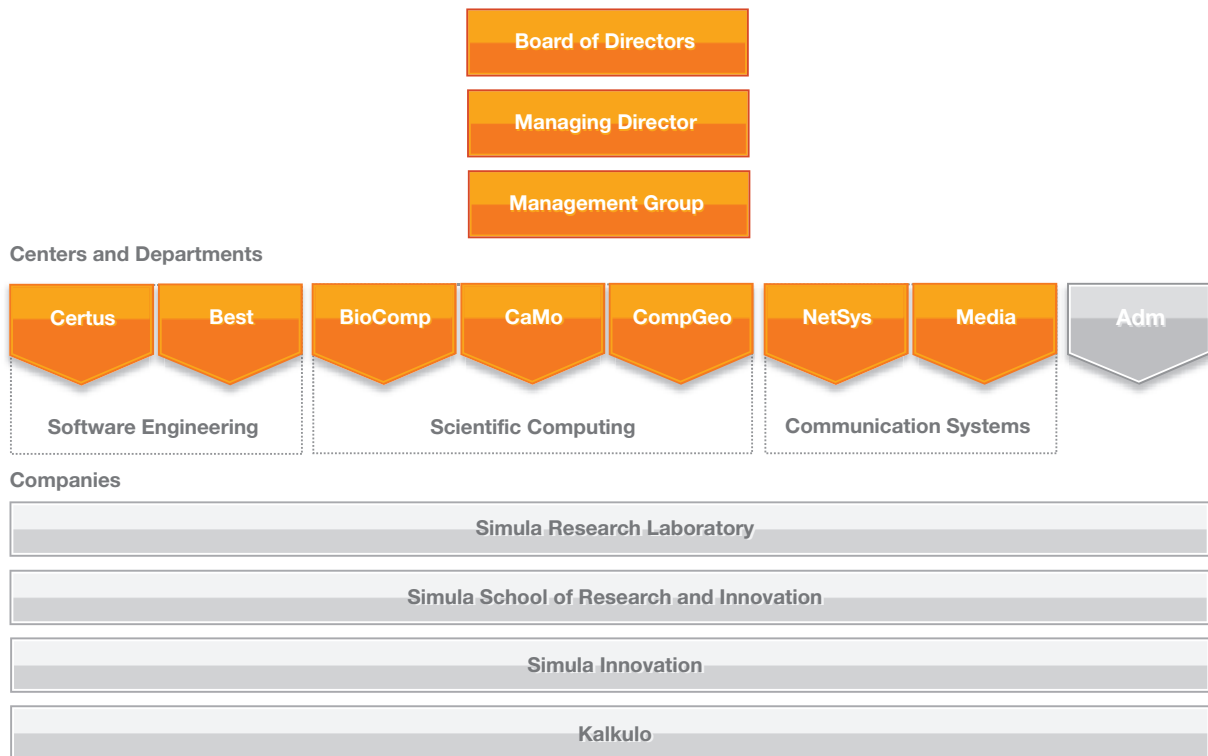
Board of Directors

- Ingvild Myhre, Chair of the Board
- Inger Stray Lien
- Tormod Hermansen
- Gunnar Hartvigsen
- Mats Lundqvist
- Amund Kvalbein
- Ola Skavhaug

Management

- Professor Aslak Tveito, Managing Director
- Ottar Hovind, Deputy Managing Director
- Professor Are Magnus Bruaset, Director of Simula School of Research and Innovation
- Dr. Audun Fosselie Hansen, Director of Simula Innovation
- Marianne M. Sundet, Director of Corporate Development and Communication

SIMULA GROUP



Departments

- The Certus Centre
Head: Professor Lionel Briand
- Best
Head: Professor Magne Jørgensen
- BioComp
Head: Professor Hans Petter Langtangen
- Camo
Head: Dr. Molly Maleckar
- CompGeo
Head: Dr. Stuart Clark
- Media
Head: Professor Carsten Griwodz
- NetSys
Head: Professor Olav Lysne

Administration

Director: Dr. Åsmund Ødegård

Subsidiary companies

- Simula School of Research and Innovation AS
Director: Professor Are Magnus Bruaset
- Simula Innovation AS
Director: Dr. Audun Fosselie Hansen
- Kalkulo AS
Director: Dr. Christian Tarrou

Staff year-end 2010

Category	Number of employees
Scientists	39,5
Postdoctoral fellows	17
PhD Students	41
Management/Support	16,5
Total	114

KEY FACTS

GENDER EQUALITY AND DIVERSITY

Simula's gender action plan for 2010–2015 was adopted by the Board of Directors at the end of 2009, with one main goal: to increase the proportion of female employees.

As directed by the action plan, Simula is focusing on gender and diversity awareness in the recruitment and hiring processes. During 2010, in total fifteen new employees were hired at Simula; six women and six men were hired in scientific positions. The percentage of female employees among the scientific staff has increased from 13 per cent in 2009 to 17 per cent in 2010.

Zooming down to the PhD and post-doctoral level, the proportion of female employees is 29%. Simula will continue the focus and implement the measures of the Gender Action Plan in order to reach the goal by 2015.

Simula's science awareness program Prepare was initiated in 2010 in collaboration with school authorities in Akershus, Oslo, Asker and Bærum. Female bachelor and master students within science and technology were recruited to positions as mentors and received tailored communication training and follow-up through a program in collaboration with Penn State University. The main goal of the project is to inspire pupils at secondary and upper secondary levels to choose a career path within science and technology. The Prepare program aims at inspiring pupils in general, but as the mentors are all female role models, the program especially targets girls and has ambitions to influence on choices they are about to make regarding their future studies. The Prepare activities include presentations at 13 different schools, and the project will continue through 2011.

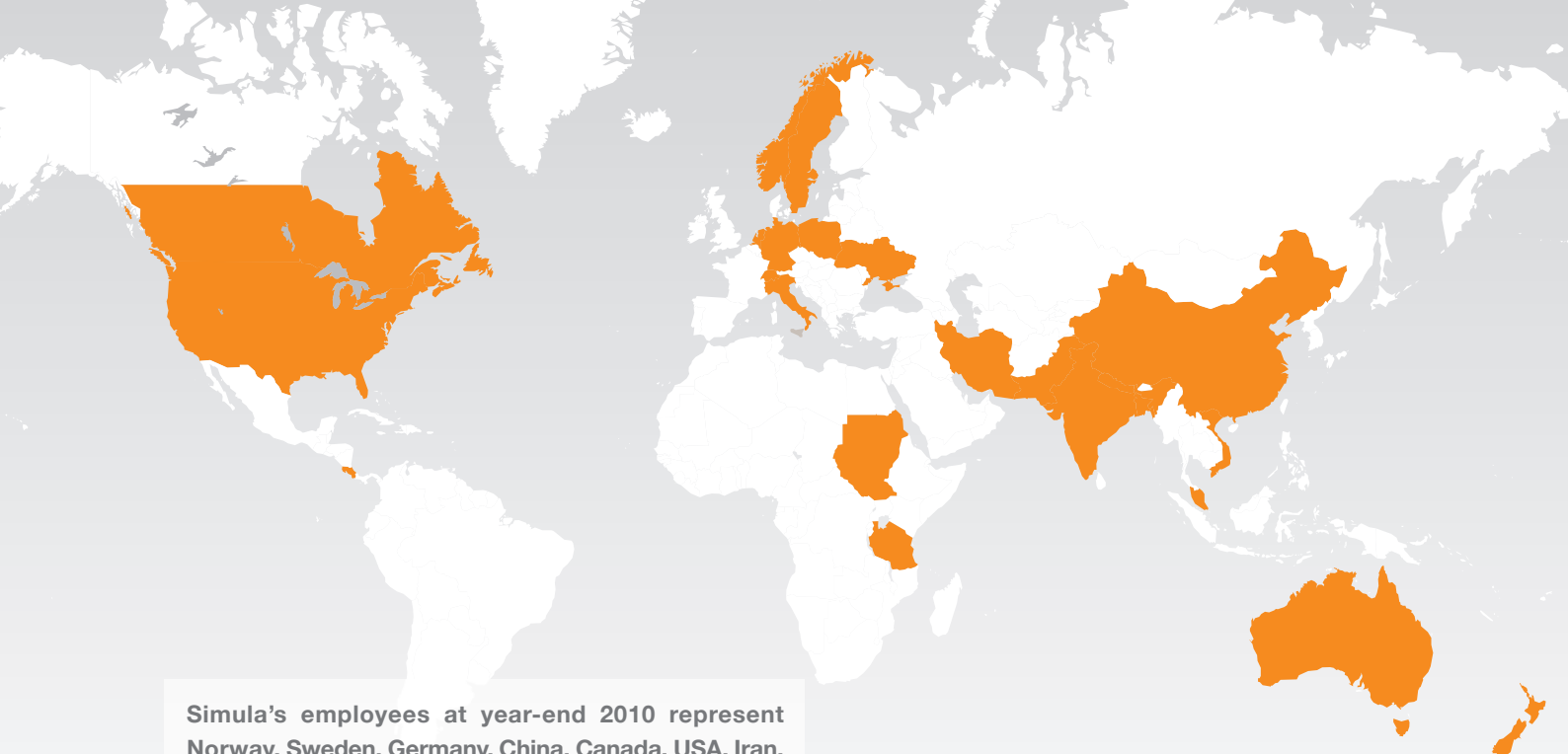
In October, Simula together with the ACM Special Interest Group on Multimedia (SIGMM) sponsored a "Women's Research Meeting" lunch at the ACM Multimedia 2010 event in Florence, Italy. The goal of the meeting was to strengthen the social networking among female researchers in the SIGMM community, as well as increase

