CHALMERS UNIVERSITY OF TECHNOLOGY

Linnaeus Centre on Engineered Quantum Systems (Linneqs)

and its Research School

Organization

The Linnaeus Centre on Engineered Quantum Systems (Linneqs) is hosted by the Department of Microtechnology and Nanoscience at Chalmers University of Technology, Gothenburg. Chalmers is a “Foundation University” that is to say, it is a legally independent establishment of higher education. The organizational pattern that dominates at Chalmers is relatively flat. The intermediary stages of planning, decision-making and reporting between department and university president are reduced to a minimum, thereby optimizing the attention institutional leadership can devote both to supporting Linneqs and to monitoring its progress. There is a direct management line from the president to the head of the host department who is mandated to pay special attention to those centres affiliated with it. Planning meetings take place yearly between president and departments at which the centre’s achievements and agenda for the coming year are discussed. A second channel of management has the directors of centres reporting directly to the president. Annual work plans are drawn up by the coordinator, supported by the departmental head and the president’s office.

Linneqs divides into three main areas: quantum bits, quantum transport and enabling technologies. Linneqs is under the charge of a coordinator to whom the three principal investigators responsible for these three areas report. The centre’s scientific board is made up of the coordinator and the three area leaders. The scientific board as too the centre itself, would appear to operate on a relatively fluid ad hoc basis, with general meetings of centre staff as well as meetings of principal investigators, area leaders and coordinator being called as and when required.

At present, within the three main research areas, Linneqs coordinates some eleven projects.
This arrangement appears flexible and pragmatic. Though one of the area leaders will retire in the near future, his successor is already nominated. Linneqs’ budgeting follows a two-year cycle at the end of which progress is evaluated. Resources are allocated in the light of the evaluation, though the process of evaluation itself is continuous. The decision to shift resources or to start up new areas falls to the scientific board. There is no formally constituted advisory board, rather external experts are incorporated into the membership of the scientific board. The scientific board allocates resources and decides which new areas should be opened up. Current plans anticipate adding to external members to the scientific board within the coming 18 months. The function which elsewhere falls to an external advisory board seems to be fulfilled as part of the on-going collaboration Linneqs has with such partner institutions as Yale, the University of California, Berkeley, Caltech and within Sweden close ties with Linneqs counterpart in the Lund-based Linnaeus environment Nanoscience and Quantum Engineering. There is, in addition, active and intense exchange with industry.

Currently, Linneqs strength draws in all upon six professors, five lecturers, two postdoctoral fellows, five researchers from junior research positions, four researchers and twenty-five students within Linneqs.

Cooperation

That Chalmers is a foundation university has considerable bearing on the positioning of Linneqs both in respect of internal and external cooperation. In the first place, the impression retained from a close reading of the documents we were given, suggests that cooperation is an explicit goal in itself rather than as an on-flowing by-product and consequence of fundamental research. Such an emphasis emerges in Linneqs mission, which is to have fundamental science serve “other actors and stakeholders”.

This emphasis within the Linneqs in turn reflects the broader institutional strategy that Chalmers has put in place. Key in Chalmers institutional strategy is the principal that the internal allocation of direct government funding should be a matter for the university and in keeping with its self-determined goals and priorities. Such priorities focus on excellence and scale with the objective of attracting further research funding and “fruitful cooperation with industry.” Internal allocation to departments is competitive and explicitly directed towards departments and research groups that are successful in generating external funding on the one hand, and on the other, show a high productivity in the number of graduated licentiate and doctoral students.

The university’s policy towards the centre is clearly based on these principles. This emerges in the fact that for the first two years of start up, all Linneqs projects are supported equally. As they develop, so their performance is assessed and support adjusted in the light of scientific productivity. That this policy is reflected with the
centre is clear. One example is the decision to transfer resources from the project investigating electrons in helium to the more promising area of graphene. Another example is the shifting of the new project from the research area quantum bits to the quantum transport area, which is an illustration, as clear as one might wish, of the performance driven nature of resourcing on the one hand, not to mention the flexibility and rapidity with which this decision could be taken, on the other.

In the matter of cooperation internal to Chalmers, institutional leadership sets particular store on Linneqs playing a prominent part in advancing the university’s long-term strategy. This strategy turns around the development of three cross-disciplinary “initiative areas” – industry and communication, materials and bio and finally, systems and environment. Expectations that Linneqs will generate close ties across other centres and departments and open up new pathways of collaboration with other research groups are explicit and high. Nor, from the evidence we have received are they misplaced. Already, this mobilizing effect has recently emerged in the area of quantum computers, which sees members of the Department of Computer Science and Engineering have begun work with Linneqs. Nor are the effects of mobilization limited to Chalmers itself. Strengthened internal collaboration reinforces, it would seem, external attractiveness, both regionally and internationally.

Leadership

From an organizational perspective, Linneqs – so it seems to us – presents several features of more than passing interest. That its organization has a relatively “flat hierarchy” has already been noted. Yet, flat though it is, it also revolves around what may be seen as two nodal points represented by a strong leadership strategy at the institutional level and an equally strong sense of self-direction within the centre itself. That rapid action can be taken to phase out an unpromising area of research and the equally rapid move into another would seem to us, to be clear pointers to the latter quality. Our exchange with Linneqs leadership was not conclusive in allowing us, with any definiteness, to detect whether the shared vision was the outcome of what we alluded to elsewhere as “scientific collectivism” at work in the centre. It is, however, very clear that the centre’s leadership, having a vision over the long-term, is singularly sensitive to the identification of areas for investigation that few have taken up and which have the potential to place Linneqs in a leading position. Two were mentioned to us: molecular electronics and ITC superconductors – domains in which Linneqs is at the cutting edge.

There is, however, another dimension to this sensitivity. It has been studied in a rather different context than weighing up the organizational initiatives that recipients of the Linnaeus grant undertake during the grant’s first phase. Several years ago, Chalmers figured as a case study of what has later come to be known as “The
Entrepreneurial University\textsuperscript{1}. One of the conclusions of that cross-national investigation into organizational adaptation was the presence of a very specific pattern of internal governance that emerged from the six cases studies of innovative universities. This took the form of an “innovative periphery” amongst the base units which coexisted together with a “strong steering core” at the level of the institution’s central administration. Though we have no doubt that, over the ensuing decade since that study was completed, Chalmers has evolved considerably – not least in the abolition of schools and their replacement by a more focused and specialized departmental structure – nevertheless we incline to the view that Linneqs’ patterns of self governance and leadership are not too distant from the pioneering model of “The Entrepreneurial University”, which the study of Chalmers helped conceptualize.

Opportunities Created by the Linnaeus Grant

The impact the Linnaeus grant has had both within Chalmers and farther a-field is generally held to be positive by Linneqs leadership. In concrete terms, such impact is to be seen in the new instrumentation that has been installed following a successful application for new equipment from a major Swedish foundation. That the application was successful, it is felt, was due in part to the recognition the Linnaeus grant conferred upon the centre. New opportunities have thus been opened particularly in the Nanofabrication Laboratory at Chalmers. Many Linneqs projects are undertaken in this setting. The opening up of new technical developments, which new equipment makes possible, has had direct consequence for both internal and external cooperation. As regards internal cooperation closer links have developed between Linneqs and the Physics Department. In the case of the external links, ties with Europe have been intensified thanks to a European Union trans-national access project, which places the Nanofabrication Laboratory at the disposal of researchers, both academic and industrial.

The Linnaeus grant has boosted the attractiveness of Linneqs both as a working partner as well as raising the centre’s profile amongst leading scientists and graduate students, a situation reflected in the rising number of participants at its colloquia and summer schools. It has spurred on collaboration between Linneqs and its fellow centre of Nanoscience and Quantum Engineering at Lund University. We retain the impression that these are not the only direct outcomes that have followed upon Linneqs successful application. A higher and more visible public profile has also conferred a measure of advantage in recruiting students to the graduate school in quantum engineering. One pointer to the already solid standing of Linneqs is the fact that of the master’s level students enrolled in the graduate school, 80% are foreign. Added to this is Linneqs ability to attract students from the Third World who, through the ERASMUS MUNDUS programme, are already studying in other European universities – a sure indication of

Linneqs drawing power for high quality students, not just in Sweden, but also in “open competition” with other universities at continental level.

The Linnaeus Graduate School in Quantum Engineering was launched in July 2006. Currently, some 23 students are enrolled. Interestingly, the school does not have a steering group. Rather, it relies on a collegial model, which brings together senior staff and students in the Linnaeus centre. Enrolment procedures at masters level follow the practices established by individual departments. At the doctoral level, student recruitment is on the basis of open competition. The graduate school does not employ students. This is a matter for individual research groups, though one consequence of support from the Linnaeus grant five new students were admitted.

Whilst the Linnaeus graduate school offers courses that are also part of the master’s programme, current focus is upon developing three courses more closely aligned to Linneqs research needs. The courses focus on superconducting devises, quantum informatics and molecular electronics. The Linnaeus graduate school is well integrated with the Linneqs project.

Strategic and International Implications

Linneqs, in our perception, is part of a broader ranging strategy unfolding at the institutional level to reinforce and reposition the long established ties between Chalmers and its external environment, regional, national and international. This is a strategy developed for the long term. There are clear indications, from both within Linneqs and at the central administrative level, in the documentation we were provided that already thought is being given to the period after Linnaeus. Linneqs is then part of a strategy, extensive both in time and in the areas of application. The purpose of this strategy is to reposition Chalmers by providing long term support to areas of basic research that hold promise on their own account, but which also have a high potential for application. This is a strategy of sustainability, which continued over the long term, has as its task to generate support from multiple sources, and not from government alone. The Linnaeus grant, in our view, serves a double function: first, to permit a highly focused and high performing research group to test its flexibility and its capacity to identify key area for long term development and, second, for central administration to verify through this particular vehicle the viability in the medium term of the reforms and the strategy it has put in place at institutional level.

