Centre for Advanced Study
at the Norwegian Academy of Science and Letters

Annual

Report

2002

CAS
OSLO

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Centre for Advanced Study
at the Norwegian Academy of Science and Letters

Annual Report 2002

1. Administrative matters

On 1 August 2002 the Centre changed its Norwegian name from *Senter for høyere studier* to *Senter for grunnforskning ved Det Norske Videnskaps-Akademi*. Its English name (Centre for Advanced Study at the Norwegian Academy of Science and Letters) was not changed.

The Centre is a foundation and it was established by the Norwegian Academy of Science and Letters (NASL) in 1989. Its activities commenced in full from 1992. Its purpose is to promote basic research and interdisciplinary theoretical work on the highest academic level.

The principal governing body of the Centre is the *Board*. Until 1 July 2002 the Centre also had a *Council*. At the meeting of the Board on 11 June 2002 a resolution was passed to abolish the Council.

The Operating Fund at the Centre for Advanced Study was established in 1993. Its purpose is to contribute to the running of the Centre. This fund is administered by the Board of the Centre.

1.1   The Council

Until it was abolished the Council was composed of the following members:

- Rector Kirsti Koch Christensen, University of Bergen (chair)
- Rector Kaare R. Norum, University of Oslo
- Rector Tove Bull, University of Tromsø
- Rector Emil Spjøtvoll, Norwegian University of Science and Technology, Trondheim
- Professor Inger Moen, President of the Norwegian Academy of Science and Letters, Oslo
- Arne Bjørlykke, President of the Norwegian Academy of Technology and Science, Trondheim
- Ranveig Frøiland, Member of the Storting and leader of its Standing Committee on the Church, Education and Research
- Tore Li, Head of Department, Confederation of Norwegian Employers
- Per Gunnar Olsen, First Secretary, Norwegian Federation of Trade Unions
- Professor Roy H. Gabrielsen, Executive Board of the Norwegian Research Council

The background to the abolition of the Council was that the need for such a body no longer existed. Prior to the resolution to abolish the Council, affected parties, including sitting members of the Council and the bodies appointing the Council, were given the opportunity to express their views on the matter. There were no strong objections. The abolition of the Council did not require any amendment to the Memorandum of Association.

The Council had no meetings in 2002.

1.2   The Board

The composition of the Board is regulated by Article 4 of the Memorandum of Association, in which the relevant provisions subsequent to the change that was made in 2001 read as follows:

"The Board of the Norwegian Academy of Science and Letters, and the Norwegian Universities Council each appoint two members with alternates to the Board of the Centre. In agreement with the Universities Council the Academy appoints one additional member who shall be the chairman of the Board, and it appoints the latter member's alternate. … The State nominates the sixth member of the Board. In agreement with the Universities Council the Academy appoints one of the other members to be vice-chairman of the Board. … The Board of the Norwegian Academy of Science and Letters has the right to appoint one of its members to serve as an observer on the Board of the Centre for Advanced Study."

In the year 2002 the Board was composed of the following members:
- Professor Aanund Hylland, University of Oslo (chairman) - NASL
- Professor Jan Fridthjof Bernt, University of Bergen (vice-chairman) - NASL
- Professor Bjørn Tysdahl, University of Oslo - NASL
- Professor Tore O. Vorren, University of Tromsø - Universities and Colleges Council
- Professor Kathrine Skretting, Norwegian University of Science and Technology - Universities and Colleges Council
- County Governor Ann-Kristin Olsen, County of Vest-Agder - The State/Research Council
- The Academy's observer: Professor Reidun Sirevåg, Secretary General

Alternates:
- Professor Ragni Piene, University of Oslo - NASL (for Hylland)
- Professor Erling Eide, University of Oslo - NASL (for Bernt)
- Professor Sølvi Sogner, University of Oslo - NASL (for Tysdahl)
- Professor Hanna Mustaparta, Norwegian University of Science and Technology - Universities and Colleges Council (for Vorren)
- Professor Erik H. Egeberg, University of Tromsø - Universities and Colleges Council (for Skretting)
- County Governor Leif Arne Heløe, County of Troms - The State/Research Council (for Olsen)

The Board had 4 meetings in 2002.

1.3 Location, management and administration

The Centre rents offices in the premises of the Norwegian Academy of Science and Letters at 78 Drammensveien.

The administration consisted of Scientific Director Ole-Jørgen Skog, Office Manager Unn Haaheim Hagen, Senior Executive Officer Maria Sætre and Executive Officer Marit Finnemyhr Strøm. The post for a senior executive officer was established in 2002, and Maria Sætre took up the post in mid August

USIT (the University of Oslo's Centre for Information Technology) was responsible for the running of the computer system and for providing computer support for the researchers. Bjarne Røsjø at Faktotum AS was editor of the Centre's Newsletter. Additional help was provided during certain periods by engaging people on an hourly basis.

1.4 Other matters

The working environment at the Centre is considered to be good, and there is very little absence on account of illness among the staff. There were 16 days of sick leave out of a total of 31/2 man-years in 2002. The Centre's activity does not pollute the external environment.

2. The objectives of the Centre and the work of the Board

Also in the year 2002 the Board saw it as its most important task to work to realise the ambitious objectives that were formulated in 1994:

1 The academic activity at the Centre shall be known to satisfy the highest international standards and thereby contribute to raising the level of basic research in Norway.

2   The academic work of the Centre shall be long-term and independent in nature.

An important element in the work of realising these aims is the recruitment of collaborators who can show evidence of international academic results on the highest level. At the same time the Board wishes to encourage the broadest possible co-operation within the framework of the system of thematic research groups. This form of teamwork appears to be functioning extremely well with the size, the academic weight and the youthful constituents (at post-doctoral level) that each group has. The contact between the three subject groups reinforces both the academic and the social sense of community at the Centre. The subject groups, as they function at the Centre, are unusual in an international context, and many of the leading researchers who have been here, have had extremely positive things to say about this arrangement.

In the first years of its operations the Centre had to manoeuvre within very strict financial limitations. In recent years the situation has improved considerably, firstly as a result of the fact that the support provided for the Centre's running costs was brought together under one item in the budget of the Ministry of Education and Research, and subsequently through a considerable strengthening of the provision under this item. The budgetary increase accorded to the Centre in recent years has made possible a considerable reinforcement both of the provision of services to the visiting researchers and of the direct financial support to the projects. Both factors contribute to making the Centre a more attractive place for outstanding researchers and thereby also to achieving the Centre's aims.

The Centre received an increase in real terms of 2 million kroner in the Norwegian national budget for 2002. This represented a considerable step forward and made possible a badly needed strengthening of the administration in the form of a post for a senior executive officer. Even though the Centre's budgetary limits were somewhat lower than the amounts the Board asked for in its budget proposal, all this is nevertheless a significant movement in the right direction. A new significant step in the same direction came in the national budget passed by the Norwegian Storting for 2003, which entails a new increase in real terms of 2 million kroner. This means that the Centre is now beginning to

approach the level proposed by the Bjørgo Committee in its evaluation report in 1997 (If one index-relates the Bjørgo Committee's proposals to the 2003-krone, the difference between ideals and realities is reduced to roughly 2 million kroner.)

Through an exchange arrangement with the NASL, in the course of 2002 the Centre acquired and equipped one more office in the basement. The new administrative post did not therefore entail any reduction in the number of offices for visiting researchers. The groups have at their disposal a total of 18 offices (i.e. 6 offices for each group), of which some can accommodate more than one researcher. Nevertheless space is rather short at times and a further increase in the number of available offices would have been desirable.

The budget increase in 2002 made it possible to increase the groups' budgets to approximately 2 million kroner each. Seen in relation to the number of man-years this is still a modest sum. As in previous years, however, the agreements with the universities represented considerable additional funding, since visiting researchers from Norwegian universities are paid by their respective universities. The funds made available by the Centre are mainly used to cover project costs and expenses relating to guests from abroad, including accommodation and travel. Until recently resources were much too limited to allow a sufficiently large number of really leading international researchers to be brought to Norway. Nevertheless the financial situation is now more favourable, and the Board will give greater priority to this matter in the years ahead.

The Centre celebrated its 10-year Jubilee in 2002. The Jubilee was marked partly by the publication of a book (CAS Oslo 1992–2002 – Advanced Study in a Norwegian Context), and partly with a Jubilee seminar followed by a banquet in the premises of the Academy. The book provides both an account of the history of the Centre and the ideas in terms of research policy that lay behind its establishment, and a survey of the projects at the Centre during its first 10 years. The editorial committee consisted of Professor Torstein Jøssang, Professor Vigdis Ystad and Professor Ole-Jørgen Skog. The central theme of the Jubilee seminar was the strengthening of the quality of Norwegian basic research. State Secretary Bjørn Haugstad from the Ministry of Education and Research gave a lecture entitled "On the Internationalisation of

Norwegian Research", and Professor Gudmund Hernes recapitulated the pre-history of the Centre under the title "The Centre and the Vision". Professor Rolf Seljelid gave a lecture on "Experiences from the Top Research Programme in Medicine", while Professor Dagfinn Føllesdal rounded off the seminar with his thoughts on "Quality in Norwegian Research" with particular emphasis on what Norway ought to do differently.

3.   Research groups and academic activity

The Board continued its work on quality assurance. High quality and broad composition characterised the research groups that worked here in 2002 (see item 4).

The three groups that started their work in the autumn of the year 2001 continued their projects in the spring of 2002, on the following topics:

- *Non-commutative Phenomena in Mathematics and Theoretical Physics*
  headed by Professor Magnus B. Landstad, Norwegian University of Science and Technology and Professor Stein Arild Strømme, University of Bergen
- *Buddhist Manuscripts in the Schøyen Collection*
  headed by Professor Jens Braarvig, University of Oslo
- *Constitutional Studies – the Constitution as Norm*
  headed by Professor Eivind Smith, University of Oslo

The project entitled "Non-commutative Phenomena in Mathematics and Theoretical Physics" was part of the marking of the 200th anniversary of the birth of Nils Henrik Abel. The group contributed to great activity and co-operation between Norwegian and foreign mathematicians (of both the younger generation and from the established community). The group's work was concerned with non-commutative mathematical structures, which are characterised by the fact that the familiar commutation relation $xy = yx$ is replaced by other types of relations, or disappears altogether. In the fall semester a particular study was made of algebras occurring within wavelets, quantum groups and non-commutative

dynamics. We obtained new results concerning their structures and states. In the spring semester, the group mostly studied two types of non-commutative structures: (A) "Almost" commutative structures, in the sense that the difference xy-yx is "small" in relation to xy and yx. At the Centre work was done on vertex algebras and Lie algebras in connection with parameter spaces for sets of points in a plane. (B) "Anticommutative" structures, where the commutation relation is replaced by xy = -yx, or "approximately" this. These allow for new types of duality between commutative and anticommutative structures, which also provide greater insight into classical commutative algebra and geometry. The group particularly worked on Koszul duality and its generalization to filtered algebras.