"Simula will increase the percentage of women in amongst the employees. By December 2015, Simula should have at least 25% female employees within the categories of scientific and support staff."

the participation of women in this community. About 40 female researchers, including participants from Simula, attended the meeting where plans for further activities were established, including a workshop for networking of women in Multimedia at future ACM Multimedia conferences. Simula will for 2011 establish procedures and set aside a budget for gender related activities like the SIGMM lunch, as such networking can be important for retaining women within the research communities.

<http://simula.no/about/gender-action-plan-2010-2015>



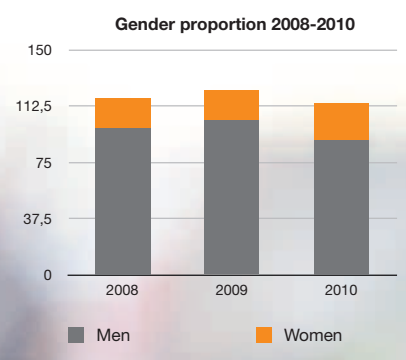
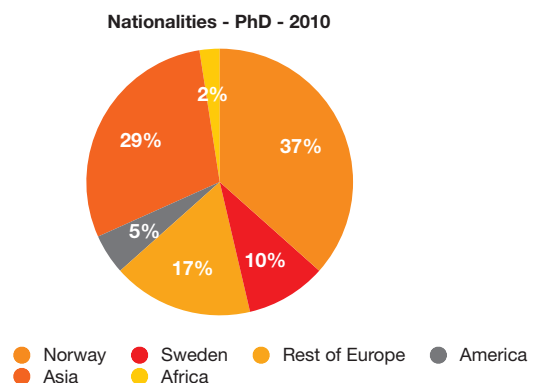
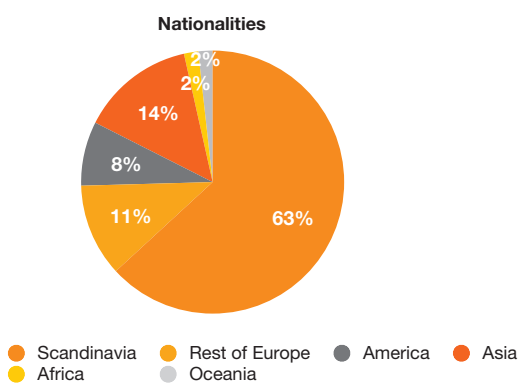


Simula's employees at year-end 2010 represent Norway, Sweden, Germany, China, Canada, USA, Iran, Netherlands, India, Pakistan, Australia, Bangladesh, Costa Rica, Italy, Malaysia, Nepal, New Zealand, Poland, Sudan, Switzerland, Tanzania, Ukraine, and Vietnam.

International employees

Simula is an international workplace, and 43 per cent of the total work force is from countries outside Norway. As of year-end 2010, 23 different nationalities were represented among the employees.

The 15 persons hired in 2010 represented 10 different nationalities. The percentage of non-Scandinavian employees at Simula has thus increased from 33 per cent to 37 per cent in the period. On the PhD level, 63 per cent of the employees have another citizenship than Norwegian by the end of 2010, an 8 per cent increase since last year.





California Dreamin'

By Are Magnus Bruaset

Sun. Blue sky. Long, powerful waves breaking rhythmically on the shore. Tan bodies with perfect smiles, laughing. Wetsuits and surfboards. A sandy beach ending in Eternity. A song playing on the radio in a fancy sports car. Succulent oranges, health freaks jogging, and the eccentric hippie preaching a gospel from the past. The images of California are plentiful and strong, more often than not, depicting dreams. But dreams are diverse — they are also dreams of opportunities.

*The sunset in Delmar and
The Geisel Library at UCSD*

Standing on the hill, you overlook the Mighty Ocean and catch a distant view of La Jolla's tiny city centre, just next to caves that once could have hidden pirates and treasures. In the front, you are facing a cluster of humble wooden buildings populating the hillside that runs steeply down to the beach and the pier. These buildings house the birthplace of modern ocean science, the Scripps Institution of Oceanography. Having been around for more than a century, it is one of the oldest and largest centres for ocean and earth science research in the world. Out of this institution grew University of California San Diego, pet-named UCSD. Today, at the age of 50, this university houses more than 27,000 students and stretches its campus wide on top of a bluff overlooking Scripps.

The sweaty walk across the campus is a journey through academic fame. The numbers are impressive: eight Nobel Laureates, eight MacArthur fellows, three National Medal of Science laureates, and one Fields medallist. Currently, UCSD ranks as the 14th best university in the world according to the Academic Ranking of World Universities, a score which has proven itself to be consistent over time. In 2010, the Washington Monthly ranked the university 1st nationally, taking into account both scientific achievements and social responsibility. Within many important fields of research and education, in particular related to medicine and life sciences, UCSD has gained wide recognition and impact. Like Scripps' graduate program in oceanography and atmospheric sciences, the bioengineering program is regarded as the best offered in the United States.

Within the field of computational cardiac modelling, Simula has enjoyed almost a decade of scientific relationship with UCSD. But, there is vast potential for a much stronger relation between the two institutions: Based on advice from the previous international evaluation of Simula, the year that recently passed brought a special focus on the selection of a high calibre educational partner. Both scientific and political factors have pointed us across the Atlantic in order to establish an integrated graduate program covering Simula's research areas in communication systems, scientific computing, and software engineering. This program, the Simula Graduate School of Computing, is envisioned as a tri-lateral collaboration between Simula, UCSD, and the University of Oslo.

An ambitious goal for the proposed collaboration is to establish the first Norwegian-American joint degree at the PhD level. As pointed out by one of the panels in the 2009 evaluation: "Simula is important because of its role as a change agent in relation to the university and research institute system in Norway." So, also the goal of joint degrees is consistent with Simula's role.

A formal proposal describing the joint educational program was submitted to the Norwegian Ministry of Education and Research last December, and we are now eagerly waiting for any financial signals. Hopefully, such signals can reveal themselves in the national budget for 2012.

So, how did we get here? The process leading to the partner selection started out with a menu of 18 outstanding American universities nominated by Simula's researchers. What narrowed it down to this particular institution in sunny California, apart from the obvious climatic advantage, I mean? The answer can be summarized in a handful of factors: quality, scientific coverage, industrial relevance and impact — and, foremost, mutual interest and acknowledgement.

Obviously, the metrics quoted above, place UCSD's research quality at the top international level. Education-wise, the quality is just as high. The university offers 125 undergraduate majors, 52 master's degrees, 51 doctoral programs, and four professional degrees. Several of these programs rank very highly in the national statistics, and therefore also internationally. As an aggregated measure of UCSD's competitiveness in the educational marketplace, it is noteworthy that more than 47,000 applications for undergraduate programs in the fall of 2009 ended up as 3,749 registered students. That is an acceptance rate of less than eight percent.

The images of California are plentiful and strong, more often than not, depicting dreams. But dreams are diverse — they are also dreams of opportunities.

Along the research axis from La Jolla to Fornebu, we observe the sufficient overlap and the necessary complementarity to build joint projects that will be strong and potentially have large impact. Some of these links are obvious, like research on computational geoscience, where both institutions already nurture collaboration with Statoil. In computational cardiac modelling, relevant groups in La Jolla and at Fornebu are internationally leading, but in ways that can be mutually strengthening. Likewise, new generations of computational clusters at UCSD's supercomputing institute will most likely run traffic routing al-

gorithms developed at Simula, suggesting possibilities of mouth-watering in situ experiments that neither party could have conducted on its own. The media performance department at Simula has found research groups doing state-of-the-art work on key technologies, as well as possible partners for mind-blowing marriages between Art and Technology. Research on expert assessments and estimation of project workloads is another common denominator. This list is dynamic, and will hopefully develop for years to come. Augmented by the knowledge-based business culture gravitating around the campus in La Jolla, the collaboration with UCSD also holds an exciting industrial potential.