Conclusion and Recommendation

Linneqs is a medium sized centre, which has fully benefited from the Linnaeus grant and so far has produced some very significant results. Its organization is parsimonious and, to some of us, seems to have built upon a very particular model that Chalmers has pioneered. It is adaptable. It is flexible and, from the discussions we have had, it works.
On these grounds, the evaluation panel would wish to recommend that the Linneqs at Chalmers be seriously considered for an increase in the grant made to it.
Organization

Learning Interaction and Mediated Communication in Contemporary Society (LinCS) is a multi-institutional centre. It brings together scholars and environments from three different institutes of higher education from the University of Gothenburg, and within it, the IT University, a joint faculty run by Gothenburg and Chalmers Universities, together with the Swedish School of Library and Information Science of the University College at Borås. It is located in the newly re-sited Faculty of Education at the University of Gothenburg, where both its leadership and administration are centred. LinCS integrates four different research groups, which earlier had varying but nevertheless overlapping research interests, skills and competences. It is governed by an eight member board, composed of the director of LinCS, five co-directors who head the participating work groups from the three institutions involved in LinCS, a representative of PhD students and the administrative head. Lines of reporting to faculty and to institutional leadership are ensured by the presence of the dean of the Faculty of Education as one of the co-directors of the board. Another board member, also co-director, sits on the university’s research board. LinCS lodges an annual progress report on its activities with the vice chancellor.

LinCS board meets once a month. Other centre staff may participate if and when required. It is a collegial body. It is responsible for the distribution of resources, the running of the centre and for its strategic development. It initiates and plans the submissions of new project applications. It decides on the enrolment of doctoral students, is involved in the recruitment and hiring of staff including researchers, research assistants and technical support staff. It plans and organizes international activities, which include conferences and seminars, reviews the scholarly output of LinCS members and monitors the centre’s dissemination policy.

The director has responsibility for the day-to-day administration.

LinCS draws upon a seven member international advisory board, which includes some of the most prominent figures in the fields of education and the study of communications: three from the United States, two from the United Kingdom and two from Scandinavia. The international advisory board plays an active and prominent part in LinCS. It advises on the research agenda, reviews the activities of the
research groups. Individually, its members give seminars at LinCS and take part in research training. The international advisory board met for the first time in June 2007 when it subjected the centres research agenda to a two-day scrutiny.

Currently, LinCS musters 5 professors, 1 associate professor, 12 senior lecturers/researchers, 5 post-doctoral fellows, 30 graduate students and PhD candidates, 1 head of administration and 6 assistants/technical staff.

**Cooperation**

In the matter of cooperation, LinCS starts from a position of considerable strength. The Faculty of Education is Sweden’s largest in terms of research and research training in this field. Within the University of Gothenburg, in shear numbers, education is the largest study programme at undergraduate level. It is to be expected, then, that substantial networks with researchers abroad have long been in place and that LinCS is in an excellent position to capitalize on them. This is born out. LinCS working groups and “collegia” (see below under “Leadership”) work along multiple “trade routes”, both international and national. In all, LinCS is tied in to some 20 “avenues of collaboration”.

LinCS networking, we reckon, is considerably facilitated by the fact that two senior members have presided of two of Europe’s key research associations, the European Educational Research Association (EERA) and the European Association for Research on Learning and Instruction (EARLI). The first brings together some 20 national associations engaged in educational research. The second is an individual membership association, which similarly draws in some 2,000 of the most active of Europe’s specialists in this field. In the areas of education and information technology applied to education, these associations occupy a portal position. They are hubs from which further networks may be sought out and developed further. This LinCS has done.

Members of LinCS have been similarly prominent in founding the Network of Excellence in Technology Enhanced Learning, funded by the European Union. This is another example of the shaping influence the Faculty of Education has wielded in organizing the European dimension of its field. Currently, one of LinCS senior members coordinates a seven-country study of professional knowledge, which uses large-scale comparative case studies to examine work restructuring in the health and education sectors.

Of particular importance to LinCS is its participation in the Learner’s Perspective study, coordinated by the University of Melbourne (Australia) into mathematics education in 15 countries. This offers excellent base data for future research and PhD dissertations and extends its networks into the southern hemisphere. The development of further ties within the Nordic region and in particular with Norway, Finland and Estonia are also in hand.

LinCS, itself the product of inter-institutional cooperation, is no less active in furthering this particular form of cooperation within Sweden. Two undertakings, we feel, are well worth the mentioning in...
this context. They illustrate the entrepreneurial range LinCS displays. The first underlines the solidity of LinCS as a research centre, the second illustrates its commitment to what is becoming known as “The Third Task” of universities – in effect, community outreach and servicing. The project Learning, Interactive Technologies and the Development of Narrative Knowing and Remembering is coordinated by a senior member of LinCS and involves the universities of Linköping, Stockholm and Uppsala. The second is sponsored by the communes of the Gothenburg region. It is a PhD programme based on some 51 PhD students in applied educational research and direct cooperation with schools and other educational establishments in the region.

Finally, we would wish to draw attention to an initiative that demonstrates clearly LinCS’ deep commitment to maintaining its prominence in the international domain. This is its determination to become a wholly bi-lingual research centre, all of whose members publish at a minimum in English and Swedish. Given our vastly insufficient grasp of Swedish, this seems to us wholly praiseworthy! That it will be mandatory for newly enrolled students to write their thesis in English can be no less so.

**Leadership**

LinCS publicly stated task is to address “[…] in empirical research […] the role of modern technologies for the transformation of teaching, learning and literacy practices, comparative studies (historical and contemporary) of the organization of classroom activities, learning in the work place and systems of life-long learning.” This is an ambitious agenda, but the evidence presented in the previous section of this report shows that LinCS is set fair upon the route which will lead on to realizing it.

Education by its nature is an area that calls upon multiple disciplines and disciplinary perspectives. Bringing them to bear in a coherent and interdisciplinary manner upon communications and media places a very heavy challenge upon the scholarly acumen and skills of leadership. Prime amongst these challenges is the organization of the structures to be used for research, for advanced induction into the emerging specifics of the field under development.

LinCS leadership is, we feel, well aware of this. The structure it has put in place shows a high degree of continuity, on the one hand, and flexible accommodation on the other. Continuity is to be seen in the system of “Collegia”. Flexibility is to the fore in the working groups. The use of “Collegia” as base units for research was taken over from the Department of Education, where obviously it had already proven itself. The Collegium in effect brings together research, practice and policy in the form of sustained and regular public seminars. In LinCS, there are four. These are:

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The Collegium for Learning, Literacies and Infrastructures in Digital Environments

The Collegium for Learning and Information Technology

The Collegium for Socio-Cultural Studies

The Collegium for the Politics of Education

The collegia are public in the sense that LinCS members take part in more than one collegium. From our view of the matter, they perform a central function in building up a synthesis to the work that has already begun to profit from the synergy generated within the centre’s work groups.

The work groups number eight. They carry out the work the projects require. Here it is that PhD students present their work during the “writing up” stage. Membership of individual working groups ranges from 6 to 15. They too see a cross flow of members between groups. They are chaired by senior scholars and are carefully scheduled to avoid timetable clashes. They focus on the following aspects:

- Socio-cultural studies
- Learning and language at work
- Learning, knowing and information technologies
- Libraries, ICT and learning
- Expertise, authority and control on the Internet
- Politics of education
- Classroom research
- Professional expertise and life-long learning

This is clearly a structure of no little complexity. Clearly, it is a project-driven, “bottom-up”, system that is both layered and also interlocking. Its architecture effectively divides LinCS into three successive strata. The structure has the specific purpose of developing new perspectives that result from the synergy brought together within the working groups, its reinforcement through “synthesis-building” as a result of cross-group dialogue within the collegia. Assessment and the diffusion of the results thus achieved, plus whatever reorientation may be necessary falls to the board, which also identifies further avenues for exploration.

Such complexity creates its own problems. The large number of working groups is not always conducive to synergy or to coherence. LinCS is already giving thought to this. One of the options currently under discussion is whether to cut back on the number of working groups and whether reductions in the number of PhD students should be made in the interest of sustaining a high level of coherence.

Given the size of the student group in LinCS and given too that the vision that underpins the centre might possibly require re-negotiation in view of the fact that of the six co-working researchers who made the original submission for the Linnaeus Award, four will face retirement in the near future, this strikes us as wise.

Opportunities Created by the Linnaeus Grant
LinCS leadership is particularly sensitive to the opportunities Linnaeus has brought them. The grant confirmed the decision of the University of Gothenburg to make research on learning one of its major priorities. Likewise, Linnaeus confirmed leadership in its strong commitment to focus on new media and on distance learning, which some of their number had been active in pursuing in settings other than LinCS. The Linnaeus grant opened the way for creating a cross-institutional base and a focal point. Equally important has been the spur the Linnaeus grant brought to collaboration, both new and intense, within the University of Gothenburg. It “clinched” the decision to link in with the Swedish School of Library and Information Services at Borås. It opened the way for LinCS members to drive down their already established academic “trade routes” with a determination renewed and with a new mission.