The work on the project entitled "Buddhist Manuscripts in the Schøyen Collection" involved numerous disciplines within the textual sciences, such as conservation of fragile manuscripts, palaeography, transcription, translation work and analysis of texts with a view to understanding the thinking and the societies in which they arose and of which they are an expression. The Buddhist manuscripts in the Schøyen Collection were found in Afghanistan, but many of them come originally from India. Fragments of a number of important works from the literature of Buddhism that are to be found in the collection – known and hitherto unknown – were identified and made available for further research through commentary editions in the book series "Buddhist Manuscripts in the Schøyen Collection". The organising of the work of producing a "Virtual Schøyen Collection", in which the whole collection is to be available in digital form, was also set in motion. Contributions to a computerised lexicographical project, Thesaurus Literaturae Buddhicae, in connection with the work on the collection were cleared for the Internet, and today they are available in this form. Furthermore there was work on projects linked to other parts of the Schøyen Collection, including Greek papyri and material relevant to the beginning of the art of writing in Sumer, as well as work on Babylonian mathematics.

The project entitled "Constitutional Studies – the Constitution as Norm" was designed as co-operation between lawyers, political scientists, historians and philosophers on subjects of a comparative nature. The group included four Norwegian researchers and 10 foreign participants from seven different countries. Many others were drawn in through confer-

ences and seminars. The point of departure for the project was that constitutions must be studied not only as descriptive texts, but also – and primarily – as norms of a legal and other nature. As norms they may have different types of effects – from pure symbolism to "strict" law, depending inter alia on the constitutional culture and institutional systems for laying down the content of the norms. The project led to numerous publications, but first and foremost it contributed to fruitful confrontation between different academic approaches and thus laid the foundation for further co-operation.

The autumn of 2002 saw the start of the activity to be carried out in the research groups that are to function in the period 2002/2003, on the following topics:

- *Geometric Integration*
  headed by Professor Brynjulf Owren, Norwegian University of Science and Technology, and Professor Hans Munthe-Kaas, University of Bergen
- *Aesthetics and Cognition*
  headed by Professor Jostein Børtnes and Professor Tomas Hägg, University of Bergen
- *Landscape, Law and Justice*
  headed by Professor Michael Jones, Norwegian University of Science and Technology

Newsletters Nos. 1 and 2, 2002 give an account of the groups' activities. Both these Newsletters are available in Norwegian and English editions and are also to be found on the Centre's web pages: http://www.cas.uio.no

In June 2002 the Board completed its business relating to the nomination of the researchers who are to head each group in 2004/2005. (The number of nominations had been somewhat lower this time than in earlier years, something that may be connected with the fact that several potential candidates were then involved in the then ongoing competition concerning the Centres of Excellence.) After a preceding two-stage perusal of a total of 14 proposals put forward in the previous autumn, 10 candidates were selected. These were the object of an international peer review in the spring of 2002. The Centre procured a total of 49 evalua-

tion reports from outstanding, independent international researchers, i.e. an average of 4.9 reports per candidate, and this material constituted the basis of the Board's final decision at its meeting in June. It was resolved that the following projects be invited for the academic year 2004/2005:

- *Linguistic Theory and Grammatical Change*
  headed by Professor Jan Terje Faarlund, University of Oslo
- *Turbulence in Plasmas and Fluids*
  headed by Professor Hans L. Pécseli and Professor Jan Trulsen, University of Oslo
- *Attention-Deficit/Hyperactivity Disorder (ADHD) from Genes to Therapy*
  headed by Professor Terje Sagvolden, University of Oslo

In the autumn of 2002 the selection process was begun for 2005/2006. The number of proposals that had come in this time was higher than last year, namely a total of 16. The Board chose to invite all the 16 candidates to submit project proposals with a view to further consideration.

4. Objectives and results

The Board can show evidence of very good academic results during the first ten years of operation at the Centre. While the first years of operation were hampered by scant resources, the possibilities of realising the Board's ambitious goals have become significantly better in recent years.

The Board also feels that activities are now being conducted with full recognition by both the Ministry of Education and Research and the Norwegian universities. The good results, according to the visiting researchers themselves, are to a great extent due to the infrastructure, which is appropriately maintained by a very small but extremely efficient administration. Earlier the workload falling upon the administration was at times very heavy, but the strengthening of the staff with an extra post has significantly improved the situation.

In the spring of 2002, 35 researchers were working at the Centre for long stays (periods of more than one month). Eleven of our most outstanding

Norwegian researchers within 3 main academic areas were working together with 17 international experts. In addition the CAS was the workplace for 7 younger researchers (doctoral degree students and post-doctoral research fellows). In the autumn of 2002 twenty-three researchers were working at the Centre – of whom 9 were leading Norwegian researchers, 9 were outstanding researchers from abroad and 5 were younger researchers. A number of outstanding researchers from abroad are also guests at the Centre for short periods, i.e. a month or less. In the course of the year the Centre was the workplace for researchers from 14 countries in 4 continents.

Major seminars with broad national/international participation have now become a natural part of the academic activity in all the groups. In addition a number of internal seminars were arranged.

The interaction at the Centre between the researchers from abroad and those from Norway, and the many lectures the researchers from abroad have given at universities and in other academic fora, represent an important contribution to the internationalisation of Norwegian research and are a significant result in themselves.

As a result of the Centre's activities, the Board is expecting a number of publications in the form of books, articles in international journals, and databases. On account of the long delay before material is printed, it is naturally impossible at the present time to have any real overview of these results in relation to the work carried out in the year 2002. Some works have already been published, but most of them are either being evaluated, are available in manuscript form or are the object of further treatment. A complete survey of the results of the work performed in the year 2002 will not be available for some years. The Board will in the time ahead be working to establish a better documentation system for this purpose. This has hitherto been somewhat delayed on account of a lack of administrative resources. Otherwise reference is made to reports from the research groups for 2001/2002 (see attachments).

In addition the following objectives were achieved in the year 2002:
* The academic activity was performed in conformity with the planned result targets.

- The selection procedure for new research groups is now of a high international level.
- The Newsletter has now achieved a good form and is of a high quality. It appears twice a year in Norwegian and English editions, and it is sent to all those who are working with basic research in Norway. Web pages have also been established for the Centre.
- Contact with good Norwegian researchers outside Oslo was improved and there has been a significant increase in the number of group leaders from other universities.
- Improvement of the contact with the subject communities in the universities was brought about through the fact that contact persons have been nominated in all the universities. This arrangement is functioning well and work is in progress to extend the selection of contacts.
- The excellent, constructive and mutually obligating co-operation with the universities in Norway and the Norwegian Academy of Science and Letters was carried further.

Work on establishing closer contact with international sister organisations was started in the course of 2001 and further developed in 2002. In the winter of 2002 the Chairman of the Board and the Scientific Director visited the Wissenschaftskolleg zu Berlin, after having visited the Netherlands Institute for Advanced Study (NIAS) in Wassenaar and the Zentrum für interdisziplinäre Forschung (ZiF) in Bielefeld in the autumn of 2001. A report from the visit has been produced.

5.   Finance

5.1   The Centre for Advanced Study

From and including the budget year 1999 the former grant from the Norwegian Research Council has been included in the grant from the Ministry. The total grant from the Ministry of Education and Research in the year 2002 was NOK 10,618,000. Beyond this the individual research groups received a direct contribution amounting to a total of NOK 137,538. The sources were the Research Council and the Tibet-

Norway Network at the University of Oslo. In addition the agreement with the universities indirectly brought in considerable resources in the form of approximately 8.5 research man-years.

The Norwegian Academy of Science and Letters also contributed to relieving the Centre's financial burden in the form of a favourable lease. The lease was renegotiated in 2001 and although the rent was adjusted upwards relatively steeply, it is still moderate in comparison with market prices. Furthermore the Academy has put meeting premises at the disposal of the research groups in return for a small payment.

The Centre's Statement of Accounts for the year 2002 shows a surplus of NOK 913,041. The surplus is essentially a result of the fact that the academic year does not follow the budgetary year. The research groups' expenses are normally considerably higher in the spring semester than in the autumn semester. In 2002 the groups had spent NOK 837,000 less than they could have done, and these are funds that the groups can carry over to the spring semester. The Centre's surplus in real terms in 2002 was therefore only NOK 76,000.

The balance sheet shows a balance of NOK 3,877,278. Of this sum, NOK 1,468,158 represents short-term debt, while a good 837 thousand kroner is, as mentioned, project funding for the groups that has so far not been spent. The Centre's net liquidity at the end of 2002/beginning of 2003 was in other words approximately 1.5 million kroner.

The Accounts were audited by the firm of auditors, Nitschke. The accounts for 2002 were produced on the assumption that operations would continue.

5.2   The Operating Fund at the CAS

The Centre enters into binding agreements for periods up to three years ahead. The Operating Fund was established as a form of security in relation to these long-term obligations. The Operating Fund consists of the basic capital, which is untouchable, and disposable funds. No money

from the Operating Fund was spent in 2002. Income from interest was NOK 383,115 and this money was added to the Fund, so that the total capital of the Operating Fund at the end of the year was NOK 6,177,062.

The Accounts were audited by the firm of auditors, Nitschke. The Accounts for 2002 were produced on the assumption that operations would continue.

Centre for Advanced Study, 12 February 2003

Attachments:

Reports from the research groups of 2001/2002:
- Magnus B. Landstad and Stein Arild Strømme
  Non-commutative Phenomena in Mathematics and Theoretical Physics
- Jens Braarvig
  Buddhist Manuscripts in the Schøyen Collection
- Eivind Smith
  Constitutional Studies – the Constitution as Norm

Non-commutative Phenomena in Mathematics and Theoretical Physics

Report by Magnus B. Landstad and Stein Arild Strømme

1. Introduction

The special year of mathematics at The Centre for Advanced Study (CAS) 2001–02 was a part of the Abel celebration in 2002. The intention was that a broad spectrum of mathematics in Norway should benefit. The title "Non-Commutative Phenomena in Mathematics and Theoretical Physics" includes a large spectrum of Norwegian mathematicians working in non-commutative ring theory, algebraic geometry and operator algebra. Although it might have been beneficial to have people from all three areas together through the whole year, we quickly realized that it would be better and more attractive to foreign visitors to concentrate the activity on three different areas during the year. With these restrictions we feel that the funds were effectively used, in addition the activities attracted other mathematicians with own resources. It was important for us to also include young people – both pre and post-doc, they were also partly financed from other sources.

The scientific activities took place as is traditional in mathematics: through seminars, workshops, informal discussions and individual work. All the participants have expressed great satisfaction with the excellent working conditions and relaxed atmosphere at the CAS. The only negative factor in this regard is the lack of an in-house mathematical library.

This problem was solved mostly by the participants using the mathematics library at Blindern. The service from the library was excellent; copies were faxed the same day if necessary. Many journals and Mathematical Reviews are now available online, this also helped.

There was a good mix of mathematical interest and expertise, and fruitful discussions took place on a daily basis. Most weeks there were two seminar talks, they were also followed by a number of mathematicians from the University of Oslo.

During the year we held a total of five workshops on various subjects. This is an effective way of communicating in mathematics and we are grateful to the Norwegian Academy of Sciences and Letters for the use of their premises. The program for the activities here is enclosed.