All the observations commented on above are of course valuable and important. However, the single most important factor is the genuine interest shown by both parties in cutting the vision loose from the ground and let it rise, daringly and joyfully. In her letter to the Norwegian Minister of Research and Higher Education, Tora Aasland, the Chancellor of UCSD, professor Marye Anne Fox, writes:

“Simula represents a strong and very attractive partner complementing UC San Diego's strengths and expertise. At UC San Diego, we are eager to explore similar synergies in other scientific fields where Simula is internationally recognized. Likewise, we are eager to expand our existing collaboration in research to higher education. Understanding the interplay between the two, we foresee that the proposed educational collaboration will further strengthen the research achievements of our institutions. Furthermore, we regard this initiative to be well aligned with our philosophy of pursuing opportunities in research and education that are interdisciplinary, innovative, and international.”

There is no doubt — the dream of California is stronger than ever.

UCSD facts

- Public university founded in 1960, located in La Jolla, just outside San Diego
- 27,417 students, of which 4,274 on graduate level
- Annual revenues \$2.6 billion
- 6 Nobel Prizes and 2 Fields Medals
- Leading within biomedical research and simulation
- Broad scientific profile
- Well-established research collaboration with Simula since 2002





THE CERTUS CENTRE

Professor Lionel Briand

VERIFICATION AND VALIDATION OF SOFTWARE SYSTEMS

Software is pervasive in all areas of society. Business and safety-critical systems increasingly rely on software to improve productivity, enable more sophisticated operations, and provide flexibility in handling evolving needs. To ensure successful operation and to avoid posing undue risks to users or the environment, software must be reliable, robust, efficient, safe, and secure.

Despite large investments in the verification and validation (V&V) of software systems, serious software failures are frequently detailed in the press. A 2010 example involved Toyota recalling about 130,000 of its Prius hybrid vehicles and 10,000 Lexus vehicles in the U.S. because the braking system software did not function correctly.

In response to the continually increasing demand for dependable systems and for ways to bring software V&V costs under control, Simula is establishing a leading research and innovation centre on software V&V in Europe. The Certus Centre is led by Professor Lionel Briand, hosted by Simula Research Laboratory, and funded by the Norwegian Research Council as part of the Centre for Research-based Innovation (SFI) program.

The user partners in the Certus Centre are major players in business sectors of the highest importance in Norway: public administration, energy, environment, and telecommunications. These sectors are software intensive, and our user partners develop some of the most complex software systems in Norway.

The Certus Centre enables research-intensive enterprises and world-leading research groups to join forces and develop new, industrial-strength technology for V&V. The centre addresses both technical and managerial aspects of software V&V. On the technical side, the Certus Centre focuses on both upstream

V&V activities, such as requirements quality assurance and architecture analysis, as well as downstream V&V activities, primarily software testing. In addition, the successful application of new and improved V&V technologies requires that V&V activities be well managed. In particular, project managers must be able to identify and evaluate trade-offs between dependability, cost, and timelines.

Model-driven engineering (MDE) is the primary strategy that the Certus Centre employs to address the challenges described above for supporting V&V technical activities and management. As in other engineering disciplines, models should play a central role in enabling abstraction, delineation of concerns, and early analysis of requirements, architecture, and design. In our experience, this is the most effective way to provide automated, scalable support for V&V, such as for test automation. Extensive international standards, widely supported by commercial tools, now exist to model software (UML and extensions) and software-intensive systems (SysML). The methods and technologies developed by the Certus Centre leverage and extend standard MDE technologies to support V&V activities and management.

THE CAMO DEPARTMENT

Dr. Molly Maleckar



Complex mathematical models are required to accurately simulate heart physiology, which creates a series of research challenges. First, it is necessary to approach problems via mathematical theory, which can lead to advanced understanding but may require novel analytical approaches. Solving models of cardiac electrophysiology and mechanics by computer also requires stable, rapid numerical methods. There are additional challenges related to how such complex systems can be implemented in software in efficient, yet flexible ways.

Our research focuses on developing and applying sophisticated numerical models and software tools, as well as creating quantitative, human-specific models of the heart. Targeted models can then be applied to elucidate responsible mechanisms and potential medical consequences of cardiac pathologies. Key current application areas within our research group focus on electrophysiological modelling of drug interactions in cardiac muscle cells (cardiomyocytes), stability and ectopy in cardiomyocytes, the dynamics of subcellular calcium release in the cardiomyocyte, and, at the organ level, cardiac electromechanics aimed at understanding mechanical dysfunction in post-infarct and failing ventricles.

The CaMo department is associated with the Centre for Biomedical Computing (CBC) at Simula Research Laboratory, a Norwegian Centre of Excellence (SFF) since 2007. CBC was founded on the basis of an ambitious and detailed research plan and its research activity has followed this plan closely. Membership in the CBC assists CaMo in establishing close and effective collaborations with world-leading experts, resulting in publication in high-impact international journals.

This year also witnesses a great growth opportunity for cardiac computation within Simula: CaMo is partnered

CARDIAC MODELLING

The CaMo department features a range of competencies in cardiac modelling. These include the development of methods to study electrophysiology and mechanics in heart tissue, and the use of these tools to study selected questions related to cardiac dysfunction and arrhythmia.

with the Oslo University Hospital System in an SFI recently awarded by the Norwegian Research Council. This SFI, entitled the Centre for Cardiological Innovation (CCI), includes internationally recognized industrial partners: General Electric Vingmed Ultrasound (echocardiographic systems), Biosense Webster (catheter ablation), CardioSolv (cardiac simulation and software), and Kalkulo (visualization and software systems; a Simula subsidiary).

The primary purpose of this SFI is to develop next-generation cardiac ultrasound systems. Novel tools and technologies will be created via linking currently isolated diagnostic systems with advanced biomedical research, advanced patient-specific computer simulations, and multi-modality visualization techniques. The targeted clinical uses of the proposed innovations are for better triage and treatment of patients at risk of sudden cardiac death, or suffering from heart failure, two of today's biggest challenges in cardiology. CaMo's partnership will contribute concretely to the CCI by providing a basic research foundation for the development of patient-specific modelling techniques and software development for implementation in commercial systems.

Partnership in CBC and CCI, coupled with additional, novel external funding, permits CaMo's imminent expansion aimed at increased international impact in our high-lighted research streams in the coming years.



THE NETSYS DEPARTMENT

Professor Olav Lysne

NETWORK SYSTEMS

One of the buzz topics in the ICT industry is that the software currently housed on PCs, and the services provided by installations in server rooms, will migrate to huge data centre facilities located at some unspecified place. This vision is known as “cloud computing”, and it promises to deliver software, infrastructure, and platforms as a service. Cloud computing is expected to yield massive reductions in cost, elastic scaling of servers relative to the needs of the customer, and a whole new way of providing for ICT needs.

The NetSys department addresses two problem areas of particular relevance to the realization of the vision of cloud computing. The first area is management of data centre and supercomputer interconnection networks. These are communication networks that reside within the data centre and allow all the computing resources, such as CPUs, disks, and memory, to interact. Together with Oracle, our main collaborating partner, we have in the last year developed solutions for increased flexibility in InfiniBand networks. More specifically, we address problems related to improved exploitation of the capabilities of the network, both for tweaking out higher performance, and to handle dynamics in network topologies. The latter problem is of particular importance in large installations, where the number of components is so high that one cannot assume that all of them will function at all times.

Another problem area we are addressing in this field is resilience of the Internet. This amounts to securing data connections when one or more components in the network have stopped working. This research field is of im-

portance to all of society, but it has a particularly central place in the vision of cloud computing. Every time we out-source a service or a resource of some kind to a cloud computing facility, the question of availability becomes important. When the service is no longer placed in the server room of a company, the availability of the service will be as dependent on the stability of the data connection as it is on the stability of the cloud facility.

The Ministry of Transport and Communication has funded the Resilient Networks project at Simula for the past five years. Over this period, we have educated four PhDs, published approximately 100 academic papers, registered several patents, and initiated a start-up company. Still, our most noteworthy achievement is that we were the first group in the world to demonstrate a working solution for IP-fast reroute.