More specifically, having been awarded a Linnaeus grant seems to have strengthened the candidature of LinCS as the home for a national doctoral school in educational sciences. Nor is this the only area in which success recognized brings more in its wake. The decision by LinCS members to launch the Ph D programme at the Education and Research Board for Teacher Training in partnership with the regional municipalities is regarded as a direct outcome of being singled out for the grant. This initiative has considerably added to the range of high level training available at regional level. That 51 students, part and full time, have enrolled in this programme serves merely to show the extent of the demand amongst teachers for this kind of service.

**Strategic and International Implications**

It is clear to us that LinCS, on the basis of the mobilization the Linnaeus grant has set in train, has markedly advanced cooperation within the University of Gothenburg, between the constituent institutions that make up LinCS, within the region and very certainly at the international level. New staff have been engaged. New and essential equipment and facilities in the shape of a video laboratory have been acquired. As individuals, LinCS senior staff are deeply embedded in strategically important networks in the United States and very visibly so in Europe. LinCS, in short, is in an excellent strategic posture. That leadership is well aware of the dangers of “over reaching” itself, we have already had cause to remark. We feel this is the correct stance to take.

In many respects, LinCS, recent though it is, has already accelerated out of the “start-up stage”. Its internal architecture is sophisticated, multilevel and explicitly dedicated to achieving further levels of coherence and interdisciplinarity in fields that, in their classical configuration, are already well advanced along that path. That it has been able to move so rapidly is an obvious testimony to two factors: the very solid base in educational research and teaching in place prior to the formation of LinCS, and the vision its leadership has set out and is currently carrying forward with confidence and determination.

**Conclusion and Recommendation**
On these grounds, the evaluation panel would wish to recommend that the grant made to the LinCS be maintained at the present level.
KAROLINSKA INSTITUTET

Developmental Biology for Regenerative Medicine (DBRM)

and its Research School

Organization

The Centre for Developmental Biology for Regenerative Medicine (DBRM) is located on two sites, one with the Department of Cell and Molecular Biology and the Ludwig Institute for Cancer Research, and one at the Retzius laboratory which it shares with the Department of Medical Biology and Biophysics and the Department of Neuroscience. DBRM covers thirteen research groups, headed by leading scholars in their fields. Lines of communication have been established with the research board of the Karolinska Institutet to which the centre reports annually on scientific achievement, publications, deliverables, dissemination and on the general situation in respect of external and internal funding. Revisions to either research or financial plans are signalled to the research board.

DBRM is run by a director, assisted by the DBRM council of principal investigators composed of the 13 group leaders. It meets monthly to discuss current management issues and the general policy line the centre pursues. The director reports to the institute’s research board. The centre draws on the Karolinska Institutet’s technical and support services in such areas as administration, personnel, teaching programmes and general computing. With the setting up of a web-based knowledge system there is a priority, DBRM has put in place its own information technology group. In addition, the DBRM has a scientific advisory board, currently operating on an ad interim basis. With a membership of four well-known international scholars, the advisory board is extensively consulted on key strategic issues.

Currently, DBRM’s strength rests on some 107 individuals, 13 researchers who are group leaders, 6 assistant professors, 50 postdoctoral assistants, and 50 PhD students.
Cooperation

DBRM brings together areas that are fundamental to regenerative medicine, namely stem cell biology, developmental biology and neurobiology. Developmental biology has since 2001 occupied a prominent place in the Karolinska institutet’s strategic plan and, as a result, the institute enjoys a position amongst the world leaders in human embryonics and stem cell research. The establishment of DBRM capitalizes on the principle of concentrating on already acquired and internationally recognized strength in order to build up further strength in the field of regenerative medicine, an opportunity that being in possession of a ten year programme permits. DBRM is one of the Karolinska’s priority areas and one of the Karolinska’s most prominent groups in shaping the institute’s repute, both scientifically and internationally.

The pattern of cooperation DBRM displays is unusually complex and rich. At one level, it draws upon a dense and mature international network that has grown up around stem cell research and which today represents the cutting edge by linking leading centres together. This has given rise to intense exchange and close ongoing collaboration with establishments such as the University of California (San Francisco) which is the medical university of the University of California system, with Columbia University (New York), Keio University (Japan) and the A*Star programme in Singapore.

In addition to what may be regarded as the “research cooperation” nexus, DBRM lies at the hub of second series of networks which are devoted to translating the findings of research into clinical practice with the purpose of creating formal and structured interplay between the basic and clinical sciences. This second network is in the process of development and has recently taken shape in a translational research centre, based on separate sites spread over Stockholm. This second network has an important and parallel function in providing feedback to basic research as well as drawing on research in clinical diagnostics. This is underpinned through the establishment of the Translational Research Centre whose membership consists of two scientists and two clinicians.

Finally, one may note the presence of what may be presented as “lateral” research cooperation both within and without the Karolinska institutet, the former in the close ties with the Karolinska Centre for Transgenic Technology and the latter in the centre’s collaboration with scientists working on nanobiology and organic bio-electronics at Linköping University.

Leadership

The experience of DBRM’s leadership is reflected on the one hand in the strength of the vision it entertains for the coming ten years and, on the other, its undoubted and demonstrated capacity rapidly to take full account of opportunities that present themselves in the short term. Operating across a series of fields that are subject to rapid and
sometimes unpredictable change, DBRM has as its stated aim “to be a research centre operating at the highest international level”. It is clear that under the current leadership, the centre is rapidly attaining new degrees of internally generated synergy in the form of evident inter-group collaboration within the centre. A recent publication in Nature was the joint work of three groups. The addition of three new research groups to the centre during the start up phase is itself evidence of dynamism of the centre’s leadership.

DBRM leadership has embarked on a two pronged strategy for maintaining the centre at the frontiers of knowledge. This involves the use of animal models as experimental vehicles and the clinical application of cell therapy. But staying at the cutting edge has both its advantages and its price. Being amongst the world leaders allows the centre to recruit amongst the best on a global market to bring aboard new research lines and techniques. Such a policy, already evident before the centre’s foundation, has been continued at levels both senior and junior. Amongst the latter, of some 42 postdoctoral students registered in 2007, 37 were non Swedish – a pleasing an indicator of the centre’s attractiveness as ever one might wish. The price of being amongst the world leaders is the envious eyes of one’s competitors or those whose ambitions lie in the hope of becoming so. Such a situation may not prove a threat, but it places a particular emphasis on nurturing young talent on the one hand and preparing others for future leadership positions, on the other. Of both these strategic issues, DBRM’s leadership is well aware.

Opportunities Created by the Linnaeus Grant

The impression we retain from the hearing as well as from the documentation provided beforehand is that the Linnaeus grant has contributed significantly to the overall response capacity of the centre by providing a predictable degree of funding. Amongst initiatives, it has helped in the rapid setting up of KI-FISH (a breeding facility for zebrafish which serve as vehicles in developmental biology), and in the setting up of the Translational Research Centre and the further consolidation of established exchanges with Japan, Singapore and California. Equally important has been the contribution of the Linnaeus grant to strengthening the DBRM research school.

The school has developed in close relationship with the centre. The latter’s council of principal investigators acts as the school’s steering group. It is responsible for planning over the long term of the school’s curriculum and has responsibility for quality assurance. The school meets two demands: to strengthen the programme in cell biology and regenerative medicine within the research school and nationally. It organizes at advanced undergraduate level a basic course in stem cell biology, with a parallel programme for doctoral level students in DBRM and further afield. In 2008, the basic course will be expanded to between ten and fifteen students, with the possibility of extending it to medical students as an option to the degree project usually included in Swedish medical training.
The research school occupies a crucial niche in the DPRM’s overall strategy of disseminating “state of the art” knowledge in stem cell research and regenerative medicine to broader categories within the medical profession, to doctoral level students as well as to the community.

The overwhelming majority of DBRM’s PhD students take up good positions in university research or in industry, amongst the former, Harvard Medical School, University of California (San Francisco) and the University of Cambridge (UK).

**Strategic and International Implications**

DBRM is itself the outcome of earlier strategies that have knit together the various departments active in stem cell research and regenerative medicine at KI with their leading counterparts abroad. The inflow of foreign students pursuing doctoral or post doctoral study at DBRM is steady, of high quality and within the centre’s capacity to handle them. That post-doctoral students are almost as numerous as their doctoral level fellows is unusual. Even so, we take the view that this reflects the explicitly acknowledged “flagship status” in their particular domain of the groups that go to make the centre up. Whether the research school could be further expanded in keeping with demand both within Sweden and internationally may well be an issue that will make itself felt in the future. And it may well raise the well-known but predictable question of the balance to be struck between dissemination of research-based knowledge and the quest for those new knowledge breaks-through that result from constantly pushing at the frontiers of knowledge.

**Conclusion and Recommendation**

DBRM occupies a very particular, prominent and internationally salient position amongst the leading research groups in the area of regenerative medicine. Though some groups have been recently formed, they are in synergistic relationship with others who have “fought their way to the top” over the past seven years or so. The centre has shown itself well positioned to draw in the best talent internationally available, able rapidly to act upon opportunities presented and to have clearly demonstrated – and that very soon after the centre’s creation – the very real benefits that synergy and the cross-fertilization of ideas and techniques have to offer.

On these grounds, the evaluation panel would wish to recommend that the DBRM centre at the Karolinska Institutet be seriously considered for an increase in the grant made to it.
KAROLINSKA INSTITUTET

Centre for Studies on the Therapeutic and Prognostic Potential of Mesenchymal Cells of the Tumor Stroma (STARGET)

Organization

STARGET is an integrated research group within a network established to bring together cancer research across the whole of the Karolinska Institutet and more specifically to raise the level of collaboration between experimental basic research and patient centred, clinical research. It brings together seven associated research groups from the Departments of Oncology-Pathology, Cell and Molecular Biology, Medical Biochemistry and Biophysics and the Ludwig Institute for Cancer Research. Half the research groups have a marked clinical involvement, which also entails basic molecular applications on clinical material. The second half has a strong experimental orientation. STARGET is located across three “nodes”: 1) two of its principal investigators are located at the Stockholm base of the Ludwig Institute for Cancer Research, which in turn is sited in the Department of Cell and Molecular Biology at the Karolinska Institutet, 2) a second “node” forms part of that same department, whilst 3) a third is to be found in the Department of Medical Biology and Biophysics.