The research performed is described separately; we include a list of publications where the research was done in whole or partly at CAS. Together with the program for the workshops and seminars and the list of participants this shows the variety and productivity during the year. The feedback from the participants – both foreign and Norwegians – are all positive, and one will see that many of the articles contain thanks to CAS.

1.1   Norwegian participants

Five of the Norwegian participants (Bratteli, Ellingsrud, Landstad, Rudakov, Strømme) had extraordinary sabbaticals according to the various agreements between CAS and the four Norwegian universities. Other participants outside Oslo (Digernes, Reiten, Skau, Smalø, Solberg, Fløystad) organised their stay by "trading" their teaching duties among themselves and inside the department. Some participants from the University of Oslo and Oslo College continued their regular teaching duties, but had cooperation with fellows at CAS and also participated actively in the seminars.

There is no financial obligation in the agreements between CAS and the universities. Since the department gets no extra funds for people on

sabbatical it can be a burden when several persons from the same department visit CAS. Our policy was that CAS-funds should only be used for expenses in Oslo and travel, while the home institution should cover the local expenses (like teaching, exams etc).

It would be easier to get more researchers to apply at CAS if the universities also had a financial obligation. Having people in a research group at CAS gives the department prestige, but puts a burden on the rest of the department – since teaching and other obligations have to be distributed among fewer. Getting chosen to a research group at CAS is extraordinary, so it should be reasonable that the universities set aside some extraordinary funds for this. This would encourage applications from a broader area of science.

It has been important for us to include graduate students in the activities. The students from Oslo have regularly participated in the seminars, while students from Bergen and Trondheim participated for shorter periods.

1.2   Foreign participants

One of the foreign visitors stayed 5 months, while most others stayed 3–8 weeks; shorter stays were mostly in connections with the workshops. It would have been better if more people stayed longer, but that seemed difficult. Mostly this is due to commitments at the home institution – foreigners do not get an extra sabbatical – so they either have to use a sabbatical, trade teaching with colleagues or come outside teaching periods. One invited person withdrew late. 11th September also had its impact: one person did not come and others shortened their visits. One result of this was less theoretical physics than planned in the fall.

The stays of Jørgensen and Kapranov were partly financed by a grant from NFR.

The activities at CAS also attracted other mathematicians to Oslo for shorter periods, financed by other sources. They had offices at Blindern, but participated in the seminars and other discussions.

1.3 Interaction with other groups

The structure of the CAS with the three simultaneous groups is exactly right, as is also the size of the groups. The interaction with the other groups occurred mostly during lunches and gave many interesting discussions. We would like to thank the other groups for pleasant and friendly exchanges around the coffee machine downstairs and the lunch table upstairs. The mathematics in the Sumerian clay tablets of the Schøyen collection certainly confirmed for us the long history of our subject! Jöran Friberg was invited to NTNU in the fall of 2002 were he gave two very interesting talks on the history of Babylonian and Greek mathematics.

1.4 Administrative matters

CAS has a small, but very efficient administration. The many changes of fellows during the year put a heavy burden on the staff. We felt that the cooperation with the group leaders went smoothly, matters where taken up at an early stage before they became problems. The apartments used were of high standard and the foreign visitors commented specially on this. Our heartfelt thanks go to the scientific director Ole-Jørgen Skog with his all-embracing scientific interest and the good-natured administrative staff Marit Strøm and Unn Hagen. They did a marvellous job, they were always efficient and helpful, and invariably with a smile.

1.5 Computer facilities

Mathematicians' use of computers varies a lot. Some are computer illiterates (who needs help turning on a PC), while others are experts (who want to take over the whole system). They are used to various platforms (PC, Mac, UNIX etc) and need different programs. The same will be true for other research groups.

It is therefore important that CAS has flexible computer facilities and that assistance can be offered on various levels. In August there were some start problems and it usually took some time before new fellows were able to use the computers effectively. The transition in January went much more smoothly and the spring group was happy with the computer support given by CAS and by USIT. This group installed and administered GNU/Linux on the CAS computers. The computers were integrated into the University of Oslo's general computing services, including distribution of mathematical and other software from USIT. Thanks to very professional and efficient USIT support, this integration was remarkably smooth and painless.

1.6   Other activities

A large number of the participants in August attended either the Summer school on Representation theory of algebras "Homological conjectures" at the Sophus Lie centre in Nordfjordeid or The 8th Danish-Norwegian meeting on operator algebras at Lysebu 2001.

The Abel conference at Blindern in June 2002 was also an important part of the activities. Piene, Størmer, Rudakov, Bratteli, Skau, Kapranov, Strømme, Reiten, Ringel and Kleiman were all invited speakers at this conference.

1.7   Miscellaneous

In September 2002 the Research Council of Norway published an evaluation report on the mathematical research conducted in Norwegian universities. All the groups present during the year received favourable reviews and the committee specially mentioned the activities at CAS.

On 8 October 2001 Ola Bratteli was awarded that year's prize from Professor Ingerid Dal and Sister Ulrikke Greve Dal's endowment for the support of humanistic research.

Ragni Piene was in July 2002 elected as one of the 9 members to the executive committee of the International Mathematical Union.

2. The research group

Norwegian participants financed by CAS:
Magnus B. Landstad, Trondheim, leader, 1/7–31/12
Stein Arild Strømme, Bergen, leader, 3/1–30/6
Ola Bratteli, Oslo 01/10–17/12
Trond Digernes, Trondheim 09/10–20/12
Geir Ellingsrud, Oslo 3/1–30/6
Gunnar Fløystad, Bergen 14/1–30/6
Martin G. Gulbrandsen, Oslo 1/2–30/6
Idun Reiten, Trondheim 15/8–30/9
Alexei Rudakov, Trondheim 14/1–30/6
Christian Skau, Trondheim 15/10–20/12
Sverre O. Smalø, Trondheim 15/8–30/9
Øyvind Solberg, Trondheim 15/8–30/9
Jon Eivind Vatne, Bergen 3/2–8/2
Jan-Magnus Økland, Bergen 3/1–30/6

Foreign participants financed by CAS:
Bill Arveson, Berkeley, USA, 29/9–01/11
Etienne Blanchard, Paris, France, 27/11–5/12
Roberto Conti, Erlangen, 01/10–14/10
Wiliam Crawlev-Boevey, Leeds, England
Dai Evans, Cardiff, 23/7–18/8
Henning Haahr Andersen, Århus University, 21/5–30/6
Dieter Happel, Chemnitz, Germany
Ilan Hirshberg, Berkeley, USA 01/12–8/12
Birge Huisgen-Zimmermann, Santa Barbara, USA
Palle Jorgensen, Iowa, USA 10/7–18/8
Steve Kaliszewski, Arizona, USA 02/12–23/12
Mikhail Kapranov, Northwestern University 25/5–30/6
Steven Kleiman, Massachusetts Inst. of Techn. 2/5–30/6
Marcelo Laca, Victoria, 04/12–09/12
Nadia Larsen, Copenhagen, 31/10–08/11, 08/12–14/12

Helmut Lenzing, Paderborn, Germany
Ulf Lindström, KTH, Stockholm 15/4–30/4
Michael Müger, Amsterdam, 07/7–18/8, 02/12–21/12
Hiraku Nakajima, Kyoto University 11/4–30/6
Sergey Neshveyev, Oslo, 01/8–31/12
John Quigg, Arizona, USA, 29/11–28/12
Jean Renault, Orleans, France, 08/10–24/11
Claus M. Ringel, Bielefeld, Germany
Andrzej Skowronski, Torun, Polen
Andrei Tyurin, Moscow 17/3–24/3
Luise Unger, Hagen, Germany

Jorgensen and Kapranov were also financed by the Norwegian Research
Council (NFR).

Norwegian participants not financed by CAS:

Erik Alfsen	Erik Bedos
Aslak Bakke Buan	Jan Christophersen
Haakon Enger	Eivind Eriksen
Trond Gustavsen	Svend Hjelmeland
Audun Holme	Trygve Johnsen
Jan O. Kleppe	Andreas Leopold Knutsen
Arnfinn Laudal	Carsten A. Lütken
Ragni Piene	Kristian Ranestad
Roy Mikael Skjelnes	Arne B. Sletsjø
Erling Størmer	Lars Tuset
Elise Øby	

Participants only at workshops financed by CAS:

Maria Alberich	Apostolos Beligianis
Klaus Bongartz	Stefano Brangani
Berndt Brenken	Michela Brundu
Thomas Brustle	Enrico Carlini
Ana-Maria Castravet	Wojtek Chacholski
Ethan Cotterill	Igor Dolgachev
Alessandra Dragotto	Torsten Ekedahl
Ruy Exel	Carel Faber
Giorgio Ferrarese	Robert Fossum
Jesper Funch Thomsen	Gerard Gonzalez-Sprinberg

Gert M. Hana	Anders Høyer Berg
Gary Kennedy	Henning Krause
Dan Laksov	Manfred Lehn
Helge Maakestad	Raquel Mallavibarrena
Arthur Mattuck	Nivaldo Nunes de Medeiros
Franck Melliez	Judith Packer Jesudason
Pietro De Poi	Lorenzo Ramero
Miles Reid	Sandra di Rocco
Joaquim Roé	Margherita Roggero
Gianni Sacchiero	Giovanna Scataglini
Frank Schreyer	Jan Stevens
Anders Thorup	Stanislaw Lech Woronowicz
Dan Zacharia	Laszlo Zsido

Foreign mathematicians at the University of Oslo financed by other sources:

Alfons van Daele, Leuven, 31/10–2/12
Valentin Golodets, Kharkov, 08/10–14/10
Lars Kadison, Gothenburg, 22–26/10
Louis Labuchagne, Pretoria, 01/11–07/11
Andrei Lodkin, St.Petersburg, 01/11–10/11
Kornel Szlachanyi, Budapest, 22–26/10
Anatoly Vershik, St.Petersburg, 03/11–09/11

Students:

Sindre Duedahl, Oslo
Gert Hana, Bergen
Arnoud Jacobs, Leuven, Belgia (Marie Curie program)
Bernt Tore Jensen, Trondheim
Dag Madsen, Trondheim
Mats Molberg, Trondheim
Kjetil Røysland, Oslo
Anita Valenta, Trondheim

3.   Scientific report

3.1   Representation theory for finite dimensional algebras

The participants worked closely together on several topics during August and September.

Idun Reiten and Claus M. Ringel worked on infinite dimensional representations of canonical algebras leading to the paper [RR] on that subject.

Idun Reiten and Helmut Lenzing worked on hereditary noetherian categories and together with Andrzej Skowronski, Idun Reiten was working on double tilting. These co-operations are manifested in the publications [LR] and [RS].

Aslak Bakke Buan, Øyvind Solberg and Henning Krause were working on cotilting theories leading to three publications, [BK1], [BK2] and [BS].

Birge Heusgen Zimmermann and Sverre O. Smalø were working on homological question on string algebras leading to a publication, [HS].

Together with Dan Zacharia, and Andrzej Skowronski, Sverre O. Smalø also started on some homological questions leading to a publication, [SSZ].