In the national budget for 2011 it is clear that the ministry will fund the second phase of the project. Our plan for the next five years is to take our research out of the laboratory and into the real world. We will build a network of routing nodes spread out across Norway. These nodes will be connected to the networks of all infrastructure owners in Norway. In this way, we will be able to assess the health of the Norwegian network infrastructure, as well as research and test solutions that exploit the full diversity of the combined installations of all network owners.

THE MEDIA DEPARTMENT

Professor Carsten Griwodz



Activities in 2010 were shaped by two new high-risk initiatives: P2G, the Parallel Processing Graph Framework, and the first Art.on.Wires workshop.

P2G is a framework for heterogeneous multi-core and distributed programming aimed at multimedia workloads. Increasing computational demands of multimedia applications are addressed using multi-core hardware architectures. These provide ample resources, but programming them is far from straightforward. P2G is designed for the interdependence, cyclic nature, and temporal dependencies of multimedia workloads that existing approaches fail to address. As an outreach activity, we spoke on the power of GPU programming at The Gathering, the world's second largest LAN party, and received the honour "Exceptional Master Course 2009" for our course "Programming heterogeneous multi-core architectures".

Art.on.Wires is the start of a laboratory-style workshop series that combines elements of scientific workshops with interactive exploration and artistic performance. Creative artists and researchers can explore technology for live, interactive and mixed-reality spaces. Art.on.Wires 2010 was a four-day event organized in Oslo that will be held again in 2011. It was a collaboration with FourMS (UiO) and the Nordic project SUM (Systematic Understanding of Music).

Other activities were continued successfully. The Verdione project saw three networked musical rehearsals and performances at the Conservatory of Music in Tromsø, where remotely and locally present actors shared a stage. These tests, open to the public as part of the European World Opera Day, confirmed the relevance of our work on latency reduction in video processing when current professional equipment irritates performers with high delays in low light conditions.

MEDIA PERFORMANCE

The Media department investigates end-to-end performance of distributed applications. The goal is to understand the performance of all links in the communication chain of multimedia applications, ranging from programmability to subjective quality.

Our 3D video capturing activity for Verdione was brought forward by Deepak Dwarakanath's four-month stay at A*STAR in Singapore. Besides knowledge transfer in 3D capturing, we agreed on a deeper future cooperation.

The Media department's work on thin TCP streams, initiated in 2006, resulted in the release of TCP Thin Stream support with the 2.6.34 version of the Linux kernel in May 2010. This reduces the latency of interactive applications such as stock trading, online games and PC remote control. The thin stream extensions also led to formal cooperation with Funcom AS on other research topics. Our cooperation with Microsoft, Netview and UiT resulted in vESP, which modifies a commercial enterprise search engine by video into traditional query results. Users can combine subsets of search results freely into new, customized video of events. We demonstrated the efficiency of vESP in a user study conducted jointly with Microsoft. User studies also played a major role in our advances in subjective assessment of visual quality. The Media department cooperates with UiO, NTNU, Bang&Olufsen, the TUs Ilmenau and Tampere in this field. We were able to show that visual quality fluctuation in scalable video can be predicted by a psycho-visual model, but that display devices and video content characteristics must be taken into account.



BIOMEDICAL COMPUTING

The BioComp department forms the core of a Norwegian Center of Excellence, Center for Biomedical Computing, hosted by Simula. The vision of the center is to develop and apply novel simulation technologies to reach new understanding of complex physical processes affecting human health. We aim in particular to increase the understanding of flows in the human body and thereby improve clinical treatment.

This research is strongly multi-disciplinary, with teams of experts in physical modelling, mathematics, numerical methods, scientific software development, bioengineering, medical research, and clinical treatment.

An estimated 1–6% of the population develops aneurysms in a blood-vessel system at the bottom of the brain (aneurysms are balloon-shaped structures at the vessel wall). Aneurysm rupture causes stroke, resulting in death or serious disability. Because the probability of rupture is only 1% per year and aneurysm surgery is risky and complicated, the neurosurgeon's dilemma is to decide whether a patient should undergo surgery. Through computer simulations of blood flow, we attempt to define criteria that may help to identify which aneurysms are likely to rupture. Recently, we found localized turbulence in the vicinity of aneurysms, both experimentally and computationally. The rapid oscillations of turbulent flow may severely impact cells in the vessel walls, but this effect is not yet understood.

Another poorly understood clinical problem concerns cyst formation in the spinal cord, with associated symptoms of motor dysfunction, headache, and double vision. Cyst

formation seems to be correlated with abnormal flow of cerebrospinal fluid (CSF) between the brain and the spinal canal. Abnormal CSF flow is caused by abnormal brain anatomy and induces abnormal deformations inside the porous spinal cord, which may cause formation and growth of cysts. To examine this problem we use computer models to reach a new level of understanding of the underlying physical processes. The goal is to develop flow indicators that can help radiologists to

adjust their imaging procedures to obtain more precise diagnostics. This advance is much needed, as the only effective treatment known today is risky brain surgery.

Making computer models of blood and CSF flow is challenging due to patient-specific complex geometries (anatomy), uncertain measurements of patient-specific flow into the physical system being modelled, occurrence of localized turbulence, and interactions between the flow and the deformable vessel walls or spinal cord. Our aim is to develop robust mathematical solution methods that break down less often than the common methods in use today. A central focus of our research is to create tools that greatly simplify the development of robust, flexible, and tailored simulation software. To this end, we are deeply engaged in the open source FEniCS project (fenicsproject.org), a collaborative effort among several institutions, including Cambridge University, University of Chicago, Texas Tech University, KTH in Stockholm, and Simula. FEniCS is unique in that it combines the normally contradictory features of simplicity of use, generality in application, efficiency of computation, and increased reliability of results.

THE BEST DEPARTMENT

Professor Magne Jørgensen



BETTER ESTIMATION OF SOFTWARE TASKS

In 2010, the department delivered both basic and applied research results. Together with the Department of Psychology at the University of Oslo, the project has achieved results leading to better understanding of the cognitive processes involved when people estimate the work effort needed to complete tasks. This includes results on how and why the format of how people request an estimate impacts the estimated work effort and results on how the psychological distance to a work-task is related to our perception of work-hours. Together with researchers at the Department of Education at University of Oslo, the project has produced results on how people interact when estimating in groups. All these results contribute to the goal of constructing a model of the processes involved in judgment-based effort estimation useful for improving estimation processes in software development.

More directly applicable research results have been achieved in collaboration with several national and international software companies. This includes the development of estimation processes that better separate best case and most likely use of effort to complete IT projects. The project discovered an unexpected side effect of extensive risk analyses. While the intended effect of risk analyses is to become more realistic about the work effort required, we found that the opposite sometimes occurs. More risk analysis sometimes lead to more, not less, over-optimism. Through observation of large software projects and experiments, the BEST project has produced results potentially able to improve prioritization of requirements and identification of estimation expertise.

Problems with inaccurate effort estimates in IT projects motivate the research in the BEST (Better Estimation of Software Tasks) department at Simula. The focus of the project is on improvement of judgment-based effort estimation methods, which is the type of estimation method most commonly used in the software industry.

Funding from the Norwegian Research Council has enabled the project to develop a software tool that supports better planning and estimation of software development work. Several of the project's research results, such as those related to release planning, group estimation, and methods for effort uncertainty analysis, have been implemented in this tool.

Offshoring of software development to low-cost countries is increasingly common. The BEST project has completed several studies to better understand the estimation processes and cultural differences among countries. While there are obvious differences in organizational culture, the overall conclusion is that the estimation challenges are to a large extent the same in all studied countries. One of these challenges is the impact on the estimate from irrelevant and misleading information. As an illustration, the project found an average decrease in software companies' effort estimates of about 25% when a task was described as "minor extension" instead of "new functionality". Based on our understanding of how experts' effort estimates are determined, we suggested guidelines for improved estimation processes. One essential element in this area is the removal and neutralization of information known to mislead the estimators.



COMPUTATIONAL GEOSCIENCE

The Norwegian oil and gas industry spends millions of dollars on exploration: locating and measuring the potential of resources around the world. Computational methods, while heavily used in engineering tasks around producing resources, are only now making inroads into exploration research. Several limitations pose problems for computational methods in the industry: the high cost of data collection, the indirect nature of the data collected, and the inability to observe system-evolution.

The CompGeo department is a largely industry-funded research group solving fundamental research questions in geoscience using numerical analysis. The department develops innovative geoscience models and deploys them on basic research questions that are of keen interest to both industry and academia.