STARGET is headed by a coordinator who is also member of the advisory board to the Department of Oncology-Pathology at the Karolinska Institutet. The coordinator appears to report directly to the Karolinska Institutet’s board of research. The centre is required to lodge an annual report with the board of research. It includes an internal assessment of scientific achievement; publications including papers presented, conferences organized, seminars held, deliverables met, together with a report on dissemination activities, and a current risk/contingency statement. The annual report sets out the centre’s financial situation, internal and external funding included. It also presents revisions to scientific plans or to funding estimates, where necessary, for the year following.

A scientific advisory board, composed of three external and international personalities prominent in cancer
research, provides feedback on the centre’s activities. It is envisaged that a report will be submitted by the centre to the advisory board in the summer of 2009. It will summarize activities undertaken during the centre’s first three years.

Currently, the centre’s strength is made up of seven principal investigators, five junior researchers, twenty postdoctoral fellows, thirty PhD students and three senior technical staff.

**Cooperation**

As with most newly formed research groups, STARGET brings together the international networks of the individuals working in it. And in this respect, the evidence presented to us in the form of a selected list of international collaborators shows that STARGET works with the leading figures in the domain. Though individual collaboration is not always a pointer to the intensity of the traffic of exchange, nevertheless it provides an indication of geographical outreach. Of the fifteen leading scholars thus selected with whom STARGET works, seven are from the United States, two from Japan and one each from Canada, Belgium, Finland, Italy, Switzerland, Singapore and the United Kingdom. Currently, STARGET’s principal investigators have partnerships with four different networks, sponsored by the European Union. In addition, two of STARGET’s senior staff are closely involved in a series of international trial networks: the Breast International Group, the multi-centred Brain Tumour trial group BDE40 and the Nordic VII colo-rectal cancer study.

Given the nature of the research undertaken, close collaboration with the pharmaceutical industry forms an essential component in both STARGET’s patterns of outreach and in shaping its research agenda. Such linkages are especially significant from the long-term perspective and also from the standpoint of funding research. At an aggregate rather than an individual level, STARGET’s leadership is highly active in consultancy, advisory and research with world-leading enterprises such as Merck, Roche, and Novartis and with regionally based firms such as CSL in Australia, Acceleron Pharma at Cambridge (Massachusetts), and Angiogenetics Sweden AB, a start-up drug company specializing in the formation of new blood vessels.

Yet, internal cooperation within the Karolinska Institutet has to be one of the main criteria in assessing the process made during the start up phrase. This follows from the basic purpose for which STARGET was created, namely to bring together researchers working across a broad spectrum of disciplines contributing to the study of cancer and, more specifically to predict the responsiveness of tumours to different forms of treatment. Furthermore, translation research (that is the application of experimental, basic research into clinical practice) is a central feature of STARGET’s strategic purpose. Recent policy of the Karolinska Institutet has focused on recruiting very highly qualified researchers to what are best described as “interstitial” posts, either jointly held in laboratory or hospital, or which stand at the intersection of a number of different disciplines – biology, oncology, tumour and cell biology, for example. Three of the
seven principal investigators were recruited within the past four years. One solid pointer to STARGET’s international attraction is to be seen in the origins of its PhD students: one third comes from abroad.

In view of STARGET’s mission to enhance further “the integration of basic and clinical research on a broad system-oriented scale”, it is gratifying to see the degree of integration already present, not only across the seven constituent groups within STARGET, but also with other departments in the Karolinska Institutet. Collaborative projects are currently on-going with the Departments of Medical Epidemiology and Biostatistics, of Biosciences and Nutrition, Microbiology, Tumour and Cell Biology, of Biosciences, with Medicine and Surgery and the Department of Neurology.

Leadership

Our exchange with the leadership of STARGET left us with the distinct impression that the basic model on which its organization rests is one of an enthusiastic collegiality, firmly grounded in the close collective interplay between individuals and groups and with less emphasis set upon formal line-management. At the risk of over-simplification, we would incline to the view that STARGET is an interesting variant on what is sometimes known, in the phrase coined by the American sociologist of organizations, Karl Weick as “a loosely coupled organization”. In operational terms, this feature emerges in the policy of splitting resources evenly between the seven principal investigators, thereby underlining the basic principle of collegiality. One of the advantages said to accrue to such an arrangement is that the relatively autonomous groups within it are often better placed and more sensitive to changes in their environment than large, tightly-run organizations.

Precisely because STARGET has been created to ensure a rapid and efficient flow of findings and results between basic science and clinical science, between academia and industry, so it places a premium on the intensity and the comprehensive nature of its dissemination policy within the Karolinska Institutet and the hospitals with which it collaborates. Formally, dissemination activities are diverse in form and in their level of involvement. They range from half-day discussions between principal investigators on strategic developments, through monthly seminars where two or three presentations are made by post-doctoral fellows. Two annual two-day retreats review progress made over the past year as well as two-day international workshops to which the internationally foremost in the field are invited. Interaction with the scientific community at the international level is intense. In the course of 2007, senior STARGET staff have presented their most recent findings to more than 30 international meetings. The complementary activity – organizing international conferences – is equally to the fore. STARGET is taking part in organizing such events as the 2008 Keystone meeting on Hypoxia, TAT 2008 and the Karolinska Institutet’s

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international symposium on targeted cancer therapy, which took place in March this year. Invited speakers came from the USA, Canada, the Netherlands, Spain, Belgium and Norway as well as Sweden.

Indeed, the desire to disseminate seems infectious. PhD students are mobilising to create a journal club. In addition, dissemination has a solid external dimension in the form of a website aimed at health professionals and patients’ organizations. To date, STARGET had taken part in over 15 information and training events for medical doctors and nurses, quite apart from articles in popular science magazines.

The impression we retain from our discussions is that leadership is optimistic about the prospects for STARGET doing well in Europe. But that definite pronouncements on this, as too on the development of the training environment, are premature. Of major significance are those developments scheduled to take place over the coming two years. Foremost amongst them is the possible establishment of an innovative eighth group to concentrate on “target identification” with the purpose, inter alia, of examining “compartment specific” morphological and molecular characterization of human tumour tissue.

Opportunities Created by the Linnaeus Grant

For STARGET’s spokespeople the prime impact the Linnaeus grant has had, is in providing public and international visibility to a programme, which whilst both rare and visible within the Karolinska Institutet, was less evident to the outside world. Nor was impact limited to conferring a high external profile upon STARGET. Within the centre, the grant opened the way to new ideas and from new ideas come new opportunities. To be able to interact with world leading figures was one. Another, very certainly of long-term importance internally, was the speeding up of the exchange between STARGET and other networks in which its principal investigators participate. Seen from an outsider’s standpoint, it appears to us that the Linnaeus grant acted as a primary stimulus, intensifying inter-group collaboration within STARGET itself and, no less important, quickening the pace of collaboration between STARGET and other departments with which it works inside the Karolinska Institutet.

In short, the Linnaeus grant appears to have galvanized STARGET’s members to new levels of mobilization – an important development, in our view, in consolidating the critical mass of talent already in place and especially so given the “loose coupling” that is one of the salient features of the STARGET enterprise. Though interpreting these developments is always delicate and very especially so for outsiders, it would appear to us that the major contribution the Linnaeus grant has brought to STARGET is to extend its ambition and its planning horizon. This is of high significance since our perception of STARGET’s “management strategy” is that it is characterized by both its base-line orientation and its prudence. Looking forward to the period 2008 – 2011, STARGET anticipates recruiting two principal investigators at junior level and the addition of an eighth research group.
focusing on “target identification”. For the first, a strategic reserve has been set aside. For the second, grant applications are to be made to specialist agencies, both national and international, for the infrastructural investments the additional group will demand.

**Strategic and International Implications**

STARGET, to use a maritime metaphor, is rapidly “building up a head of steam”. Inter-group collaboration in scientific production is coalescing with some 40 publications in highly prestigious international journals – publications, which also reflect STARGET’s on-going collaboration with its numerous partners around the globe. The “production” of PhD students appears still to be in the start-up phase, not unnatural in our view, given that this aspect tends to display a “lagged response”. Of the students working within the seven groups, three earned their PhD in the course of 2007, two of whom have taken up research, one in the Karolinska Institutet, the other at Harvard Medical School. However, with seven students nearing the completion of their theses, it is clear that in this dimension too, STARGET will “come on stream” in the very near future.

**Conclusion and Recommendation**

STARGET, from an organizational perspective, brings together a number of noteworthy features that appear to set its inner organization apart. It is unashamedly collegial both in the structures through which it is managed, in the way budgets are assigned as in the spirit that seems to pervade it. Maintaining a “loosely coupled” environment is a constant challenge if only for the fact that in such a setting contemporary notions of “leadership” are not always easily to be reconciled with what an earlier age once termed “scientific collectivism”.

The main thrust of STARGET’s development appears, rightly in our view, to place special weight on building up its position inside the Karolinska Institutet. That it should take this approach would seem, at one and the same time, to reflect its confidence in the very solid position its component research groups already enjoy in the international scientific community and in the commercial ties that follow from high repute, ties on which STARGET can – and most assuredly does – count.