Luise Unger and Dieter Happel were working on problems related to tilting theory, leading to a publication, [HU].

3.2 Quantum groups (fall)

Erik Bedos, Etienne Blanchard, Roberto Conti and Lars Tuset have been working on amenability in quantum groups. Tuset and Blanchard also started a joint work on boundary theory for discrete quantum groups, which is still in progress. Michael Müger and Lars Tuset have been working on the papers [MT1] and [MT2]. The first of these, joint with J. E. Roberts (Rome), has been finished and submitted during a recent visit of Tuset to Amsterdam. The second will be finished the summer of 2002. Müger and Tuset also had many discussions with Blanchard about Tensor Categories during his stay. The presence of A. van Daele at the University of Oslo was also fruitful, he presented his research program on C*-algebraic quantum groups and some related questions. Digernes worked on a joint paper [DS] with V.S. Varadarajan. (He was invited for a longer stay, but decided not to come.) Most of the results of the paper were presented at the workshop in November 2001.

3.3 Wavelets

Ola Bratteli and Palle Jorgensen completed their work on their new book [BJ] "Wavelets through a looking glass". This 424 page monograph was published by Birkhauser in June 2002. While it is based on joint research both from the CAS visit and earlier visits by Jorgensen, the book has a much wider focus. The material of the book includes several recent mathematical developments that have found applications in wavelet analysis. The subject of wavelets in turn represents a merger of trends in both pure and applied disciplines, with harmonic analysis, operator algebras, and representation theory on the pure side; and signal processing, computer graphics algorithms, data compression, and more recently, quantum computer algorithms, on the applied side, just to mention a few. The book received very positive reviews, and the authors have talked on this subject at the Abel conference in Oslo in June 2002 and at several other conferences. The Bratteli-Jorgensen work was followed up by work of other CAS visitors later in the program, Bill Arveson and Judy Packer.

3.4   Noncommutative dynamics

This constitutes a large part of the research in the fall. Bill Arveson completed a paper [A1] "Generators of noncommutative dynamics". He also worked on a monograph "Noncommutative Dynamics and E-semi-groups", a long-term project that is by now 80% finished. He also had scientific interactions with Bratteli, Digernes and Renault.

Arveson's student Hirshberg was working on endomorphisms of stable continuous trace C*-algebras. A paper [H] with this title is in the process of being refereed. He presented the main results, and held informative conversations with some of the participants about other potential research directions worth pursuing.

Sergey Nesveyev and Erling Størmer have been working on ergodic theory and maximal abelian subalgebras. They completed a paper [NS] and the results were presented in the seminars and at the workshop. Nesveyev also worked with Marcelo Laca on KMS-states of Pimsner C*-algebras (work in progress).

Ola Bratteli and Palle Jorgensen also worked on decidability of isomor-phism of ordered dimension groups. This has resulted in the papers [BJK1-3] with Kim and Roush.

Blanchard presented his joint work with E. Kirchberg on Purely infinite C*-algebras at the CAS seminar (work in progress): "A major problem arising in the classification program for nuclear C*-algebras is to find a refined analogue for C*-algebras of the type classification of von Neumann algebras introduced by Murray and von Neumann. We study the anagoges of properly infinite (= type III) von Neumann algebras for C*-algebras in the special situation of a Hausdorff primitive ideal space."

Renault and Skau worked with so-called etale equivalence relations, and it turned out to be considerable overlap between their research. The paper [GPS] was completed in Oslo, while [R1-2] were started and will be soon completed. Renault also had very useful discussions with Bratteli about traces on AF algebras. The mini-conference in November was particu-

larly useful. Renault, A. Vershik and R. Exel started discussions on KMS states on Cuntz-like algebras. Renault and Exel planned to continue this work in June 2002.

3.5   Non-commutative Hecke algebras

Ruy Exel, Steve Kaliszewski, Marcelo Laca, Magnus Landstad, Nadia Larsen and John Quigg have all been working on various aspects of Hecke algebras and connections to phase transitions and number theory. Inspired by discussions with Ruy Exel, Larsen started a work on crossed products by endomorphisms of Ore semigroups via transfer operators.

Kaliszewski, Landstad and Quigg looked at constructions of the completion of an arbitrary Hecke pair of groups. The Hecke algebra is then Morita-Rieffel equivalent to an ideal in a group C*-algebra. This gives easier proofs and better insight in many cases. The results will appear in [KLQ] during 2003.

3.6   Vertex algebras

A. Rudakov studied Vertex algebras and worked on classifying irreducible representations of the specific infinite-dimensional Lie super-algebras E(3,6) and E(3,8). The topics are in loose connection to each other. The Lie super-algebras E(3,6), E(3,8) are simple infinite-dimensional "vectorial" Lie super-algebras. They can be realised as vector field algebras on a super-manifold of the even dimension 3. Similar algebras for the even dimension 1 (and their representations) are the so-called formal distribution algebras and are related to Conformal and Vertex algebras. There is a hope to make multi-parameter Vertex algebras and thus to establish connection of these "even dimension 3" algebras to "3-parameter vertex algebras". On the other hand as "vector field algebras" all these algebras and their representations provide an algebraic approach to a kind of non-commutative geometry, because they are related to the pseudo-groups of transformations in the sense of S. Lie and E. Cartan but in the realm of supermanifolds.

Making complexes of representations is a way to construct irreducible representations, as homologies or images of the differential. It also helps to study the structure of the modules, and often points to interesting applications. In the paper [K-V 1], completed in Oslo, Kac and Rudakov provide the construction of series of complexes that generalise their previous construction of complexes of representations of E(3,6).

By definition, a singular vector is the highest vector (of a kind) of a submodule. Finding singular vectors is the method of proving that the module in question is not irreducible, and the classification of singular vectors is an approach to the classification of the irreducible representations. Kac and Rudakov are aiming at getting the full classification of the irreducible representations of E(3,6). The paper [K-V 2] elaborates the conditions where the singular vectors could only exist and then finds them explicitly.

3.7   Quiver varieties

H. Nakajima gave four lectures on introduction to quiver varieties. They were particularly interesting as he adapted a geometric approach different from the one in the original paper, hoping that the material would be easier to understand in the present audience. This benefited Nakajima himself also, since the geometric meaning of his computations was clarified. It motivated him to formulate conjectures on moduli spaces of sheaves on K3 surfaces, which he wrote a paper on. Another topic which he did at CAS was writing a computer program calculating Betti numbers of quiver varieties. He found an algorithm some years ago, but writing a computer program was not so easy, especially because the algorithm requires lots of memory. Says Nakajima: "I benefit the stay at CAS so much, since I have enough time to concentrate the study."

3.8   Derived algebraic geometry

M. Kapranov was working on derived deformation theory, jointly with Ionut Ciocan-Fontanine. They have developed a new technique to define

the virtual fundamental class in the situation where higher obstructions are present. This technique is based on the virtual structure sheaf, and the virtual class lies in the Chow group not of the moduli space itself but of a certain scheme mapping onto this moduli space. This opens the way for explicit calculation for higher genus Gromov-Witten invariants of Calabi-Yau complete intersections.

3.9 Quantum groups (spring)

H. Haahr Andersen worked on topics in the representation theory for quantum groups at roots of unity and algebraic groups in prime characteristics. The main idea was to explore both the similarities and the differences between the two cases. In particular, he finished a short note [HA] on the strong linkage principle for the quantum case. This unifies the treatments contained in earlier work of Haahr Andersen's with various collaborators. A special feature is the situation when the root of unity (belonging to an arbitrary field) has even order. Here the analogy to the modular representation theory is somewhat different from the odd case.

3.10 Enumerative geometry

S. Kleiman and R. Piene worked on refining and generalizing some results on enumerating nodal curves on surfaces. In particular, they considered the space of ordered configurations of infinitely near points with the same Enriques diagram, and analysed the natural map from this space to the Hilbert scheme of complete ideals. The map factors through the quotient modulo the automorphism group of the diagram. They succeeded in proving that the quotient is embedded into the Hilbert scheme in characteristic zero, but is not always embedded in positive characteristic.

They also worked on generalizing the hypotheses guaranteeing the validity of a cycle relation central to the enumerations. They have a proof in the case that the cycles are reduced, and this case is, so far, the only one in which the relation has been used. However, the relation should

hold as well when the cycles are not reduced, and Kleiman and Piene made a good start on a proof. Generalizing the relation will not only remove the need to establish the reducedness in the present applications, but pave the way for future applications.

3.11   History of the Abel map

Kleiman's historical research focused on three periods 1826–1880, 1868–1926, and 1929–1962. The first period concerns Abel's own work and the early attempts to understand it. The situation was made complicated by the fifteen-year delay in publication of Abel's Paris monograph. Meanwhile, Abel published two special cases. The result is that many different statements have come to be called "Abel's theorem" without qualification and the full extent of Abel's advance is not widely known even today.

The second period concerns the theory of irregular surfaces. The theory grew out of the work on generalizing Abel's theorem from curves to surfaces. One important approach was to consider a 1-parameter family of curves and to apply Abel's theorem to the curves in the family and to the parameter curve. However, many mathematical surprises turned up, and developing the theory required a lot of effort over many years.

The third period concerns Weil's proof of E. Artin's Riemann hypothesis for a curve over a finite field. First, Hasse proved the case of genus 1 by using an analogue of the theory of elliptic functions, and he and Deuring noted that to extend the proof to higher genus would require developing an analogue of the theory of correspondences. Then Weil took over. He carefully rebuilt the foundations of algebraic geometry in any characteristic. He developed the needed theory of correspondences, and proved the Riemann hypothesis. Then he developed the theory of Abelian varieties, and gave a second proof of the Riemann hypothesis. Finally, he recognized the importance of an abstract theory of the Picard and Albanese varieties, and he spearheaded its development.

3.12   Koszul duality

Fløystad studied filtered algebras U such that the associated graded algebras A are Koszul (non-homogeneous Koszul algebras). In [F 1] he showed that if U is augmented, then the dual of A has the structure of a differential graded algebra. There is a corresponding equivalence of module categories for this duality. The more general situation where U is not augmented is also studied.

It is natural to follow this up by trying to define Koszul duals to quantum groups. It seems reasonable to believe that these duals can be thought of as distribution algebras for virtual non-commutative algebraic groups.

Fløystad was also exploring relations between Koszul dualy, Hochschild homology, cyclic homology and (non-commutative) de Rham cohomology.

3.13   Simplicial complexes and the Bernstein-Gelfand-Gelfand correspondence

Simplicial complexes are in natural correspondence with monomial ideals in exterior algebras. Via the BGG correspondence one may associate a complex of coherent sheaves on projective space. In [F-V] Fløystad and J. E. Vatne show that this complex reduces to a coherent sheaf if and only if the Alexander dual of the simplicial complex is Cohen-Macaulay. In addition, the sheaf is also Cohen-Macaulay if and only if the (original) simplicial complex is Cohen-Macaulay. A conjecture is made on the set of such simplicial complexes, which are parameterised by three numerical invariants.