Since 2005, Simula has maintained close collaboration with Statoil, formerly Hydro, to address computational problems related to oil and gas exploration. The great majority of fundamental research on geo-scientific topics is funded by Statoil, partly through the Simula School of Research and Innovation's participation as an academic partner in Statoil's VISTA program, and partly through strategic research projects. These basic research activities are paired with technology development conducted by Simula's commercial subsidiary, Kalkulo, under contracts with Statoil. The research is conducted in close interaction with senior personnel at Statoil's research centres and in the business unit for global exploration.

The department conducts research into geodynamic problems and basin dynamic problems using sophisticated parallel computing codes and numerical techniques. The research is aimed understanding plate driving forces, mantle convection, mantle-induced vertical basin movements, as well as modelling the sedimentary processes forming basins. This project is tied closely to basic research questions that interest our industry partner, Statoil, and utilizes software developed for Statoil by Simula's subsidiary, Kalkulo.

Modelling geodynamic processes requires efficient numerical methods and high-performance computing so that sufficient model complexity and spatial and temporal resolution can be achieved. In order to meet these demands, the group currently engages in research directed toward parallel computing, the finite element method, and discrete and continuous model representations.

Uncertainty in numerical models stems from not only from the numerical method employed, but from the model parameters. The group therefore conducts research into inverse methods of parameter estimation, efficient methods of parameter selection, and model dependence on parameters, through stochastic analysis. The overlap with the interest in uncertainty at the Centre for Biomedical Computing at Simula allows for cross-fertilization of ideas and models.

DOCTORATES & MASTER'S DEGREES SIMULA 2010

MASTER'S*	SUPERVISORS	THESES
Jacobsen, Espen	Carsten Griwodz	Investigating the limitations of video stream scheduling in the Internet
Khan, Farah	Jo Hannay, Magne Jørgensen	Erfaringer med kontraktstandarder i store og smidige IT-prosjekter
Blechingberg, Anna Lovisa	Kent André Mardal, A. Stray-Pedersen (IFM), Joakim Sundnes	On the Shaking Baby Syndrome
Arnesen, Arne Jørgen	Kent-Andre Mardal	Comparison of Finite Element Methods for the Navier-Stokes Equations
Jansen, Karsten	Lionel Claude Briand	Instrumentation and transformation of Java source code for automated testing with search-based testing algorithms
Wam, Martin	Pål Halvorsen	Distributed Computing with the Cell Broadband Engine
Kehlet, Benjamin Dam	Anders Logg	Analysis and implementation of high-precision finite element methods for ordinary differential equations with application to the Lorenz system
Lin, Wenjing	Xing Cai	A comparison of existing Python modules of MPI
Wangberg, Ruben Drøsdal	Dag Sjøberg (IfI), Aiko F. Yamashita	A Literature Review on Code Smells and Refactoring
Bergene, Else-Merete	Martin Reimers (IfI), Glenn Terje Lines	Sammenligning av numeriske metoder for monodomene- og bidomenemodellen
Johansen, Tor Anders	Paal Einar Engelstad	Identity management in future personalized service environments
Frøysadal, Jørgen Bentseng	Stein Gjessing	WirelessHART
Tegelsrud, Håvard	Stein Gjessing	WirelessHART
Hagen, Mathias	Tor Skeie	Empirisk undersøkelse av mobil løsning for ERP-systemer
Dahl, Christoffer	Roar Fjellheim (IfI) Lionel Briand	Evolutionary Algorithms for Planning in an Autonomous Agent
DOCTORATES*		
Al-Khayat, Omar	Hans Petter Langtangen, Are Magnus Bruaset	Mesoscale Modeling of Particle Flow

IfI = Department of Informatics, University of Oslo

IFM = Institute of Forensic Medicine, University of Oslo

* candidates supervised throughout their PhD/MSc projects by researchers at Simula

FINANCIAL STATEMENTS 2010

2009		2010		INCOME STATEMENT		2010		2009	
GROUP				Note	PARENT COMPANY				
99 701 039	108 614 673	OPERATING REVENUES	6	88 652 000	76 126 989				
		OPERATING EXPENSES							
72 572 882	72 031 247	Cost of labour	5	54 548 793	55 860 819				
1 993 824	1 823 535	Ordinary depreciation	3	1 670 411	1 861 520				
28 771 084	27 693 366	Other operating expenses	5,14	29 342 124	23 216 503				
103 337 790	101 548 148	TOTAL OPERATING EXPENSES		85 561 328	80 938 842				
-3 636 751	7 066 525	OPERATING PROFIT		3 090 672	-4 811 853				
		FINANCIAL ITEMS							
614 512	569 589	Other interest income		478 415	343 923				
41 545	25 740	Other financial income		19 901	1 024 059				
19 101	39 948	Other interest expenses		31 160	1 470				
2 617 099	1 511 823	Other financial expenses		22 307	23 390				
-1 980 143	- 956 442	RESULT OF FINANCIAL ITEMS		444 849	1 343 122				
-5 616 894	6 110 083	PROFIT BEFORE TAXES		3 535 521	-3 468 731				
76 059	463 894	TAXES FOR THE YEAR		0	0				
-5 692 953	5 646 189	NET PROFIT		3 535 521	-3 468 731				
-471 379	550 934	Minority Interests		0	0				
-5 221 574	5 095 255	RESULTS AFTER MINORITY INTERESTS		3 535 521	-3 468 731				
		TRANSFERS							
		Transferred to equity		3 535 521	-3 468 731				
				3 535 521	-3 468 731				

2009	2010	BALANCE SHEET		2010	2009
GROUP			Note	PARENT COMPANY	
		TANGIBLE FIXED ASSETS			
		Fixed assets			
2 683 842	1 617 367	Furniture, equipment, etc.	3	1 485 178	2 521 736
2 683 842	1 617 367	Total fixed assets		1 485 178	2 521 736
		Financial fixed assets			
2 431 650	1 566 460	Investments in shares	12	0	0
600 000	250 000	Other receivables		0	0
-	-	Investments in subsidiaries	10	5 319 700	5 319 700
3 031 650	1 816 460	Total financial fixed assets		5 319 700	5 319 700
5 715 492	3 433 827	TOTAL FIXED ASSETS		6 804 878	7 841 436
		CURRENT ASSETS			
		Receiveables			
8 395 582	7 001 337	Accounts receivable		2 463 682	5 375 163
8 136 647	7 192 572	Other receiveables		6 899 158	8 233 296
16 532 229	14 193 909	Total receivables		9 362 840	13 608 459
17 191 949	26 363 509	Bank deposits	9	18 445 187	8 767 212
33 724 178	40 557 418	TOTAL CURRENT ASSETS		27 808 027	22 375 671
39 439 670	43 991 245	TOTAL ASSETS		34 612 905	30 217 107
		EQUITY			
		Paid-in equity			
1 500 000	1 200 000	Share capital	7,8	1 200 000	1 500 000
1 500 000	1 200 000	Total paid-in capital		1 200 000	1 500 000
		Earned equity			
6 983 968	11 413 223	Other equity	8	6 199 607	3 330 085
1 290 800	1 841 734	Minority Interests	8	0	0
8 274 768	13 254 957	Total earned equity		6 199 607	3 330 085
9 774 768	14 454 957	TOTAL EQUITY		7 399 607	4 830 085
		LIABILITIES			
		Avsetning for forpliktelser			
0	286 767	Utsatt skatt	13	0	0
0	286 767	Total avsetning for forpliktelser		0	0
		Short-term liabilities			
4 162 012	5 364 330	Accounts payable		8 907 191	7 157 257
678 430	177 127	Tax payable	13	0	0
5 886 290	4 330 814	Duties payable		2 405 763	3 143 853
18 938 170	19 377 250	Other short-term liabilities		15 900 344	15 085 912
29 664 902	29 249 521	Total short-term liabilities		27 213 298	25 387 022
29 664 902	29 249 521	TOTAL LIABILITIES		27 213 298	25 387 022
39 439 670	43 991 245	TOTAL EQUITY AND LIABILITIES		34 612 905	30 217 107

FINANCIAL STATEMENTS 2010

NOTE 1 - ACCOUNTING PRINCIPLES

The financial statements have been prepared pursuant to the regulations in the Norwegian Accounting Act of 1998. The statements have been drawn up in accordance with Norwegian accounting standards.

The main rule for the valuation and classification of assets and liabilities

Assets intended for permanent ownership or use are classified as tangible fixed assets. Other assets are classified as current assets. Receivables to be paid back within one year are always classified as current assets. The same criteria are applied to the classification of short- and long-term liabilities.

Fixed assets are valued at acquisition cost, but written down to their fair value if the reduction in value is believed to be of a permanent nature. Fixed assets are depreciated systematically over the useful life of the asset. Long-term liabilities are recognised at their nominal values on the date the debt was incurred. Long-term liabilities are not revalued to fair value in response to interest rate fluctuations.