On these grounds, the evaluation panel would wish to recommend that the grant made to it be maintained at its present level.
The Royal Institute of Technology

Autonomic Complex Communication nEtworks, Signals and Systems (ACCESS)

and its Research School

Organization

The Centre for Autonomic Complex Communication nEtworks, Signals and Systems, (ACCESS), is a self-standing unit located within the School of Electrical Engineering at the Royal Institute of Technology (KTH). ACCESS brings together researchers from electrical engineering, computer science and mathematics. It is governed by a six member board which is composed of researchers and representatives of partner organizations. The board is appointed by the rector, who is also its chairman. The director of ACCESS is appointed by the rector, on recommendation of the board. He is responsible for the management of the centre and reports to the board. The director is assisted by a co-director. Together with four researchers representing the centre’s main research group, director and co-director constitute an executive committee, which discharges the day-to-day affairs of the centre and has oversight for its daily activities.

A scientific advisory board with a membership of distinguished international scholars plays an evaluatory and monitoring role, assesses the centre’s activities and presents a report together with recommendations to the centre’s board. It meets every one and a half to two years. In the light of the evaluation and recommendations submitted by the scientific advisory board the ACCESS board may revise the strategic plan for research. The board determines the budgetary allocations to the thematic research areas in keeping with the centre’s goals.

In addition to the scientific advisory board, ACCESS also benefits from an industrial advisory board. Its remit covers projects funded wholly or in part by partner organizations, industry and firms. Its remit also covers targeted activities such as workshops, seminars and courses, which the centre organizes for its partners.

This is a highly complex structure of governance. The bi-cephalous arrangement for the advisory boards is, however, logical when account is taken of the part that application and close relations with industry play in KTH and very especially of the importance of communications technology in its overall research profile. Communications technology accounts for some 30% of KTH’s research budget. All research groups have a history of both fundamental and
applied research, much of which is funded through partnerships and industry. What at first sight appears an unusual configuration of two advisory boards becomes logical once consideration is paid to the intense pressure that comes from working in fields which, like communications technology, are moving very quickly and where short-term demands from industry for targeted research are no less intense. In effect, the setting up of two advisory boards allows the centre to maintain strategic oversight over projects of a long-term nature through the function of the scientific advisory board. Similarly, oversight for the considerable number of short-term targeted research projects of high relevance to industry undertaken by the centre is ensured by the industrial advisory board.

Currently, those participating in the centre are made up of 12 professors, 8 docents, 4 doctors, 11 post-doctoral fellows and 62 PhD students.

Cooperation

It is self-evident that the centre’s strategy distinguishes between short- and long-term projects, between “curiosity driven” as against commissioned, targeted and industrial research. A similar distinction has also to be made in respect of its patterns of cooperation. ACCESS members have developed several collaborative projects, within KTH and outside it. The level of participation by research groups in projects the centre has launched, is claimed to be high. In the area of international collaboration, ACCESS is helped by the opportunity to build upon routes of exchange already in place. However, the centre is driving ahead to develop new international ties on its own.

Whilst the evidence presented to us was not comprehensive, inasmuch as it did not include the full range of the centre’s current international ties and the initiatives it has engaged upon, we were nevertheless provided with a small selection. Such a selection does give us a pointer to the level of institution with which ACCESS collaborates in the area of fundamental research. We would only point out that such data do not allow us to form any opinion as to the number of initiatives the centre has taken over the two years since the granting of the Linnaeus grant. Still less does it give us an insight into the level of “initiative taking” across the thematic research areas.

This is a pity since it is unlikely all would display a similar level. It is, moreover, highly likely that the patterns of international cooperation, whether project centred, exchanging personnel and/or students, shared training sessions or joint collaboration resulting in publications, would reveal interesting geographical differences. And very certainly so between the individual research areas. In other words, we can gain no purchase whatsoever over the density of the traffic that flows back and forth along the centre’s academic “trade routes” any more than we can gain a hold over where they lead to and the type of establishment with which the centre wishes to have dealings.

What we may glean from the information laid before us is that all four research areas enjoy very substantial ties with some of the
world’s leading technological universities amongst which CalTech, the Eidgenossenschaftliche Technische Hochschule (Switzerland), MIT, Princeton, Stanford, the University of California, Berkeley and, in a slightly different category, the Chinese Academy of Sciences.

In most cases, these networks bear a multidimensional traffic and involve joint projects, researcher exchange, workshops, joint publications or conference sessions. Details such as these are important, and very especially because they provide information that would otherwise have permitted some estimate to be made about the dynamism involved in their construction. That the centre had been able to put such intense networks of academic traffic in place during the two years since receiving the Linnaeus grant would be an outstanding testimony to its energy, and indirectly to the esteem in which it is held by its partner universities. If, on the contrary, these networks were already in place, then the esteem is no less for their being expanded. But such a situation would, in our opinion, demonstrate something else, equally important, namely, the strategy and the centre’s capacity rapidly to capitalize on established “trade routes”.

We note the active and substantial involvement of ACCESS research groups in the European Union’s networked research in the form of the 13 projects of the Sixth EU Framework Programme in which they participate.

In the area of cooperation with industrial partners, the ACCESS “platform” hosts joint university-industry projects, either industry supported or paid from external grants. The industrial workshops as part of the Industrial Partnership Programme are clear examples of the synergy ACCESS seeks to create. Such events, taken in conjunction with the centre’s monthly distinguished lecture series are truly occasions with a multiple purpose. Not only do they serve to forge new links with industry. They reinforce internal ties across KTH, whilst drawing on scholars of international standing which appears to perform a similar function vis-à-vis ACCESS’s global networking.

Leadership

The stated purpose of ACCESS is “to develop new methods and to determine fundamental limitations for the design and evaluation of communications systems and architectures […]”. It was made plain to us during the hearing that ACCESS’s aim was to become one of the top centres in Northern Europe.

To this end, ACCESS is structured around four thematic research areas. These are:

- Networked services
- Distributed management
- Communications infrastructure
- Signals and systems theory

The thematic research areas are ACCESS’ central instruments. They have the specific purpose of advancing interdisciplinarity. They are regularly evaluated and their funding seems to be conditional on a
favourable evaluation. Thus, they are also subject to revision and a shift in funding between them on the recommendation of the scientific advisory board and following the Board’s decision. At the same time, the thematic research areas are also the vehicles through which ACCESS moves towards achieving its long-term goals. At first sight, the long-term goals appear to rest on a fundamental tension, namely, how to advance a programme of strong basic research and at the same time undertake commissioned and targeted research that is seen to be highly relevant for – and by - the Centre’s industrial partners. The answer ACCESS leadership has come up with to square the circle, appears to us to be a form of matrix system on the one hand, and a strictly enforced series of criteria that govern the funding of research, on the other. The four thematic research areas mentioned above have been drawn up to provide the interdisciplinary framework. Inter-thematic projects, however, provide the cross-cutting operational means by which the centre reconciles long-term goals with short-term research results.

We take the view that the organization of leadership at the project level is the key element in ACCESS’ strategy. Each individual research area is headed up by a member of the centre’s executive board. Projects fall into two categories – either goal oriented or partner centred projects. The first come under the oversight of ACCESS board, whereas projects of the second type, are targeted research. As such, they are funded by the industrial partnership programme. Decisions relating to projects of the second type fall under the purview of the industrial advisory board. The funding of “goal oriented” projects is time-limited to two years. In addition, only those projects are retained which involve the participation across two or more thematic research groups. In such a way is the cause of interdisciplinary, strong basic research and rapid results, served.

Finally, responsibility within each project for the allocation of funding and reporting progress in achieving the particular goals of the project to the heads of the thematic research areas falls to a manager assigned to each project. Project leaders are not represented in the management structure, however. Yet, project management also plays its part in the centre’s strategy of bringing forward young researchers to positions of responsibility. Most of the leadership positions at project level have been taken up by younger staff.

Complex though this arrangement is, it appears to us already to be yielding its fruits. Six cross theme projects are currently in progress, amongst which one may mention, simply as illustration, traffic control and wireless sensing and actuation. Two industrial partnership projects are also in hand and three more have come on stream in 2008. The results, expressed in terms of publication (or accepted for publication) since the time of start up in July 2006, cannot but command respect: 95 journal papers, 182 conference presentations and 20 chapters in books!

**Opportunities Created by the Linnaeus Grant**
Though the organization of thematic areas and “goal oriented” projects shows the first substantial signs of success, this is not without its price. Tensions exist, we were told, between project leaders and the thematic research areas. In part, it was suggested, because many of the project leaders are highly goal oriented. It is here that the Linnaeus grant has had particular impact. It has opened the opportunity for project leaders to develop areas of enquiry over the longer term, thereby, we would surmise, relieving some of the tension.

Linnaeus grant has contributed significantly to the centre’s recruitment drive. Since start-up one professorial post has been filled, with another under negotiation and three senior research appointments, two of them women, have taken up post. These positions, we were told, were central to the ACCESS programme. Building up strength is one thing. To be able to draw on qualified young talent is quite another. Information technology in Sweden has expanded markedly over the past two years and universities face difficulties in recruiting graduate students in competition with industry.

The setting up of the ACCESS graduate school is one response to this situation. To date, the graduate school has focused on PhD courses that act as a form of induction to the skills and techniques utilized in the centre’s research areas and project groups. It is now extending its programme, strengthening the interdisciplinary element and developing new courses.