3.14   Hilbert schemes and combinatorics

G. Ellingsrud and S. A. Strømme spent most of the time trying to penetrate and simplify work of M. Haiman on the n! theorem and generalizations. In the course of this process they found counterexamples to a conjecture by Ginzburg and several related conjectures by Kumar and Thomsen. Much insight into the rich mathematics around the n! theorem and the plane Hilbert scheme was gained, but so far it has not lead to a significant simplification of Haiman's proof.

4.   Workshops

4.1   "Homological, Geometrical and Combinatorial Aspects of Representation Theory" at the Academy for Science and Letters in Oslo, September 21st–23rd, 2001

- Apostolos Beligianis: "Homologically Finite Subcategories, Torsion Theories and Closed Model Structures."
- Klaus Bongartz: "Some Properties of Minimal Degenerations of Quiver Representations."
- Thomas Brustle: "On Tame Algebras and Tits Form."
- Dieter Happel: "Piecewise Hereditary Algebras."
- Birge Huisgen-Zimmermann: "Direct Products of Modules and The Pure Semi-Simplicity Conjecture."
- Henning Krause: "Filtering Modules of Finite Homological Dimension."
- Helmut Lenzing: "2-Torus, Moebius Band, Klein Bottle, and Their Non-Commutative Friends."
- Alexei Rudakov: "Representations of Graded Lie s-Algebras with sl(3) x sl(2) x gl(1) as the Zero Degree Component."
- Andrzej Skowronski: "Derived Categories and Euler Forms."
- Luise Unger: "On a Partial Order of Tilting Modules."
- Dan Zacharia: "Self injective Koszul Algebras."

4.2 "Operator algebras and applications", November 5th–7th, 2001

- Erik Alfsen: "On the use of spectral convex sets in non-commutative probability."
- Erik Bedos: "Amenability and algebraic quantum groups."
- Berndt Brenken: "Representations of Graph C*-algebras and Endomorphisms."
- Alfons van Daele: "About the Haar measure on locally compact quantum groups."
- Trond Digernes: "Weyl Systems for Heisenberg Groups and the structure of their vacuum sectors."
- Ruy Exel: "A new look at crossed products by endomorphisms and KMS states."
- Louis Labuschagne: "A non-commutative theory of composition operators."
- Magnus B. Landstad: "Hecke subgroups and algebras."
- Nadia Larsen: "Representations of Hecke algebras, dilations of semigroup crossed products and applications."
- Andrei Lodkin: "Quasicrystallic tilings and their spectra."
- Sergey Neshveyev: "Masa's in crossed products."
- Judith Packer Jesudason: "A Hilbert module approach to wavelet theory."
- Jean Renault: "The Radon-Nikodym problem for AP-equivalence relations."
- Christian Skau: "Affable equivalence relations and Cantor minimal systems."
- Erling Størmer: "Entropy in operator algebras and the McMillan theorem."
- Anatoly Vershik: "Dynamical systems and C*-Lie-algebras."
- Stanislaw Lech Woronowicz: "Quotients of quantum groups."
- Laszlo Zsido: "Non-commutative recurrence theorems."

4.3 "Hilbert schemes, combinatorics, and vertex algebras", March 18th–19th, 2002

- Gunnar Fløystad: "On the exterior algebra."
- Funch Thomsen: "Principal nilpotent pairs and the n! conjecture."
- Martin G. Gulbrandsen: "Symplectic quotient singularities – after Kaledin and Verbitsky."
- Lehn: "The cohomology ring of Hilb(K3)."
- Melliez: "Duality of (1,5)-polarized abelian surface."
- Alexei Rudakov: "Constructing Vertex Algebras and Hilbert schemes."
- Schreyer: "Maximally linear Cohen-Macaulay modules and application to resultants."
- Skjelnes: "Hilbert schemes of local rings."
- Stein Arild Strømme: "Elementary proof of the n! conjecture."
- Andrei Tyurin: "Spin networks and theta functions."

4.4 "Mathematics related to string theory, mirror symmetry, and Calabi Yau manifolds", April 22nd–23rd, 2002

- Dolgachev: "Normal elliptic curves and elliptic fibrations on projective spaces."
- Ekedahl: "Liftings and non-liftings of Calabi-Yau varieties in positive characteristics."
- Trygve Johnsen: "Curves on some specific threefolds."
- Ulf Lindström: "String theory and non-commutative geometry."
- Lütken: "Quantum algebraic geometry."
- Hiraku Nakajima: "Homology groups of moduli spaces for sheaves on K3 surfaces."
- Ranestad: "Rank two vector bundles on linear sections of the symplectic Grassmannian."
- Reid: "Derived categories and higher dimensional geometry."
- Alexei Rudakov: "Conformal algebras, Lie algebras, and representations."
- Andrei Tyurin: "Mirror symmetry and vector bundles on CY-threefolds."

4.5 Conference in Honour of Steven Kleiman's 60th Birthday, May 30th–June 2nd, 2002

- Lawrence Breen: "Combinatorial differential forms."
- Herb Clemens: "On subvarieties of general hypersurfaces of complex projective space."
- Susan Colley: "Multiple-point theory: old and new."
- Dan Edidin: "Riemann-Roch for quotients and Todd classes of simplicial toric varieties."
- Eduardo Esteves: "Pfaff systems of equations: singularities and solutions", abstract.
- Dan Grayson: "Motivic cohomology and K-theory."
- Henning Haahr Andersen: "The strong linkage principle for quantum groups at a root of unity."
- Abramo Hefez: "The Iterated Osculating Developable of Projective Curves."
- Anthony A. Iarrobino: "Some families of Artinian Gorenstein algebras, and the Hilbert scheme of curves on P3."
- Trygve Johnsen: "Curves on Calabi-Yau threefolds."
- Knud Lønsted: "Mathematics and software engineering in the EU-R&D Sixth Framework Program."
- Bernard Teissier: "Valuations, deformations, and toric geometry."
- Israel Vainsencher: "Counting hypersurfaces with up to six double points", abstract.
- Ravi Vakil: "Vanishing of cohomology classes on the moduli space of curves."
- Angelo Vistoli: "Stacks of double covers of projective spaces."
- Sebastià Xambó-Descamps: "Completing Hermann Schubert's work on the enumerative geometry of cuspidal cubics in P3", abstract.

5.   Seminars

5.1   Fall, 2001

- Bill Crawley-Boevey: "The Deligne-Simson problem & weighted projective lines." August 21st.
- Helmut Lenzing: "Hereditary noetherian categories with a commutative function field." August 23rd.
- Claus M. Ringel: "Subgroups of finite abelian groups." August 28th.
- Øyvind Solberg: "The Hochschild cohomology ring of a self-injective algebra of finite representation type." August 30th.
- Andrzej Skowronski: "Infinitesimal Groups with Tame Principal Block." September 4th.
- Sergey Neshveyev: "Popa's paper on Betti numbers of II_1 factors." September 5th.
- Birge Huisgen-Zimmermann: "The geometry of chain complexes and outer automorphisms under derived equivalence." September 6th.
- Luise Unger: "The Genus of a Graph of Tilting Modules." September 11th.
- Sergey Neshveyev: "Popa's paper on Betti numbers of II_1 factors." September 12th.
- Aslak Bakke Buan: "Systems and Limits of Pure Injective Cotilting Modules." September 13th.
- Dieter Happel: "Some remarks on H^1." September 18th.
- Ola Bratteli: "Operator Theory in Wavelet Analysis." September 19th.
- Sverre O. Smalø: "Finiteness of the representation dimension." September 25th.
- Idun Reiten: "Torsion Theories." September 27th.
- Lars Tuset: "The modular square for quantum SU(2)." October 3rd.
- Valentin Golodets: "The spectrum of completely positive entropy actions of countable amenable groups." October 10th.
- Bill Arveson: "Generators for non-commutative dynamics." October 15th.
- Jean Renault: "AF equivalence relations and their cocycles." October 17th.

- Christian Skau: "Affable equivalence relations and Cantor dynamical systems." October 22nd.
- Kornel Szlachanyi: "Quantum groupoids in field theory and quantum field theory." October 24th.
- Jean Renault: "Basic aspects of groupoids, Haar-systems and graph algebras." October 25th.
- Ola Bratteli: "A wavelet index theorem." October 29th.
- Jean Renault: "Basic aspects of groupoids, Haar-systems and graph algebras," continued. November 1st.
- Alfons van Daele: "The Heisenberg Commutation Relations, Commuting Squares and the Haar Measure on Locally Compact Groups." November 14th.
- Jean Renault: "Basic aspects of groupoids, Haar systems and graph algebras," continued. November 15th.
- Arnoud Jacobs: "The quantum E(2) as an example of a locally compact quantum group." November 21st.
- Erik Alfsen: "On the use of spectral convex sets in non-commutative probability." November 22nd.
- Etienne Blanchard: "A stellar analogue of type III von Neumann algebras." (with E. Kirchberg and M. Rørdam). November 28th.
- Erling Størmer: "Entropy and MASAs of the hyperfinite II_1 – factor." (with Sergey Neshveyev). November 29th.
- Ilan Hirshberg: "Endomorphisms of stable continuous-trace C*-algebras." December 3rd.
- John Quigg: "Maximal coactions." December 5th.
- Marcelo Laca: "Hecke C*-algebras from number fields." December 6th.
- Nadia S. Larsen: "Representations of Hecke algebras, dilations of semigroup crossed products and applications." December 12th.
- Michael Müger & Lars Tuset: "Reconstruction theorems for tensor C*-categories." December 17th.
- Steve Kaliszewski: "Naturality and Induced Representations for C*-Dynamical Systems." December 19th.

5.2   Spring, 2002

- Geir Ellingsrud: "Haiman's work on the Hilbert scheme of the affine plane." January 15th, 22nd and 29th.
- Gunnar Fløystad: "Koszul duals of differential graded Koszul algebras." January 31st.
- Stein Arild Strømme: "Hilbert scheme and principal nilpotent pairs." February 5th.
- Jon Eivind Vatne: "Multiple structures and splittings of bundles." February 7th.
- Stein Arild Strømme: "Hilbert scheme and principal nilpotent pairs cont'd." February 12th.
- Alexei Rudakov: "Introduction to vertex algebras." February 14th.
- K. Gjøsteen: "Cryptography and cubic surfaces." February 15th.
- Stein Arild Strømme: "Hilbert scheme and principal nilpotent pairs cont'd." February 19th.
- Alexei Rudakov: "Introduction to vertex algebras cont'd." February 21st.
- Stein Arild Strømme: "Hilbert scheme and principal nilpotent pairs cont'd." February 26th.
- Geir Ellingsrud: "Hilbert schemes." March 5th.
- Alexei Rudakov: "Introduction to vertex algebras: definition." March 7th.
- Geir Ellingsrud: "Hilbert schemes of smooth surfaces." March 12th.
- Alexei Rudakov: "Introduction to vertex algebras." March 14th.
- Hiraku Nakajima: "Introduction to quiver varieties." March 16th.
- Ulf Lindström: "Supersymmetry and complex geometry." April 18th.
- Alexei Rudakov: "Vertex Algebra." April 25th.
- Hiraku Nakajima: "Quiver Varieties." April 30th, May 7th and 14th.
- Steven Kleiman: "Node polynomials for curves on surfaces." May 21st.
- Stein Arild Strømme: "On the n! conjecture." May 23rd.
- Mikhail Kapranov: "DG manifolds and virtual classes." June 13th and 20th.