Current assets are valued at cost or fair value, whichever is lower. Current liabilities are recognised at their nominal values on the date the debts were incurred. Current liabilities are not revalued to fair values in response to interest rate fluctuations.

Certain items are valued according to other rules, as explained below.

Foreign currencies

Assets and liabilities in foreign currencies are translated into Norwegian kroner at the mid-rates quoted by Norges Bank on the day of balance sheet recognition.

Tangible fixed assets

Tangible fixed assets are generally depreciated over the expected useful life of the asset. Depreciation is generally distributed on a straight line basis over the expected useful life of the asset.

Receivables

Accounts receivable and other receivables are recorded at nominal amounts less provisions for anticipated losses on bad debts. Provisions for losses are based on individual assessments of the recoverability of each receivable. In addition, if necessary, a general provision is made for anticipated bad debts on other receivables.

Pensions

A straight line earning profile is used to account for pensions and assumptions are made regarding expected salary upon retirement.

Taxes

The company has no tax expenses in the parent company accounts since its activities are not considered taxable.

NOTE 2 - FINANCIAL MARKET RISK

The company has little exposure to financial market risk.

NOTE 3 - FIXED ASSETS

Simula Research Laboratory AS

	Computer equipment	Furniture/fittings, equipment, etc.	Total
Acquisition cost at 1 Jan.	4 993 007	7 664 766	12 657 773
Acquired 2010	556 571	77 283	633 853
Disposals 2010	358 229	692 630	1 050 859
Acquisition cost at 31 Dec.	5 191 349	7 049 419	12 240 768
Acc. depreciation	4 145 883	6 609 707	10 755 590
Book value at 31 Dec.	1 045 466	439 712	1 485 178
Ordinary depreciation	991 425	678 986	1 670 411
Depreciation in %	20–50%	20–33%	

NOTES TO THE ACCOUNTS

Simula Research Laboratory AS – Group

	Computer equipment	Furniture/fittings, equipment, etc.	Total
Acquisition cost at 1 Jan.	6 590 167	7 664 766	14 254 933
Acquisitions 2010	679 777	77 283	757 060
Disposals 2010	382 791	692 630	1 075 421
Acquisition cost at 31 Dec.	6 887 153	7 049 419	13 936 572
Acc. depreciation	5 709 498	6 609 707	12 319 205
Book value at 31 Dec.	1 177 655	439 712	1 617 367
Ordinary depreciation	1 144 549	678 986	1 823 535
Depreciation in %	20–50%	20–33%	

NOTE 4 - PENSION COSTS

The Group has a pension plan that covers a total of 36 individuals in the parent company and 90 individuals in the Group. The pension plan provides defined future benefits. Pension benefits depend on the individual employee's number of years of service, salary level upon retirement age, and social security benefits. The collective pension agreement is funded by building up pension funds under the auspices of the Norwegian Public Service Pension Fund. The company has taken out a pension insurance for the managing director expensed at 261 712.

NOTE 5 - COST OF LABOUR, NUMBER OF EMPLOYEES, REMUNERATION, ETC.

	Simula Research Laboratory AS		Simula Research Laboratory AS Group	
Cost of labour	2010	2009	2010	2009
Wages	26 909 111	30 333 002	56 610 701	58 339 479
National insurance payment	4 346 665	4 462 091	8 607 651	8 693 441
Pension expenses	2 269 967	1 825 164	3 679 919	2 998 600
Other benefits	3 088 998	2 826 157	3 284 437	2 929 602
SkatteFUNN	-	-	-151 460	-388 240
Contribution, cost of labour SSRI	17 934 052	16 414 405	-	-
Total	54 548 793	55 860 819	72 031 247	72 572 882
Average man-years of labour	40,3	43,6	92,3	101,2

Benefits to top management

	Simula Research Laboratory AS	Simula Research Laboratory Group
Director	1 365 579	-
Other remuneration, director	199 580	-
Pension expenses, director	331 107	-
The Board of Directors	242 000	344 667
Auditor	52 800	118 600
Others auditing services	34 200	54 700

FINANCIAL STATEMENTS 2010

NOTE 6 - OPERATING REVENUE

	Simula Research Laboratory AS	Simula Research Laboratory Group
Research funding	47 500 000	55 000 000
Subsidies from the Research Council of Norway and the EU	41 089 194	42 389 194
Services for the subsidiary	6 600	-
Other income	56 206	11 225 479

NOTE 7 - SHARE CAPITAL AND OWNERSHIP STRUCTURE

The company's share capital consists of 800 shares with a nominal value of NOK 1 500 per share.

The shares are owned by:

The Norwegian state /repr. by the Ministry of Research and Education

NOTE 8 - EQUITY

Simula Research Laboratory AS

	Share capital	Other equity	Total equity
Equity at 1 Jan.	1 500 000	3 330 085	4 830 085
Equity reduction	-300 000	-666 000	-966 000
Net profit for the year	-	3 535 522	3 535 522
Equity at 31 Dec.	1 200 000	6 199 607	7 399 607

Simula Research Laboratory AS - Group

	Share capital	Other equity	Minority Interests	Total equity
Equity at 1 Jan.	1 500 000	6 983 968	1 290 800	9 774 768
Equity reduction	-300 000	-666 000	-	-966 000
Net profit for the year	-	5 095 255	550 934	5 646 189
Equity at 31 Dec.	1 200 000	11 413 223	1 841 734	14 454 957

NOTE 9 - BANK DEPOSITS

The company had locked-in bank deposits of NOK 2 104 049 in connection with signed leases and NOK 1 330 479 in restricted deposits relating to withholding taxes. The Group's tied-up withholding tax aggregated NOK 2 414 129.

NOTES TO THE ACCOUNTS

NOTE 10 - SUBSIDIARIES

	Main office	Stake at 31 Dec.	Book Value	Company's equity at 31 Dec.	Company's profit/loss '10
Simula Innovation AS	Fornebu	100 %	4 356 300	4 449 016	-474 427
Kalkulo AS	Fornebu	100 %	406 000	3 763 903	1 340 326
SSRI AS	Fornebu	55.74%	557 400	4 162 132	1 244 767

NOTE 11 - OUTSTANDING ACCOUNTS/INTRA-GROUP TRANSACTIONS

	2009	2010
Claims against Simula Innovation AS	3 795 512	1 558 684
Debt to Simula Innovation AS	352 729	504 499
Claims against Kalkulo AS	397 683	308 628
Debt to Kalkulo AS	220 580	199 841
Claims against SSRI AS	623 483	181 288
Debt to SSRI AS	3 112 818	4 738 292
Subidies to Simula Innovation AS	2 373 000	1 500 000
Subsidies to SSRI AS	16 414 405	17 934 052
Acquisition of services etc. to Simula Innovation AS	124 773	283 014
Acquisition of services etc. to Kalkulo AS	751 785	864 779
Sale of services etc. to Simula Innovation AS	665 161	1 789 482
Sale of services etc. to Kalkulo AS	1 444 185	1 481 950
Sale of services etc. to SSRI AS	2 323 000	3 374 365

NOTE 12 - SHARES

	Number	Nominal value per share	Book Value
Insilicomed inc, USA	131 945	USD 1.80	1 220 755
Resiliens AS	32 600	1.0	35 486
World Besides AS	540 000	1.0	-
Symphonical AS	545 528	0.10	270 151
Lividi AS	32 550	1.0	34 758
Testify AS	5 000	1.0	5 310
			1 566 460

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NOTE 13 - TAX

Simula Research Laboratory AS does not engage in taxable activities. The subsidiary Simula School of Research and Innovation AS does not engage in taxable activities. The subsidiaries Simula Innovation AS and Kalkulo AS are liable to taxation.

Taxation for the year consists of:

Tax payable	177 127
Change postponed tax	286 767
Net total taxes	463 894

Tax payable for the year is calculated as follows:

Group contribution paid	-226 605
Permanent differences	1 229 093
Change in temporary differences	-369 890
Base tax payable	632 598
Tax payable on the profit for the year	177 127

Postponed tax advantage

	1 Jan	31 Dec
Fixed assets	-7 405	-3 515
Receivables	-2 662 576	-
Losses carried forward	-	- 508 312
Other differences	1 920 000	1 536 000
Net postponed tax advantage	-749 981	1 024 173
Posponed tax/tax advantage, 28%	209 994	286 767

NOTE 14 - LEASES

The company has signed leases for four photocopiers. The leases will all expire in 2013. The company also has three leases for coffee machines which will expire in 2013 and an agreement for car leasing which will expire in 2011. NOK 415 479 were expensed for these leases in 2010.