Visiting professors from within ACCESS international network give courses on their special fields. Industrial partners are also involved, as is the case of GST and the joint annual summer school. So far, the experience of ACCESS Graduate School is judged positive by those in charge of it. New PhD courses have been introduced and students attracted from beyond the centre’s environment. This we feel, is the way to go, and very especially so, given that currently some 15 open positions remain unfilled within ACCESS. It strikes us as paradoxical, given the ability of ACCESS to attract world experts from its networks to conduct intensive graduate courses, why it is not putting more effort into attracting graduates from establishments of a similar standing. Or even casting its net further afield in Europe and beyond.

**Strategic and International Implications**

ACCESS is a large centre. It has a very substantial basis for claiming to be the largest research grouping in the domain of communications technology in Northern Europe. It has set itself an ambitious agenda both in term of long-term fundamental research and in short term targeted research. From the information provided us, clearly some of ACCESS networks bear an intense and multilevel exchange with world leading universities in the field of communications technology. There is an obvious benefit to be had in using those networks more consciously to attract young talent at graduate level and beyond into KTH with the ultimate possibility of building up a talent reserve for ACCESS on the spot. We note the already large number of PhD students participating in
the centre’s programmes. Clearly, the main issue – and there is no sign at present of its’ diminishing – is that of retention in the face of fierce competition from industry.

The centre’s start up has brought impressive results in terms of publications and presentations.

**Conclusion and Recommendation**

On these grounds, the evaluation panel would wish to recommend that the grant to the ACCESS centre be maintained at the current level.
THE ROYAL INSTITUTE OF TECHNOLOGY

The Linné Flow Centre (FLOW)

Organization

The Linné Flow Centre (FLOW) was founded in January 2007. Like most centres at the Royal Institute of Technology (KTH) it is governed by a board and a director, both of which are appointed by the president of KTH. The nine member board is headed by the vice president of KTH, an arrangement that sets up a direct line of reporting to the President. Apart from representatives of the research groups brought together by FLOW, the Board also includes three external members, prominent in Swedish academia, industry and R&D. The external members advise the centre’s senior staff. The board, which appears to have a five year mandate, is responsible for the general orientation of research, for the detailed oversight of the project portfolio and for allocating funds. Acting in corpore, it advises the president of KTH on matters concerning the centre. The board plays a key role in the Centre’s research strategy. It decides which areas require new projects and devolves the task of preparing the project submission and its recruitment needs to the director and to the management board. The management board in its turn reports back at the following board meeting. The board also discusses all budget allocations save those involving PhD projects and post-doctoral fellowships. The decision on the appropriate amounts to be distributed is made by the board. From an administrative perspective, the centre is organized as a separate unit under the framework of the School of Mechanics.

Day to day administration is carried out by a six member management board, which brings together representatives of the five priority research groups that make up the centre. It is chaired by the director. The management board acts as the main information clearing house within the centre. The five research areas have each their responsible officer who ensures the coordination of the project and is in charge of organizing meetings amongst the group members. As part of the centre’s policy of grooming for leadership and introducing younger members of staff to leadership responsibility, the possibility of appointing a co-director has been mooted.

Currently, those participating in the centre’s activities break down into 8 professors, 7 associate professors, 3 researchers, 9 assistant professors, 3 post- doctoral fellows and 32 PhD students.

Cooperation
As we have had ample opportunity to observe in the course of the Linnaeus Hearings, the pattern of cooperation, its pace of development and the direction in which it develops tend to be a function of the type of research undertaken, of its promise in achieving significant breaks through and, last but not least, of the potential it has for innovation and applicability. As a centre devoted to the study of flows and turbulences from the mega-scale of world weather systems through to the industrial processes employed in paper manufacturing and the pharmaceutical industries, it is clear that cooperation for FLOW has many dimensions, as much theoretical as practical, internal to KTH as external. In the international domain, building bridges between institutions by FLOW over the year 2007 is indeed noteworthy with project-related movements between FLOW and the University of Oklahoma, the Argonne National Laboratory, with Princeton (USA), Tokyo University of Science, the University of Eindhoven (Netherlands), the Ecole Polytechnique (Palaiseau, France) and the Nils Bohr Institute (Copenhagen). Within Sweden, ties have been forged with the CAPPI (Compétences associées en plasturgie et procès industriels) laboratory within the STFI conglomerate, with the Swedish Meteorological and Hydrological Institute and with two graduate schools inside KTH. Sponsorship links have been set up with Airbus Industries, the makers of the giant A 380 megaplane. Finally, in May 2007, FLOW brought together researchers from Australia, the United States, Europe and Japan, working on wind-tunnel experiments, to compare methods and results, an initiative funded by the Centre. In addition to these achievements, FLOW is actively engaged in developing long-term cooperation with the Peoples’ Republic of China.

FLOW’s spirit of entrepreneurial cooperation is equally visible within KTH itself. Strong ties have been forged with the Centre for Internal Combustion Engine Research Opus (CICERO), itself founded in 2005, with the Computing Science and Engineering Centre (KCSE) and with the Centre for Parallel Computing (PDC). This is an interesting strategy. It seems to imply that FLOW sees the development of a critical mass as something to be pursued on two simultaneous but different levels – inside its own territory and at the same time by joining up with other recently established centres to generate an even higher degree of synergy than could be attained by acting on its own. That other centres see matters in a similar light would seem to us to act as a species of multiplier effect to raise the synergetic potential across all three.

**Leadership**

FLOW’s leadership stands by a vision that is dynamic, forward looking and forceful. It sees “FLOW as an outstanding environment for fundamental research in fluid mechanics, where innovative research is born and future research leaders are fostered.” Leadership has aligned the Centre around five priority areas. These are:

- Stability and transition
- Flow control and optimization
High Reynold’s number turbulence including geophysical flows
• Micro and complex fluids
• Low Mach number aero acoustics

The determination to move into new research areas – such as micro-complex fluids and geophysical flows particularly in their relation to climate change – is evident as too is the centre’s commitment to reinforcing and raising the level of quality in its long established areas of strength. Each of the five areas, we were informed, has its own operational goals and a “road map” setting out how these goals were to be achieved.

FLOW is an interesting illustration of a problem that besets many research groups and we have commented on it in other case studies. It has to do with ensuring the inflow of the highly talented young into the research domain. In some cases, it is a concern because research cadres and management are ageing. In others it is in part generated by the demanding nature of the curricular pathways leading to high levels of performance and by competition for talent that can no longer be confined to one continent, let alone one country. FLOW is interesting precisely because none of senior cadres faces retirement over the course the Linnaeus grant is scheduled to run. We agree wholeheartedly with the weight FLOW sets upon fostering research leaders and more so given the obvious primordial importance – social, global and applied – of the areas they will advance in the future, whether they involve global climate change, the implications that flow studies have for conserving energy or to aircraft noise. There is, in short, a price for excellence and international visibility. And that price is very often the covetousness of competitors for the students and the qualified researches one trains and grooms.

We take the view that the attention FLOW is paying now to the recruitment of junior faculty, to the policy of bringing in internationally recognized top researchers as affiliate professors to KTH to strengthen their ties with the centre, is both necessary and foresighted. We also note the attention paid to student induction within each of the five research areas. That each group holds regular meetings (how many times per month was not mentioned) where student work is discussed, that research activities find their outlet in seminar series (in 2007, some 35 were held) and that a visitors’ programme feeds into the seminars, all show infrastructure and provision are in place. The opening of a national graduate school in fluid mechanics, scheduled for the current year will inject, we believe, further opportunities for the build-up of the centre over the long-term.

Opportunities Created by the Linnaeus Grant

The account presented by the leadership of FLOW underlines the strategic importance of the effect the Linnaeus grant had upon the centre. In the first place, the high visibility that the prospect of winning a Linnaeus grant held out, was itself crucial. It brought about a fundamental rethinking of the frame in which research in fluid
mechanics had hitherto been set. This was the galvanizing moment, a readiness to consider a new framework in which to combine. The situation was put to us in this way: “We certainly had common interests. But we did not have a common language. Linnaeus caused us to make the effort to come together.”.

The high profile that comes of being a Linnaeus grant holder appears to have played out in two areas, each as important as the other. On the one hand, it spurred other groups for which collaboration with the grant holder acquired greater attraction. On the other, it would seem, according to the accounts presented to us, to have primed the pump of funding. We cannot think that the old proverb that “Everyone loves a winner” was unique to FLOW. It is, however, the first time in the hearings we held that this particular form of “the multiplier effect” was brought to our attention.

The organization outcome of awarding the Linnaeus grant to FLOW saw the re-alignment of the Marcus Wallenberg Laboratory, specialized in sound and vibration research, and of the Numerical Analysis group within the School of Computer Science and Communication. Both were assimilated into the Fluid Mechanics Division of the Department of Mechanics.

The impact of the Linnaeus grant did not stop here. It was also instrumental in forwarding FLOW’s strategy for scholarly renewal via the recruitment of PhD students and post-doctoral fellows. Linnaeus funding was used to start five new projects up (at PhD or post-doctoral level) per year over the period 2007 and 2008. For the three years following 2008, since the Linnaeus grant is pegged at SEK 5,000,000 a year, it is planned to reduce recruitment to one project – or student – per year to remain within budget.

**Strategic and International Implications**

FLOW has put in place a strategy that is both goal oriented and long-term. Though we reckon that the centre is still in its start-up phase, it appears to us that it has already acquired a pleasing degree of visibility and very particularly in respect of its ties with industry, though these are clearly very highly developed and have long been so in KTH itself. The opening of a national graduate school in fluid mechanics will allow the centre to consolidate what appears to us as a highly promising cross-centre alliance within the Royal Institute of Technology at the same time as it engages deeper in the preparatory stages of future researcher training. Given its commitment to bringing forward young research leaders, this initiative can only be to its benefit and add further weight to the foresightedness of the Centre’s engagement in this area.