6. Publications

[HA] H. Haahr Andersen: "The strong linkage principle for quantum groups at roots of 1." Preprint.

[A1] Arveson, W.B.: "Generators of noncommutative dynamics."

[A2] Arveson, W.B.: "Noncommutative Dynamics and E-semigroups", (monograph).

[BCT] Bedos, E.; Conti, R. and Tuset, L.: "On amenability and co-amenability of algebraic quantum groups and their corepresentations." 46 pages. math.OA/0111027.

[BMT1] Bedos, E.; Murphy, G. J. and Tuset, L.: "Amenability and co-amenability of algebraic quantum groups II". 34 pages. math.OA/0111026.

[BMT2] Bedos, E.; Murphy, G. J. and Tuset, L.: "Amenability and co-amenability of algebraic quantum groups". 25 pages. math.OA/0111025.

[BJ] Bratteli, Ola and Jorgensen, Palle E. T: "Wavelets through a looking glass", Birkhauser, Boston. 400 pages, ISBN: 0-8176-4280-3, published 2002 (textbook).

[BJK3] Bratteli, Ola; Jorgensen, Palle E. T.; Kim, Ki Hang and Roush, Fred: Corrigendum to the paper: "Decidability of the isomorphism problem for stationary AF-algebras and the associated ordered simple dimension groups", Ergodic Theory Dynam. Systems 22 (2002), no. 2, 633.

[BJK2] Bratteli, Ola; Jorgensen, Palle E. T.; Kim, Ki Hang; Roush, Fred: "Computation of isomorphism invariants for stationary dimension groups." Ergodic Theory Dynam. Systems 22 (2002), no. 1, 99–127.

[BJK1] Bratteli, Ola; Jorgensen, Palle E. T.; Kim, Ki Hang; Roush, Fred: "Decidability of the isomorphism problem for stationary AF-algebras and the associated ordered simple dimension groups." Ergodic Theory Dynam. Systems 21 (2001), no. 6, 1625–1655.

[BK1] Buan, A. B. and Krause, H.: "Cotilting for Tame Hereditary Algebras" (15p), Submitted for publication.

[BK2] Buan, A. B. and Krause, H.: "Cotilting in Tubes." (13p), Preprint.

[BS] Buan, A. B. and Solberg, Ø.: "Limits of pure injective cotilting modules." (11p), Accepted for publication in Alg. and Rep. Theory.

[DV] Digernes, Trond and Varadarajan, V.S.: "Weyl Systems for Heisenberg Groups and the structure of their vacuum sector", (in preparation).

[E-S] G. Ellingsrud, S. A. Strømme, Note on a conjecture of Ginzburg, (in preparation).

[F 1] G. Fløystad: "Differential graded Koszul algebras are dual to non-homogeneous Koszul algebras." 17 pages, preprint.

[F 2] G. Fløystad: "Hvordan ytrealgebraen griper essenser i topologi, Lie-teori, kombinatorikk og projektive geometri." 6 pages, note in Norwegian.

[F-V] G. Fløystad, J. E. Vatne.: "(Bi)-Cohen-Macaulay simplicial complexes and their associated coherent sheaves." 13 pages, preprint.

[GPS] Giordano, T., Putnam, I. and Skau, C.: "Affable equivalence relations and orbit structure of Cantor dynamical systems", preprint 26 pages.

[HU] Happel, D. and Unger, L.: "On a Partial Order of Tilting Modulaes." (8p) Accepted for publication.

[H] Hirshberg, Ilan.: "Endomorphisms of Stable Continuous-Trace C^*-algebras." 11 pages.

math.OA/0112293

[HS] Huishgen Zimmermann, B. And Smalø, S. O.: "The Homology of String Algebras."

(Submitted)

[K-V 1] V. Kac, A. Rudakov: "Complexes of representations of Lie superalgebras E(3,8) and E(5,10)." Under publication in Int. Math. Res. Not.

[K-V 2] V. Kac, A. Rudakov: "Representations of the exceptional Lie superalgebra E(3,6), III: Classification of the singular vectors." (in preparation)

[KLQ] Kaliszewski,S.; Landstad, Magnus B. and Quigg, John: "Hecke algebras and groups." 40? pages (in preparation).

[KMT2] Kustermans, J.; Murphy, G. J. and Tuset, L.: "Quantum groups, differential calculi and the eigenvalues of the Laplacian." 39 pages, math.QA/0111042.

[KMT1] Kustermans, J.; Murphy, G. J. and Tuset, L.: "Differential Calculi over Quantum Groups and Twisted Cyclic Cocycles." math.QA/0110199.

[LR] Lenzing, H. and Reiten, I.: "Hereditary Noeterian Categories of Domestic or Degenerated Type." Preprint.

[MRT] Mueger, M.; Roberts, J.E. and Tuset, L.: "Representations of algebraic quantum groups and reconstruction theorems for tensor categories." 43 pages. math.QA/0203206.

[MT] Mueger, M. and Tuset, L.: "Regular representations of algebraic quantum groups and embedding theorems." (in preparation).

[Nak 1] H. Nakajima: "Convolution on homology groups of moduli spaces of sheaves on K3 surfaces." To appear in the proceeding of "Conference on Hilbert schemes, vector bundles and their interplay with representation theory", Columbia 2002.

[Nak 2] H. Nakajima: "t–analogs of q–characters of fundamental representations of quantum affine algebras." In preparation.

[NS] Nesveyev, S. and Størmer, Erling: "Ergodic theory and maximal abelian subalgebras of the hyperfinite factor." math.OA/0112227

[RR] Reiten, I. and Ringel, C. M.: "Infinite Dimensional Representations of Canonical Algebras." Preprint.

[RS] Reiten, I. and Skowronski, S.: "Generalizations of Double Tilted Algebras." Preprint.

[R1] Renault, J.: "AF equivalence relations and their cocycles." math.OA/0111182

[R2] Renault, J.: "The Radon-Nikodym problem for approximately proper equivalence relations."

[SSZ] Smalø, S. O.; Skowronski, S. and Zacharia, D.: "On the Finiteness of the Global dimension for Artinian Rings." Journal of alg. 251, 475-478 (2002).

Buddhist Manuscripts in the Schøyen Collection

Report by Jens Braarvig

1. Introduction

During the year at CAS the project "Buddhist Manuscripts in the Schøyen Collection" (BMSC) made substantial progress. The aim of the project is to publish the grand collection of Mr. Martin Schøyen, Spikkestad, Norway. The Schøyen Collection (SC) contains manuscript materials from the beginning of writing (Sumerian, about 3000 B.C.) up to the Renaissance, and represents most of the main cultural traditions of the world. The following publication projects have so far been institutionalized: Pictographic and Cuneiform Tablets (PCTSC), Greek Papyri (GPSC), Coptic Papyri (CPSC), Buddhist Manuscripts (BMSC), Aramaic, Mandaic, Syriac and Pahlavi Incantation Bowls (AMSPIBSC), Medieval Seal Matrices (MSM). However, at CAS efforts were concentrated on BMSC, though some activity can also be reported on PCTSC, GPSC and CPSC. Associated with the BMSC work was also the computer-lexicographic project "Thesaurus Literaturae Buddhicae."

The year was mostly organized as a running workshop, with emphasis on a great number of shorter visits, though a few outstanding scholars were also resident the whole year, or practically the whole year, beside junior researchers on post-doctoral and post M.A. levels (American, Chinese, German and Norwegian). Almost all the disciplines of manuscript science were practiced, form preservation work (including the study writing materials, palm leaf, birch bark, tree and vellum), to palaeography (including dating of scripts and manuscripts), and basic transcription work, text-critical and stemmatic work, translation and

interpretation, genre research, the general study of Buddhist literature as an expression of Buddhist culture, society, its monastic community and its religion and philosophy.

The style of work was informal with continuous communication between scholars and team work, for which the CAS provided the most perfect venue. Thus mostly our very efficient ad hoc meetings replaced the formal seminars and conferences, though the beginning and the end of the period saw a very numerous research group, and these periods served as conferences, though with few formal lectures. This form of work was also enhanced by the fact that the group had as its agreed aim to contribute to the series of volumes devoted to the SC. One volume was completed during the CAS period, and was published in August 2002 (BMSC vol. ii). The basis for a second volume (BMSC vol. iii, deadline October 1st, 2003) was laid with a fair number of initiated contributions to be published in this volume.

The work on producing a complete virtual SC was planned and initiated, and the group took care to develop routines and educate manpower to continue this work. Most active partners and co-operators of this work were the Max Planck Institute for the History of Science, Berlin, and UCLA, (for PCTSC); Washington University, Seattle (for BMSC); and the University of Florence (for GPSC). Naturally, the virtual BMSC was completed during the period at CAS, as representing the main material for the main research group, but also the GPSC was completed. The more work intensive PCTSC was initiated at CAS, but is now practically complete.

A short seminar on the Mesopotamian materials (PCTSC) was conducted 16th to 18th of November, and resulted in the establishment of an international steering committee for the publication of PCTSC. The members of this committee represent most fields and significant milieus of Assyriological research. Several Assyriologists were also visiting for shorter and longer periods (up to three weeks), and most of the research done by them was connected to the topics of beginning and earliest phases of (Sumerian) writing, and Mesopotamian mathematics.

A few formal seminars were, however, arranged at CAS, and some lectures inside and outside CAS. Communication with the other groups

was natural with the spatial coexistence, and resulted in a number of very fruitful discussion, among other things on constitution, law and religion with the Constitution Group, and on early Mesopotamian mathematics with the mathematics group, which discussion also resulted in a formal lecture on the topic from one of the participants in the mathematical part of the PCTSC.

A public seminar was also conducted in cooperation with the Media Institute of Oslo University and Prof. Hans Fredrik Dahl, with participants from a number of relevant institutions, on the ownership of cultural artefacts in general and the SC in particular.

The project had a relatively high profile in the media, for which purpose the information bulletin of CAS played a crucial role to initiate this process. These media appearances included a number of interviews in Norwegian papers and ether media, as well as in the BBC, DW, Japanese papers, publications and TV (NHK, still to be broadcasted), etc. Naturally, it was a duty of the project to inform on the unfortunate events in Afghanistan, since the BMSC materials have their origin in this area, viz., Bamiyan, and had participants who were specialists on the culture of the Silk Road. One of the Norwegian participants, Torkel Brekke, was also a specialist on Religion and War, and has published extensively on this topic (for his publication list, cf. his Home page at the University of Oslo). However, also the scientific side of the work on the manuscripts was the topic of several of these programs.

The BMSC project was already initiated as a project before the CAS period with a steering group of four persons (as mentioned as the first four in the list of participants below), but the CAS period gave the project a very significant impetus, the result of which will be experienced for many years to come. Plans inspired by the routines of CAS are being developed for trying to make the conditions of CAS available on a more permanent basis for the whole MSC project.