NOTES TO THE ACCOUNTS

CASH FLOW STATEMENT

Simula Research Laboratory AS Group			Simula Research Laboratory AS	
2009	2010		2010	2009
		Cash flow from operating activities:		
- 5 692 952	5 646 189	Net profit for the year	3 535 521	- 3 466 731
1 993 824	1 823 535	Depreciation expense	1 670 411	1 861 520
-	-	Write downs on share investment	-	-
- 6 567 335	5 626 859	Change in receivables	4 245 619	- 6 781 952
6 859 107	3 953 922	Change in short-term liabilities	1 826 276	5 613 669
- 3 407 356	9 142 662	Net cash flow from operating activities	11 277 827	- 2 773 494
		Cash flow from financing activities:		
- 543 060	- 757 059	Investments in production equipment, net	- 633 853	- 367 211
14 250	-5.310	Investments in shares	-	-
- 528 810	- 762 369	Net cash flow from financing activities	- 633 853	- 367 211
		Cash flow from financing activities:		
5 440 615	-	Corrections equity	-	3 042 293
-	- 966 000	Partial liquidation	- 966 000	-
-	1 470 500	Write down shares/receivalbes	-	-
-	286 767	Change deferred taxes	-	-
5 440 615	791 267	Net cash flow from financing activities	- 966 000	3 042 293
1 504 448	9 171 560	Net cash flow for the period	9 677 974	- 98 412
15 687 502	17 191 949	Cash reserves, 1 January	8 767 213	8 865 625
17 191 949	26 363 509	Cash reserves, 31 December	18 445 187	8 767 212

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- [135] O. Al-Khayat. A multiscale lumped particle modeling framework for the simulation of turbidity currents. In *7th EGU General Assembly*, vol. 12. Copernicus GmbH, 2010.

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- [136] X. Cai, D. Unat, and S. Baden. Detailed numerical analyses of the aliev-panfilov model on gpgpu. Talk at PARA2010 Conference, 2010.
- [137] S. K. Dahl and B. Skallerud. Effect of mitral valve shape on flow dynamics during left ventricular contraction. World Congress in Biomechanics, Singapore, 2010.
- [138] S. Baden. Technological disruption: Opportunities for change. International FEniCS'10 workshop, KTH, Stockholm, 2010.
- [139] S. Glimsdal, C. B. Harbitz, G. K. Pedersen, R. E. Bredesen, A. Jensen, and F. Løvholt. Propagation and run-up of rockslide generated tsunamis in complex fjord systems. EGU General Assembly, Geophysical Research Abstracts (European Geoscience Union), Copernicus, GmbH, 2010.
- [140] M. Maleckar. Right through the heart: Perspectives and problems. CBC Workshop, Right Through the Heart: Snapshots of Current and Future Research in Cardiac Modeling, 2010.
- [141] A. Blechingberg. Computational simulations of the shaken baby syndrom - history and challenges. AC/DC seminar series, 2010.
- [142] W. L. Guay, B. Bogdanski, S.-A. Reinemo, and O. Lysne. Vftree- fat tree routing with virtual lanes in InfiniBand. Poster, HiPEAC ACACES, Barcelona, Spain, 2010.
- [143] M. Jørgensen. Hvordan forbedre estimering av tid og kostnader i it-prosjekter. Presentation at TrygVesta seminar, 2010.
- [144] M. Jørgensen. How to become an excellent it-research institute (with substantial impact on the it-intensive industry). Invited presentation at the Omar Dengo fundacion seminar: "Research, Software Development, and Strategic Investments", Costa Rica, 2010.
- [145] M. Jørgensen. How to become an excellent IT-research institute. Seminar at University of Auckland, 2010.
- [146] M. Jørgensen. Jeg ser det når jeg tror det! Moter, retorikk og systemutviklingsmetoder. Seminar for Telenor, 2010.
- [147] M. Jørgensen. Identification and management of IT-projects with high risk of cost overrun. Presentation at Prepare's seminar for the IT-industry (and at an internal Bearing Point seminar), 2010.
- [148] K. Børte. Teamwork in software effort estimation: an analysis of challenges faced by software professionals when using an analogy-based top-down estimation approach. Presentation held at Nordic ISCAR, Helsinki May 23-25, 2010.
- [149] W. Wei. Parallel programming, OpenMP. CBC Lecture on Parallel Programming, OpenMP, March 17, 2010.
- [150] S. Wall. Basic electromechanical simulations. CBC Seminar Series on Computational Cardiac Modeling, 2010.
- [151] D. Unat and S. Baden. Introduction to programming a GPU with CUDA and a case study: Accelerating stencil computation with gpus, 2010.
- [152] D. Unat. Accelerating finite difference method on graphic processors (gpus). CBC Seminar on GPU Programming and Computing - May 4, 2010.
- [153] A. Massing. Convergence theory for adaptive finite elements. AC/DC seminar series, 2010.
- [154] A. Logg. Implementation of FEM assembling in DOLFIN. AC/DC seminar series, 2010.
- [155] B. Kehlet. Analysis and implementation of high-precision finite element methods for ordinary differential equations with application to the lorenz system. AC/DC seminar series, 2010.
- [156] H. K. Stensland, H. Espeland, C. Griwodz, and P. Halvorsen. Temming av multikjerneprosessorer – fordeler og utfordringer. The Gathering World & Pegasus, 2010.
- [157] A. Petlund, P. Halvorsen, and C. Griwodz. Latency can kill - defeat the lag! The Gathering World & Pegasus, 2010.
- [158] A. Schroll. Scientific computing - the (he)art of modern sciences. Forsknings Dag, SDU, 2010.
- [159] H. Narayanan. An automated computational framework for hyperelasticity. Talk at the Fourth European Conference on Computational Mechanics, Paris, France, 2010.
- [160] A. Wahlberg. Towards a virtual lung. International FEniCS'10 workshop, KTH, Stockholm, 2010.
- [161] F. Løvholt, S. Bazin, R. E. Bredesen, C. B. Harbitz, D. Kohn, and H. Bungum. Stochastic variation of tsunami run-ups due to heterogenous slip on reverse faults. Poster at the 7th EGU General Assembly, Geophysical Research Abstracts (European Geoscience Union), Copernicus, 2010.
- [162] J. E. Hannay. Expertise in planning & estimation: What is it and can one improve it? Talk given at the 2010 PREPARE Industry Seminar, October 15, 2010, 2010.
- [163] M. E. Rognes. Automated goal-oriented error control. 8th International Conference of Numerical Analysis and Applied Mathematics (ICNAAM), Rhodes, Greece, September 19-25, 2010.
- [164] A. Logg and M. E. Rognes. Automated goal-oriented error control. China-Norway-Sweden Workshop on Computational Mathematics, 2010.
- [165] A. Wahlberg. Meshing the human lung. AC/DC seminar series, 2010.