We take note of the fact that formally the Centre dispenses with an international advisory committee. This might in other circumstances, be interpreted as a lacuna. We are of the opinion that this is not necessarily the only way to draw upon the knowledge, expertise and advice of colleagues from abroad. The centre has shown it can do this by other means – through the mechanism of affiliate professorships is very obviously one. The other vehicle that suggests itself to us is the
visitor’s scheme, which could with judicious negotiation serve a similar function, if it does not already do so.

The projects in hand combine fundamental research, innovative promise and an application that very clearly sets commercial and industrial development in a context that is far wider than usual. The centre lies then at the interface between development construed as an industrial and economic process and the wider consequences both may have upon environmental sustainability in the long term. In our opinion, it is an excellent example of what, in an old fashioned phrase, was once alluded to as “The Social Responsibility of Science.”

**Conclusion and Recommendation**

On these grounds, the evaluation panel would wish to recommend that the grant made to Linné Flow Centre be maintained.
Organization

The Linkoping Linnaeus Initiative for Novel Functional Materials (LiLi-NFM) is physically sited in the Department of Physics, Chemistry and Biology which is Linköping University’s largest and most productive department. LiLi-NFM draws on the department’s support services in such matters as funding, financial administration, human resources etc.

LiLi-NFM is an autonomous research centre within the university. It enjoys the status of a prioritized research area in the university’s overall strategy. It reports directly to the vice chancellor through an informal but tightly structured arrangement, which allows it access to strategic decision-making at the highest level. It is divided into eight divisions, each headed by a senior academic of full professorial rank. Overall responsibility for LiLi-NFM is exercised by the director, who reports directly to the vice chancellor. He is backed by a deputy director.

LiLi-NFM is coordinated by a steering committee, composed of ten professors and the vice chancellor’s delegate. It meets once a month to keep track of progress made. The steering committee decides the budget, research programme, project structure, recruitment and quality control. In addition, it serves as a coordinating body for such activities as laboratory investment, overall progress and dealing with problems as they arise. New members may be taken on as and when new strategic developments are taken up, when sitting members move to new appointments or retire. It is the guardian of the centre’s strategy. In addition, a scientific board, chaired by the director, holds an biannual assembly of all chairholders. This forum concentrates on potential new initiatives to be developed, the current performance of work in hand, set against the research centre’s overall objectives. It serves as the main channel for bringing advice, external and international, that has been passed through the various scientific networks in which the centre’s
chairholders are active. “Networking” is seen as a more effective way of keeping abreast – if not ahead of – the latest development. For this reason, LiLi-NFM has no formal international advisory group.

Currently, LiLi-NFM’s strength amounts to some 120 research staff, including 23 professors, 16 lecturers and postdoctoral fellows, 56 PhD students and 13 technical and administrative staff.

**Cooperation**

Cooperation is a central and essential component in the centre’s stated ambition to “assemble a unique synerigistic world-leading organisation capable of generating new fundamental knowledge in an area with significant innovation potential, based on wide-ranging and highly multi-disciplinary skills.” Its exchange traffic in researchers with other Swedish universities and the commitment to expanding it yet further on the international level, are impressive. Cooperation involves some 25 groups within Sweden and more than 100 at the international level.

That the university’s strategy places international cooperation as an integral part of its activity at all levels of organization – faculties, departments and research groups – and from the undergraduate stage upward – is impressive. No less so is the list of individuals and institutions with which LiLi-NFM staff have exchanged or engaged in joint publications. It reads like the Gotha of the world’s premier research universities EPFL (Lausanne, Switzerland), Lawrence Berkeley National Laboratory (California), Max Planck Institut fuer Festkoerperphysik (Stuttgart), Rutherford Appleton Laboratory (UK), Ioffe Institute (St Petersburg, Russia), and Meijo University (Japan). Nor is its outreach confined to the “top drawer” universities. There is also a substantial outreach commitment to universities in developing countries – Ethiopia, Vietnam, to cite but two.

The importance of this dimension to the centre’s positioning itself as a “world leading organization” is further underscored by its commitment to injecting additional resources to building up cooperation and networks, both inside Sweden and internationally.

**Leadership**

As a large autonomous research centre, reporting directly to the vice chancellor, LiLi-NFM demands and commands high leadership qualities, with proven managerial capacity in large-scale project management. It also demands highly knowledgeable principle investigators with substantial experience in developing, sustaining and delivering results from projects of a similar scale and scope. The leadership model replicates the classic configuration in science management, ranged around a hierarchy of outstanding scholarly achievement and managerial acumen. The outstanding feature, so it seems to us as observers, is the central place occupied by a comprehensive, complex and interlocking strategy that sets the multiple activities and priorities of the centre within a clear and overall vision. Arguably, for a large centre to realise its aims,
requires such complexity. It has to work across a combination of fields that are each in their particular ways, subject to rapid evolution. Unexpected breaks through have to be taken into account. Such developments have to be factored in if the centre is to sustain its position “at the cutting edge”. It may be argued that this is a conditio sine qua non if a large centre is to realise its aims across a combination of fields that are each and therefore in unpredictable degrees, subject to very rapid evolution, where unexpected breaks through have rapidly to be taken into account above all, if the centre is to sustain its position “at the cutting edge”. Be that as it may, its presence is a clear indication of the high leadership capacity on which the future of the centre rests.

Opportunities Created by the Linnaeus Grant

Both as a priority area in Linköping University and through its own entrepreneurial activities, LiLi-NFM is a resource intensive environment. From this it follows that the contribution of the Linnaeus grant depends closely on the activity to which its resources are allocated. The grant’s impact falls into two areas. First, it enabled the centre to establish – as intended in the original application – a coordinated laboratory for interdisciplinary research on novel materials, thus increasing its visibility. Second, it allowed the centre to take rapid action in one dimension that occupies a key position in the overall strategy, namely the renewal of human resources at two levels. The first of these levels involved senior appointments and, as a result, the setting up of two new divisions within the centre – nano-structured materials and functional electronic materials. The second level involved the long term development of the centre by recruiting at junior and postdoctoral levels, together with putting in place of a “tenure track”, appointments which are competitive.

Recruitment is a sensitive indicator of a department’s standing and attractiveness, just as it is of its effective outreach. Recruitment patterns show LiLi-NFM to be a global player and, moreover, one that can demand and get the best. In recruiting young researchers, the centre laid down a number of prior conditions apart from outstanding performance and high potential, namely that applicants should have a solid international experience and have worked at another university. The mixture of recruitment from Sweden and abroad in the four positions filled shows the centre’s ability to move quickly. In effect, the Linnaeus grant demonstrates the centre’s ability, through an aggressive strategy, to turn what might otherwise have been a threat, namely the retirement of a number of senior staff, into an opportunity to move forward and build upon previous achievement.

Strategic and International Implications

LiLi-NFM’s strategy is unabashedly proactive, both in the drive to move into new fields or in intensifying its efforts in consolidating those where it is already active. The same posture extends to its international outreach and networking between leading individual scholars, as well as
its participation and collaboration in major EU research networks and partnerships, with other universities and with industry. With patents taken out by five principal investigators, one spin-off company founded by one of its plasma and coating physics division in 2007 and 15 additional “nodes of collaboration” added since 2006, its capacity for initiative is both sustained and pursued across a broad front.

Conclusion and Recommendation

LiLi-NFM has demonstrated without a doubt its ability to move quickly, with purpose and to integrate the resources of the Linnaeus grant into its overall strategy by investing in the renewal of its talent base at both senior and junior levels. This has had immediate consequences in allowing the centre to extend the number of its basic research divisions. The Linnaeus grant has enabled the centre to invest in its long term sustainability.

On these grounds, the evaluation panel would wish to recommend that the LiLi-NFM centre be seriously considered for an increase in the grant made to it.
LUND UNIVERSITY

Centre for Economic Demography (CED)
and its Research School

Organization

The Centre for Economic Demography (CED) is a multidisciplinary and cross-faculty research unit, located in the School of Economics and Management at Lund University. It brings together researchers from the departments of Economic History, Economics, Social Medicine, and Statistics, from the School of Social Work, and the Lund University Centre for Health Economics. The centre reports on a regular basis to the dean of the School of Economics and Management, which also provides the centre with administrative support services in such areas as funding, staff and logistics.

CED investigates the complex interconnections between population and economy. It is headed by a director, nominated for three years, who lodges an annual report on the coming year’s management plan, current budget and activities with the dean. The director chairs the board of CED, which has the legal responsibility for the centre’s management plan, included strategic development, research activities, and annual budget. In addition, it is responsible for the appointing an international advisory board, composed of ten members drawn from the Nordic countries, as well as the steering committee of the Research School on Economic Demography (RSED). The director/chairman of CED, together with three other members of the board, are appointed to serve for three years by the dean of the School of Economics and Management, after consulting with the deans of the Faculties of Social Science and Medicine. The Student Union of Lund University appoints a student representative to the board and determines its representative’s the length of service.

The board of CED, on the approval of the deans of the Faculties of Social Science, Economics and Management and of
Medicine, appoints an international advisory board of between three and five prominent international researchers in the domain. The advisory board serves for three years, and they meet each year. Its assignment is to provide advice, encourage and advance the exchange between CED and the international research community world-wide, and to evaluate CED’s activities over the interim period.

Currently, CED’s strength is made up of nine professors, twelve associate professors, one senior lecturer, four post doctoral students, fourteen registered PhD students and eight support staff.