2.   Participants

2.1   BMSC

- *Steering committee:*
  Professor Jens Braarvig, University of Oslo, 15/8–30/6.
  Professor Jens-Uwe Hartmann, Munich University, several about 1 week visits throughout the period.
  Professor Kazunobu Matsuda, Bukkyo University, Kyoto, 20/8–15/9; 31/10–9/11; 24/3–13/4; 24/6–1/7.
  Dr. Lore Sander, Berlin, 15/8–30/6.

- *Other participants:*
  Professor Collett Cox, University of Washington, 18/8–3/9.
  Dr. Siglinde Dietz, University of Göttingen, 18/8–9/9; 1/6–30/6.
  Dr. Eli Franco, University of Vienna, 17/8–30/9.
  Professor Paul Harrison, University of Canterbury, 30/3–30/6 (–28/4–19/5).
  Irene Lin, formerly Princepton University, 30/3–30/6 (–28/4–19/5).
  Professor Seishi Karashima, Soka University, 29/3–6/4.
  Professor Richard Salomon, University of Washington, 19/8–3/9; 18/6–2/7.
  Dr. Klaus Wille-Peters, University of Göttingen, 18/8–26/8.
  Dr. Peter Skilling, Bankok, 7/6–1/7.
  Professor Margarita Vorobyova-Desyatovskaya, St. Petersburg, 18/8–1/9.
  Dr. Andrew Skilton, University of Cardiff, 10/9–14/10.
  Andrew Glass, M.A., 22/8–12/9; 10–29/6.
  Professor Shogo Watanabe, Reiyukai, Tokyo, 30/8–7/9.
  Professor Hirofumi Toda, Fukuoka, 20–31/5.
  Cand Phil. Henrik Mathisen, Oslo, 1/9–30/6.
  Cand Phil. Stefan Baums, 19/8–3/9; 13–21/12; 1/5–30/6.
  Dr. Torkel Brekke, University of Oslo, 15/8–31/1.
  Saerji = gSar brJe, 28/10–30/6.
  Phil. Cand. Gudrun Melzer, 4–11/12; 1/2–15/6.

Dr. Olle Quarnström, Lund, 1/11–1/12.

Dr. Jens Østergaard Pedersen, University of Copenhagen, 5/11–8/11; 1–4/12.

Dr. Ulrich Pagel, SOAS, 7–16/12.

Professor Heinz Bechert, University of Göttingen, 16/4–19/4.

Dr. Lance Cousins, Oxford, 2–5/11.

Somdev Vasudev, M.A. Oxford, 2–5/11.

Professor Oskar von Hinüber, University of Freiburg, 27/6–2/7.

Professor Michael Hahn, Heidelberg, 12–16/10; 15–30/3.

Professor Nicholas Sims-Williams, SOAS, 27–29/11.

Dr. Kenneth Zysk, University of Copenhagen, 13–19/12.

Professor Wang Bangwei, Beijing University, 10–20/6.

Professor Duan Qing, Beijing University, 2–11/6.

Dr. Jarle Ebeling 1/2–30/6.

Tu Cheng-min, Chung-Hwa Institute of Buddhist Studies, 20/5–5/6.

Chou Pang-hsin, Chung-Hwa Institute of Buddhist Studies, 20/5–5/6.

Mirek Rozehnal, Chung-Hwa Institute of Buddhist Studies, 19/1–22/2; 17/5–1/6.

Bhikkhu Hui-min Guo Min-fang, 20/5–27/5.

Shayne Clarke, M.A., 15–23/6.

Professor Cristina Scherrer-Schaub, Sorbonne, 20–24/6.

2.2   GPSC

Professor Rosario Pintaudi, University of Florence, 29/4–5/5.

2.3   PCTSC

- *Steering committee*:
  Professor Andrew George, SOAS, 16–18/11.
  Professor Stefan Maul, Heidelberg, 16–18/11.
  Dr. Mogens Trolle Larsen, University of Copenhagen 17/11.
  Professor Miguel Civil, University of Chicago, 16–21/11.
  Dr. Renee Kovacs, 15/11–21/11; 3/2–10/2.
  Professor Robert Englund, UCLA, 13–20/2.

- *Other participants:*
  Professor Jöran Friberg, Chalmers, Göteborg, 5–10/8; 3–16/3.
  Dr. Peter Damerow, Max Planck Inst., Berlin, 13–18/2; 18–29/4.
  Dr. Aage Westenholz, University of Copenhagen, 2/1–9/1; 7–13/6.
  Stud. Philol. Goiko, University of Copenhagen, 2/1–9/1.
  Stud. Philol. Agnete Lassen, 2/1–9/1.
  Cand Philol. Alexander Ziesler, Oslo, 1/1–30/6.
  Stud. Philol. Odd Øyvind Fjelldal, 1/1–30/6.
  Fru Grete Næsheim, 11/4–30/6.

3. Presentations and seminars

3.1 Presentations

Professor Göran Friberg: "Problems of Mesopotamian Mathematics." Auditorium of scholars associated with CAS, Mars 10th, 2002.

Presentation of CAS BMSC results during the Guest Professorship of Professor Jens Braarvig, University of Oslo, at SOAS, London, autumn 2002.

3.2 Seminars

A seminar on the Mesopotamian materials (PCTSC) was conducted November 16th –18th, 2001. A committee for managing the work of publishing the materials was established as a result of the seminar (see the list of participants, 2.3).

The "Synonyma Serica Comparata" and the "Thesaurus Literaturae Buddhicae" with Professor Christoph Harbsmeier, representing his earlier project at CAS with the present efforts on computer lexicography, April 3rd, 2002.

"The Toramana Inscription." Weekly five times from May to June, 2002. Participants: The Research Group and Professor Georg von Simson, University of Oslo.

"Hvem eier kulturen?" ("Who owns culture?"), with Professor Hans Fredrik Dahl at the University of Oslo. Panel speakers were the National Archivist, the National Librarian, the General Secretary of the Norwegian office of UNESCO, and the director of the museums at the University of Oslo, apart from Professors Dahl and Braarvig.

3.3   Congress panel

A panel at the Congress of the International Association of Buddhist Studies (CIABS) in Bangkok, December 2002, was devoted solely to presenting results of the CAS work on the BMSC. This material will be published in BMSC vol. iii, see below.

3.4   Internet

See also http://cdli.ucla.edu/digitlib.html, where materials of the PCTSC are employed in the extensive UCLA/Max Planck project on early Sumerian writing, mathematical annotation and symbolism.

4.   Publications

4.1   BMSC vol. ii

Braarvig, J.E. (ed.), 2002: *Manuscripts in the Schøyen Collection, vol. iii: Buddhist Manuscripts, vol. ii*. Hermes Publishing, 370 pp., ISBN 82-8034-003-3.

Contributions:

I. Sūtra:
    a. Āgama:
1. More Fragments of the Caṅgīsūtra, Jens-Uwe Hartmann
2. Fragments of the Mahāparinirvāṇasūtra, Klaus Wille
3. Fragments of the *Andhasūtra, of the Sūtra on the Three Moral Defects of Devadatta, and of the Kavikumārāvadāna, Siglinde Dietz
    b. Mahāyāna:
4. New Fragments of the Aṣṭasāhasrikā Prajñāpāramitā of the Kuṣāṇa Period, Lore Sander
5. Another Fragment of the Ajātaśatrukaukṛtyavinodanāsūtra, Paul Harrison, Jens-Uwe Hartmann
6. Candrottarādārikāvyākaraṇa, Jens Braarvig, Paul Harrison
7. Saddharmapuṇḍarīkasūtra, Hirofumi Toda
8. Samādhirājasūtra, Andrew Skilton
9. Larger Sukhāvatīvyūhasūtra, Paul Harrison, Jens-Uwe Hartmann, Kazunobu Matsuda

II. Vinaya:
10. Two More Folios of the Prātimokṣa-Vibhaṅga of the Mahāsāṃghika-Lokottaravādins, Seishi Karashima
11. Fragments of a Karmavācanā Collection: Karmavācanā for Ordination, Jin-il Chung

III. Abhidharma:
12. Three Fragments Related to the Śāriputra-Abhidharma, Kazunobu Matsuda

IV. Miscellaneous:
13. Fragments of an Early Commentary, Lambert Schmithausen, Jens Braarvig, Lore Sander
14. A Fragment of a Collection of Buddhist Legends, with a Reference to King Huviṣka as a Follower of the Mahāyāna, Richard Salomon
15. A Mīmāṃsaka among the Buddhists: Three Fragments on the Relationship between Word and Object, Eli Franco
16. Jyotiṣkāvadāna, Stefan Baums
17. Poetical Texts
- Buddhastotras by Mātṛceṭa, Jens-Uwe Hartmann
- Āryaśūra's Jātakamālā, Jens-Uwe Hartmann
- Haribhaṭṭa's Jātakamālā, Michael Hahn
18. An Unusual *ye dharmā* Formula, Lore Sander
19. A Jar with a Kharoṣṭhī Inscription, Richard Salomon

4.2 "The Thesaurus Literaturae Buddhicae" (TLB)

The results of the work on this quadrilingual lexicographical thesaurus so far are published with search machine developed at CAS on the Internet at http://folk.uio.no/braarvig/tlb/.

5. Papers to be published

5.1 BMSC vol. iii

Braarvig, J.E. (ed.): *Manuscripts in the Schøyen Collection, vol. iv: Buddhist Manuscripts, vol. iii.* The agreed deadline is October 1st, 2003.

Contributions:

I. Sūtra:
  a. Āgama:
  1. Paul Harrison: Smṛtyupasthānasūtra and other meditation texts 2380/1/1+2
  2. R. Salomon: 2179/8–9
  3. S. Clarke, P. Harrison: Nagaropamasūtra
  4. K. Matsuda: Dānasūtra 2376/176
  5. J.-U. Hartmann, K. Wille: Śalyasūtra, Śikālakasūtra
  6. Prapod Assavavirulhakarn & P. Skilling: A birch-bark fragment parallel to the Gāravasutta of the Saṃyuttanikāya, 2381/186
  7. S. Dietz, P. Skilling: Saptasuryasūtra
  b. Mahāyāna:
  8. S. Watanabe: Pañcaviṃśati 2382/271b
  9. S. Watanabe: Vajracchedikā
  10. P. Harrison: Translation of the Gandhāra version of the Vajracchedikā
  11. G. Schopen: Bhaiṣajyaguru

12. K. Matsuda: Another fragment of the Pravāraṇāsūtra (Hirayama Collection)
13. J.-U. Hartmann: Maitreyavyākaraṇa MS 2386/286
14. J. Braarvig and U. Pagel: Fragments from the Bodhisattvapiṭaka

II. Vinaya:

15. S. Clarke: Vinayoddānagāthā 2381/56, second part
16. K. Wille & C. Vogel: Uddānas and Gāthās from the Vinaya, first part
17. M. Demoto: Avadānaśataka fragments
18. S. Sasaki & N. Yamagiwa: Vinaya fragments in Gupta Brahmi
19. S. Karashima: Early Mahāsāṃghika Vinaya fragments

III. Abhidharma:

20. S. Dietz, L. Sander: List of names and technical terms

IV. Miscellaneous:

21. K. Zysk: Medical texts on leather, 2382/16–22
22. P. Skilling, S. Dietz, O. Qvarnström: Commentary on the Mahāsamājasūtra 2382/272
23. R. Salomon: Kharoṣṭhī letters from the 3rd century A.D.
24. J.-U. Hartmann, K. Matsuda: Dharmapada Commentary and related stories 2382/274, 88
25. J.-U. Hartmann: Another folio of the Jatakamālā
26. G. Melzer, L. Sander: Toramāṇa–Śrīmatī Inscription on copper from A.D. 492.
27. G. Melzer: An inscribed copper ladle

5.2   MSC

Expected to be published in 2003 in the series MSC, as partly based on work done at CAS are:

- GPSC vol. i (ed. Professor Pintaudi).
- PCTSC vol. i (Pictographic tablets, ed. Robert Englund).
- PCTSC vol ii (Mesopotamian Mathematics, ed. Göran Friberg).