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- [166] K. Valen-Sendstad. Presence of turbulence in intracranial mca aneurysms. CBC Workshop on Aerosols: Dispersion, Transport and Effects, Simula, November 10, 2010.
- [167] K. Valen-Sendstad. A note on the efficiency and accuracy of some common finite element schemes for the incompressible Navier-Stokes equations. AC/DC seminar series, 2010.
- [168] A. B. Kanten. The effect of construal level on prediction of task duration. Paper presented at the 12th European social cognition network transfer of knowledge conference, Gothenburg, Sweden., 2010.
- [169] S. K. Dahl. Mitralklaffens form i systolen. Presented at Rikshospitalet University Hospital, Oslo, Norway, March, 2010.
- [170] G. R. Bergersen. Inferring programming skill from programming performance: Construction and validation of a rasch-based assessment instrument. Invited lecture, 2010.
- [171] M. Jørgensen. "Det meste av kommunikasjon er ikke-verbal" og annen misbruk av forskning. Article in Computerworld Norway, 2010.
- [172] M. Jørgensen. Små gaver er også egnet til å påvirke. Article in Computerworld Norway, 2010.
- [173] M. Jørgensen. Jeg vet ikke hva et "story point" er, men det virker bra ... Presentation at DnD Software conference, 2010.
- [174] M. Jørgensen. Research quality. What is it? How to achieve it? Presentation at Telenor seminar, 2010.
- [175] M. Jørgensen. Ønsketenkning. Article in Computerworld Norway, 2010.
- [176] M. Jørgensen. Offshoring: Vær en god kunde – og du vil lykkes. Article in Dagens Næringsliv (Media Planet's special issue on outsourcing), 2010.
- [177] M. Jørgensen. How we know what isn't so. Common myths in business, health and daily life. Why do we believe in myths? Presentation at IT-Fornebu seminar, 2010.
- [178] M. Jørgensen. Hvordan estimering av ideell tid gjør deg mer realistisk (med innlagt nm i estimering). Presentation at JavaZone, 2010.
- [179] M. Jørgensen. Hvem passer offshoring for? Hva er viktig for å lykkes? Presentation at CIO Forum (IDG), 2010.
- [180] M. Jørgensen. Estimering av IT-prosjekter: Hva vet vi? Hvordan bli bedre? Presentation at Computas seminar, 2010.
- [181] B. F. Nielsen, O. M. Lysaker, and P. Grøttum. Theoretical and practical aspects of the inverse ischemia problem. Presented at Karlsruhe Institute of Technology, Germany, 2010.
- [182] A. Logg. Fenics: Automated scientific computing. 8th International Conference of Numerical Analysis and Applied Mathematics (ICNAAM), Rhodes, Greece, September 19-25, 2010.
- [183] O. Skavhaug. Using Python for scientific computing. CBC Seminar on advanced use of Python programming language, 2010.
- [184] K.-H. Støverud, K.-A. Mardal, V. Haughton, and H. P. Langtangen. Cerebrospinal fluid (CSF) - oscillating flow and pressure. CBC Workshop on Aerosols: Dispersion, Transport and Effects, Simula, November 10, 2010.
- [185] K.-H. Støverud, K.-A. Mardal, V. Haughton, and H. P. Langtangen. Cerebrospinal fluid (CSF) - oscillating flow and pressure. Selected Topics Seminar IWS Stuttgart, 2010.
- [186] K.-H. Støverud, K.-A. Mardal, V. Haughton, and H. P. Langtangen. CSF hydrodynamic in patients with syringomyelia and Chiari I malformations. Annual NUPUS meeting in Freudenstadt, 2010.
- [187] K.-A. Mardal and B. F. Nielsen. An operator theoretical approach to preconditioning optimality systems. Talk at European Multi-Grid Conference, EMG, 2010, 2010.
- [188] S. Baden. Gpus: Supercomputers for all, opportunities and folklore. Talk at Section for Scientific Computing, Technical University of Denmark, 2010.
- [189] S. Baden. Gpus: Supercomputers for all, opportunities and folklore. Talk at PDC/GSC, KTH, Stockholm, 2010.
- [190] O. Al-Khayat. A lumped particle modeling framework for the transport of particles. Talk at CBC workshop on Tsunami Modelling, 2010.
- [191] O. Al-Khayat. A multiscale lumped particle modeling framework for the simulation of turbidity currents. Poster at the 7th EGU General Assembly, vol 12, Vienna, 2010.
- [192] A. Logg. Nya verktyg, nya möjligheter. Sveriges matematiklärarförening (SMaL), 2010.
- [193] A. Logg. FEniCS 1.0 (?). FEniCS'10, KTH, Stockholm, 2010.
- [194] M. Jørgensen. Moter, myter og overforenklinger i IT-bransjen. Keynote at Norsk Informatikk-konferanse, 2010.
- [195] M. E. Rognes and A. Logg. Automated goal-oriented error control for stationary variational problems. Talk at FEniCS'10, KTH Royal Institute of Technology, Stockholm, 2010.
- [196] M. E. Rognes and A. Logg. Automated goal-oriented error control for stationary variational problems. Presentation at the European Finite Element Fair 2010, University of Warwick, 2010.

- [197] W. Wei and X. Cai. Openmp: an easy parallel approach for scientific computing on multi-core architecture. A short course respectively given at Simula in March and University of Oslo in May, 2010.
- [198] D. Unat, X. Cai, and S. Baden. Optimizing the aliev-panfilov model of cardiac excitation on heterogeneous systems. Talk at Para 2010: State of the Art in Scientific and Parallel Computing in Reykjavik on June 6-9, 2010, 2010.
- [199] H. Narayanan. An adaptive, error-controlled scheme for the Navier-Stokes equations with applications to biomedical flow. Talk at FEniCS'10, Stockholm, Sweden., 2010.
- [200] M. Jørgensen. Hva skjer når budsjettet eller leveransedato presses? Article in Computerworld Norway, 2010.
- [201] M. Jørgensen. Vår medfødte tallforståelse. Article in Computerworld Norway, 2010.
- [202] M. Jørgensen. Blir vi mer og mer middelmådige? Article in Computerworld Norway, 2010.
- [203] M. Jørgensen. The economic benefits of publicly funded it-research. How research and education on software engineering can contribute to costa rica's ICT capability. Invited presentation at the Omar Dengo fundacion seminar: "Software Engineering and Emerging Markets", Costa Rica, 2010.
- [204] M. Jørgensen. Software development effort estimation: Why it fails and how to improve it. Presentations at seminars at Orient, VietSoft and IMT, Vietnam, 2010.
- [205] M. Jørgensen. Software development effort estimation: Why it fails and how to improve it. Seminar for the IT-industry in Auckland, organized by University of Auckland, 2010.
- [206] M. Jørgensen. The value of empirical software engineering research. Presentation at Chalmers University, 2010.
- [207] H. C. Bender, A. Thurmond, J. Skogseid, and S. R. Clark. Microplate modeling of the Afar Depression using 4D lithospheric model (4dIm) and splates: Implications for development of plate boundaries. Talk given at Geological Society of America, 2010.
- [208] H. Narayanan. What is cbc.twist? Talk at a CBC workshop, Oslo, Norway., 2010.
- [209] K. Selim. An adaptive finite element method for fluid structure-interaction problems. Talk at FEniCS'10, 2010.
- [210] K.-A. Mardal. CSF strømning i forbindelse med chiari malformasjon og syringomyelia. CBC Workshop on Clinical Issues Related to the Cerebrospinal Fluid, 2010.
- [211] D. Unat. Revisiting finite element matrix assembly. AC/DC seminar series, 2010.
- [212] K. Selim. A posteriori error analysis of adaptive finite element methods for fluid-structure interaction. AC/DC seminar series, 2010.
- [213] A. Massing. Nitsche's method on overlapping meshes in 3D. AC/DC seminar series, 2010.
- [214] H. P. Langtangen. Computational modeling of huge tsunamis from asteroid impacts. Computational Geoscience seminar, 2010.
- [215] B. Kehlet. Meshbuilder brainstorming. AC/DC seminar series, 2010.
- [216] V. Haughton. On cerebrospinal fluid flow. CBC Workshop on Cerebrospinal Fluid Flow in the Brain and Spinal Canal - Clinical, Experimental and Mathematical Models and Problems, Simula, May 28, 2010.
- [217] X. Cai. Parallel programming using Python. CBC Seminar on advanced use of Python programming language, 2010.
- [218] K.-H. Støverud, K.-A. Mardal, and H. P. Langtangen. From a physical problem to computer simulations. CBC Workshop on Cerebrospinal Fluid Flow in the Brain and Spinal Canal - Clinical, Experimental and Mathematical Models and Problems, Simula, May 28, 2010.
- [219] M. E. Rognes and A. Logg. Automated goal-oriented error control with applications to fluid flow. Talk at CBC Workshop on Cerebral Blood Flow and Stroke - Clinical, Experimental and Mathematical Models and Problems, 2010.
- [220] M. E. Rognes and A. Logg. A framework for automated goal-oriented error control. Talk at BIT 50 - Trends in Numerical Computing, 2010.
- [221] A. F. Hansen. Business models that work for n-play services over multilink networks. MARCH first international workshop, 2010.
- [222] A. Logg. Automated scientific computing. 23rd Chemnitz FEM Symposium, 2010.
- [223] A. Logg. Automated scientific computing. Docentföreläsning, Chalmers University of Technology, 2010.
- [224] M. E. Rognes and A. Logg. Automated goal-oriented error control with applications to nonlinear elasticity. Talk at DSPDEs 2010 - Emerging Topics in Dynamical Systems and Partial Differential Equations, Barcelona, 2010.
- [225] S.-A. Reinemo, E. G. Gran, M. Eimot, T. Skeie, O. Lysne, L. P. Huse, and G. Shainer. First experiences with congestion control in InfiniBand hardware. Invited talk at the HPC Advisory Council Switzerland Workshop 2010, 2010.
- [226] B. Kehlet and A. Logg. A reference solution for the lorenz system on $[0, 1000]$. 8th International Conference of Numerical Analysis and Applied Mathematics (ICNAAM), Rhodes, Greece, September 19-25, 2010.



- *by thinking constantly about it*

*Isaac Newton was once asked how he ever came up with the law of gravity, and he answered: "By thinking constantly about it"