- A planned volume of Palaeography, built on the methods developed at CAS, will be due in 2004. Some of the materials, however, are published on the Indian Palaeographic site developed by Professor Peter Falck, Freie Universität, Berlin.

The work on the MSC project is presently progressing on a lower level of intensity than that of the CAS period. However, earlier networks, and the networks built up at CAS are still very active, and as mentioned, planning is being undertaken to give the MSC and related studies a more permanent institution to secure their continuity – that on the basis of the high performance during the CAS period.

Constitutional Studies – the Constitution as Norm

Report by Eivind Smith

1.   Introduction

For many years since World War II, the Norwegian Constitution was largely studied in a national and historical context and in relative isolation from comparative research. At the same time, the influence from "modern" empirical thinking in the field of social sciences and so-called "legal realism" of the Scandinavian kind was important.

In opposition to the descriptive (empirical) approach to the study of the Constitution that has had a tendency to predominate, there has been a regain of interest in the study of Human Rights, among political scientists a "new-institutionalist" approach has grown strong, and developments such as the fall of the Berlin Wall, the process of democratisation in Eastern Europe and the debate on European integration have considerably enhanced the interest in constitutional studies as such.

Along these lines, the very basis for this research project lies in the idea that the Constitution should be studied (first) as (legal) norm. A normative approach opens up for studying the impact of these legal norms as well in the legal system as in society otherwise, but also of their own extra-legal normative basis and relationship to other sets of norms (philosophical, etc.).

Among questions approached by the group, the following may be mentioned: the relationship between a majority based and a "constitutional" concept of democracy; the Constitution not only as "instrument

of government" but even as a "law" to be upheld by Courts; "parliamentary studies" not only of political behaviour, but even of norms supposed to govern that behaviour; the internal structure of the system of (legal) constitutional norms; the importance of legal/constitutional elements in political arguing; the importance of legal form, for instance as to the relationship between constitutional change by formal amendment, by interpretation or by "unwritten" legal norms; and the relationship between norm and behaviour.

For the study of fundamental questions like these, it was important that the project included peoples from several scientific fields including lawyers, political scientists, historians and philosophers.

Moreover, a comparative perspective was crucial, allowing the situation in Norway, for example, to be compared and contrasted with that in other countries.

2.   The research group

Eivind Smith, University of Oslo (group leader)
Agust Thor Arnason, Reykjavik Academy of Law, Iceland
Jon Elster, Columbia University, New York, USA
Svein Eng, University of Oslo
John Huber, Columbia University, New York, USA
Egidijus Kuris, Constitutional Court, Vilnius, Lithuania
Rait Maruste, European Court of Human Rights, Strasbourg, France
Trond Nordby, University of Oslo
Olof Petersson, Center for Business and Policy Studies, Stockholm, Sweden
Otto Pfersmann, University of Oxford, UK / University of Paris, France
Bjørn Erik Rasch, University of Oslo
Peeter Roosma, Supreme Court of Estonia, University of Tartu, Estonia
Guy Scoffoni, Univeristy of Aix-Marseille, Aix-en-Provence, France
Caroline Taube, University of Uppsala, Sweden
Michel Troper, University of Paris, France
Anita Usacka, Justice of the Constitutional Court, Riga, Latvia

3.   Meetings and seminars

3.1   Lunch-time seminars

Regularly all over the year

3.2   The Constitution as political Instrument and as legal Norm

Conference at The Norwegian Academy of Science and Letters, November 26th–27th, 2001:

Introductions by Agust Thor Arnason (Iceland), Sverre Blandhol (Norway), Thomas Bull (Sweden), Jens Peter Christensen (Denmark), Matti Niemivuo (Finland), Trond Nordby (Norway), Eivind Smith (Norway), Harald Stanghelle (Norway), Fredrik Sterzel (Sweden), Stig Strömholm (Sweden), Palle Svensson (Denmark), Kaarlo Tuori (Finland)

3.3   The Constitution as instrument of change (in countries with old or new constitutions)

Conference at The Norwegian Academy of Science and Letters, January 31st–February 1st, 2002:

Introductions by Toma Birmontiene (Lithuania), Lars Oftedal Broch (Norway), Aivars Endzins (Latvia), Liia Hänni (Estonia), Egidijus Kuris (Lithuania), Gunars Kusins (Latvia), Andrius Kubilius (Lithuania), Uno Löhmus (Estonia), Rait Maruste (Estonia), Janis Penikis (Latvia), Bjørn Erik Rasch (Norway), Peeter Roosma (Estonia), Eivind Smith (Norway),

Stacys Staciokas (Lithuania), Gintaras Steponavicius (Lithuania), Caroline Taube (Sweden), Tom Thoresen (Norway), Anita Usacka (Latvia)

3.4 Alternatives to Monarchy

Seminar at The Norwegian Academy of Science and Letters, February 2002

3.5 Constitutional policy and Parliamentary Government

Seminar at The Norwegian Academy of Science and Letters, April 26th–30th, 2002

3.6 The Constitution as norm

Research Group Seminar in Rosendal (Norway), May 9th–12th, 2002

3.7 La loi et ses contrôles

Conference at The Norwegian Academy of Science and Letters, June 20th–21st, 2002 (in collaboration with l'Association française des constitutionnalistes):

Introductions by Finn Arnesen (Norway), Inge Lorange Backer (Norway), Bjørn Berg (Norway), Jean-Claude Colliard (France), Trond Dolva (Norway), Louis Favoreu (France), Anne Levade (France), Herbert Maisl (France), Jean Massot (France), Didier Maus (France), Nicolas Maziau (France), Bjørn Erik Rasch (Norway), Olivier Schrameck (France), Jens Edvin Skoghøy (Norway), Eivind Smith (Norway), Michel Verpeaux (France)

4.   Publications

Toma Birmontiene: "Judges as Guardians of the Constitution: 'Strict' or 'liberal' interpretation?" In: *The Constitution as Instrument of Change*, Eivind Smith (ed.), (forthcoming).

Sverre Blandhol: "Formalisme, pragmatisme, realisme. Teori, metode og grunnlovsforståelse hos Castberg, Knoph og Ross." In: *Grundlagens makt: Konstitutionen som politiskt redskap och som rättslig norm*. Eivind Smith (ed.), Stockholm: SNS Förlag, 2002, pp. 43 flg.

Lars Oftedal Broch: "Judges as Guardians of the Constitution: 'Strict' or 'liberal' interpretation?" In: *The Constitution as Instrument of Change*, Eivind Smith (ed.), (forthcoming).

Thomas Bull: "Riksdagen som grundlagstolkare." In: *Grundlagens makt: Konstitutionen som politiskt redskap och som rättslig norm*. Eivind Smith (ed.), Stockholm: SNS Förlag, 2002, pp. 142 flg.

Jens Peter Christensen: "Norm og praksis under grundloven som aldrig ændres.", In: *Grundlagens makt: Konstitutionen som politiskt redskap och som rättslig norm*. Eivind Smith (ed.), Stockholm: SNS Förlag, 2002, pp. 99 flg.

Aivars Endzins: "The Role of Constitutional Justice: Court Models and Procedures." In: *The Constitution as Instrument of Change*, Eivind Smith (ed.), (forthcoming).

Svein Eng: "The Political Basis of the Doctrine of the Sources of Law" (in progress).

Svein Eng: "Why Reflective Equilibrium?" (in progress).

Svein Eng: "The Concept of 'Institution' in Political Science and in Law" (in progress).

Liia Hänni: "Constitutional Arguments in Political Decision-Making." In: *The Constitution as Instrument of Change*, Eivind Smith (ed.), (forthcoming).

Andrius Kubilius: "Constitutional Arguments in Political Decision-Making." In: *The Constitution as Instrument of Change*, Eivind Smith (ed.), (forthcoming).

Egidijus Kuris: "Judges as Guardians of the Constitution: 'Strict' or 'liberal' interpretation?" In: *The Constitution as Instrument of Change*, Eivind Smith (ed.), (forthcoming).

Gunars Kusins: "Constitutional Arguments in Political Decision-Making." In: *The Constitution as Instrument of Change*, Eivind Smith (ed.), (forthcoming).

Uno Löhmus: "Judges as Guardians of the Constitution: 'Strict' or 'liberal' interpretation?" In: *The Constitution as Instrument of Change*, Eivind Smith (ed.), (forthcoming).

Rait Maruste: "The Role of Constitutional Justice: Court Models and Procedures." In: *The Constitution as Instrument of Change*, Eivind Smith (ed.), (forthcoming).

Matti Niemivuo: "Maktbefogenheterna för Republikens president och Finlands nya grundlag." In: *Grundlagens makt: Konstitutionen som politiskt redskap och som rättslig norm*. Eivind Smith (ed.), Stockholm: SNS Förlag, 2002, pp. 164 flg.

Trond Nordby: "Norges grunnlov, fra styringsredskap til symbol – og noen tanker om å gjenreise redskapsfunksjonen." In: *Grundlagens makt: Konstitutionen som politiskt redskap och som rättslig norm*. Eivind Smith (ed.), Stockholm: SNS Förlag, 2002, pp. 197 flg.

Trond Nordby: "Norges grunnlov, fra styringsredskap til symbol." *Tidsskrift for samfunnsforskning*, 2002, pp. 481 flg.

Trond Nordby: "Om makten bak steinløvene – en reise gjennom Stortingets kontroll 1814–2001." *Tidsskrift for samfunnsforskning*, (forthcoming).

Olof Petersson (ed.): *Från Fischer till Giscard: 24 röster om Europas framtid*. Stockholm: SNS Förlag, 2002. 191 p., ISBN: 91-7150-881-3.

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5. Evaluation

The group contributed substantially in building up the cross-disciplinary network in Norway in constitutional studies and between important members of this network and foreign colleagues. Intensive discussions within the group and with guests and participants in conferences, etc. will have long-standing effects on the knowledge and ways of reasoning of the persons involved. The importance of looking upon the constitution as a norm, not only as an "undemocratic" relict of the past, and of not seeing the legal character of this norm as the final word within the realm of the giving of reasons was confirmed. Parts at least of the cooperation are likely to continue under other forms in the years to come.