Cooperation

CED is in the advantageous position of benefiting directly from the work of its forerunner – the Research Group in Economic Demography – in the build up of extensive and particularly dense networking both individually and collectively. The 20 years experience of its pioneering parent in forging close and long sustained ties within the university with disciplines such as economics, social work, statistics and social medicine has laid down a proven infrastructure for cross-disciplinary collaboration. By the same token, CED has also inherited a series of long-standing ties and working relationships at the international level. Thus, the main characteristic in the patterns of collaboration CED displays, both internally and internationally, is then one of change in the midst of continuity.

This is important, not simply because it allows the centre to negotiate the further development of its international outreach from a position of acknowledged strength. Such enduring ties also yield uncontestable evidence of the promise and potential CED now possesses. Noteworthy in this respect has been the central part played by CED’s predecessor in setting up the EurAsian Project on Population and Family History which brought together five research groups across Belgium, the Peoples’ Republic of China, Italy, Japan and Sweden. As a path-breaking venture in developing the methodology of cross-national comparison, this project has been instrumental in shaping that high international standing which the CED is now in a position to advance further. Another highly significant contribution lies in constructing longitudinal databases in the field of demography.

A rapid perusal of the centre’s current international research projects lays bare a series of highly dense networks impressive by their links with large numbers of researchers and research institutes around the Baltic region, in practically all Western Europe countries and with leading research universities in the United States and Japan.

The maturity of these external channels of communication and productivity has already moved CED’s mode of cooperation onto a new level, concretely to be seen in the five year agreement passed with the Institute of Population Research at Beijing University (China). In addition to research collaboration, the agreement covers training by CED of Master’s and PhD level students. A similar momentum has been built up in the centre’s relationship with the Max Planck Research School of Demography. The arrangement will entail a year’s presence of some 20...
of its PhD students at Lund. Further avenues for joint research are being opened up with the Vrije Universiteit (Amsterdam), Åbo Academy (Finland), and Linköping University.

Leadership

Interestingly, the purpose the centre sets itself makes little or no mention of the quest for prestige and recognition, doubtless because these are taken to be a “situation acquise”. Rather, its aims relate specifically and almost exclusively to advancing the state of the art in economic demography and to the further development of the interplay between the centre’s component disciplines to which economic history has recently been added. More specifically, its agenda includes advancing knowledge of individual behaviour and demographic outcomes during that silent social transformation from an agrarian to a modern welfare society; gaining greater understanding of present day behaviour and health using individual full life histories and, finally, the impact of economic change and the rise of welfare institutions upon individual behaviour.

The implications that follow from such an agenda are clear. They are, first, that it focuses on major lacunae in current knowledge. Nor are they confined to Sweden, though obviously, the unique and comprehensive nature of the data Sweden possesses in this domain will serve to diminish them as well as generating new techniques and insights. Second, though largely implicitly because nowhere stated as such, that CED will continue to exercise an initiatory and pioneering influence at world level.

Yet, continuity does not always guarantee the capacity to sustain excellence. In this connection, we note that of the ten researchers whose names figured on the original submission for a Linnaeus grant, four will reach retirement age during the period the grant will cover. Happily, the centre’s development plan takes this into account. Of the eight members of the centre’s board– three deputies and one full member – are in mid career. That the “changing of the guard” is anticipated shows there is also continuity in the midst of change! Similar consideration, rightly in our view, has been paid to the age structure of management in the Research School in Economic Demography. The scientific advisory board is made up of distinguished senior scholars. This situation, we were told – and we are convinced by the argument – poses no threat either in the short or the long term. On the contrary, it allows a creative synthesis to be sustained by allying long experience of senior academics in teaching and supervision with the innovative drive of younger members.

We retain the impression that setting the centre in place has been smooth, trouble free and successful in integrating it into the university. Furthermore, the scientific output of those involved in the change-over has maintained an enviable momentum of some 174 new publications since the start-up as well as launching five new projects.

Opportunities Created by the Linnaeus Grant
The Linnaeus grant has provided the centre with a crucial measure of stability and imparted new vigour to the centre’s ability to plan over the long run. Previously, reliance on short-term grants had, we were told, placed considerable limitations on its ability to recruit on a long-term basis. The one area where such constraint was particularly marked was overseas recruitment. Given that the centre as well as extending its networks of cooperation was also in a position to benefit from a long standing skein of mature and sustained research linkages, we took the view this aspect merits further clarification.

It goes without saying that both the dynamics and the process of consolidating international networks are never standard. Each department or base unit has its own way of proceeding. In the case of CED, it would appear that overseas outreach occupies a particular niche in building further ties with certain foreign establishments, ties that go beyond mutual exchange and benefit of research collaboration. For a centre at the centre of shaping “the state of the art”, transmission of cutting edge knowledge and training, above all to students coming from abroad, is a very positive pointer to its global standing, as is the broader issue of keeping the public abreast of its achievements.

Seen from the centre’s long-term strategy, access of both Swedish and foreign students to the courses provided by the Research School on Economic Demography appears to us as the natural complement – and sometimes as the final step – in placing inter-institutional links upon a solid and multi-faceted basis, to which the Linnaeus grant has contributed substantially. Not only has it provided the Centre with the means to bring in further perspectives – the move by Economic History into the domain of the economy of the family and gender, the development of new concepts of well-being, for instance. It also gives a powerful signal to the international scholarly community and, by so doing, opens the way for new partnerships to be forged.

In this connection, the focus of the Research School on Statistical and Sequence Analysis, multilevel modelling and immigrant integration provides a solid and challenging technical grounding to both the Master’s and PhD level programmes in economic demography. We were told that the research school is “only now coming into its own”. Even so, given the mission to train both students and established researchers to a high international standard the research school clearly has a vital role in placing the relationship between the centre and its chosen partners abroad on a very solid footing that embraces research, student exchange and teaching. Particularly noteworthy in this regard are the ties with the Max Planck Research School in Demography and the possibility of bringing the European Doctoral School in Demography to Lund in the autumn of 2009.

Of equal interest is the attention the research school pays to creating opportunities for PhD students to develop their own personal networks and to have their work commented upon by their fellows, by CED members and by the advisory board of the research school.

**Strategic and International Implications**
The CED has a certain similarity with the Ageing and Living Conditions Programme (ALC) at Umeå University with which it collaborates closely in both research and student training. It possesses a uniquely comprehensive, longitudinal data base that brings together at the individual level information in such areas as demography, economics and social medicine in the form of the Scanian Demographic Database. With a local coverage across some two and a half centuries from 1646 to 1895 and a national coverage for the period 1968 to 2007, this is a resource unrivalled in its detail and comprehensiveness. The systematic exploitation of this resource over more than two decades not only has placed the centre and its predecessor at the crossing point of singularly dense scholarly networks that are world-wide. It has also shown the ability of the centre to build further upon them and to bring them to a new stage of maturity, thereby intensifying further channels of exchange that are demonstrably proven, sustainable and of central importance to developing the field of economic demography.

**Conclusion and Recommendation**

The Centre for Economic Demography is effectively the product of the opportunity the Linnaeus grant made possible to expand and to develop further an earlier environment, which had already “won its spurs”. It has, with commendable speed, added new perspectives to those that had already laid down the ground work for path-breaking investigation. It commands excellent networks, both within Sweden and abroad. The Centre links in with the major research institutes active in this generic domain from the USA to China.

On these grounds, the evaluation panel would wish to recommend that the grant made to the Centre for Economic Demography’s be maintained at its present level.
LUND UNIVERSITY

Innovation, Entrepreneurship and Knowledge Creation: Dynamics in Globalizing Learning Economies (CIRCLE)

Organization

The Linnaeus environment that focuses on Innovation, Entrepreneurship and Knowledge Creation (IEKC, editors annotation) is physically located in the Lund University Centre for Innovation and Entrepreneurship (LUCIE). LUCIE brings together five different Departments from four faculties: the Departments of Economic Geography, Economic History, Business Administration, Research Policy Institute and Division of Innovation. LUCIE has been described as an interdisciplinary forum, set up by members of Lund University’s academic staff to present their research and to identify new and promising openings for cross-disciplinary research. The Centre for Innovation Research and Competence in the Learning Economy (CIRCLE) is one of the constituent groups in LUCIE. The Linnaeus grant to develop the environment Innovation, Entrepreneurship and Knowledge Creation was made to CIRCLE in July 2006. In September 2007, CIRCLE moved into the renovated facilities of LUCIE, together with the Research Policy Institute and the Lund University Innovation System (LUIS). Combined, these units, it is claimed, constitute one of the world’s largest and most comprehensive centres in the fields of research policy, innovation and entrepreneurship.

Research supported by the Linnaeus grant in CIRCLE comes under the responsibility of a director, assisted by a deputy director. The director is advised by a five member steering committee. The director in turn reports directly to the vice chancellor, to the head of university administration and to the vice rector in charge of research, an arrangement held to be beneficial for the rapid integration of the Linnaeus environment into the Lund University. This direct line of reporting to university leadership reflects the fact that, in this particular instance, the Linnaeus environment does not form part of the faculty
structure. There is no scientific advisory board specifically set up for the Linnaeus environment within CIRCLE. Rather, to avoid undue complexity, the Linnaeus environment draws upon the nine member international advisory board, originally set up to advise and review the programmes of CIRCLE. It meets once per year.

Currently, CIRCLE of which the Linnaeus environment is part, draws its strength from more than 30 researcher and 3 administrative staff.

Cooperation

Close study of the documentation presented, clearly points to a very particular dynamic at work both in CIRCLE and, by extension in IEKC itself. The founding impulse for the former is itself an expression of the desire for closer cooperation amongst individuals and, no less relevant, amongst the leadership of Lund University. From this perspective, it may be argued that, in effect, IEKC is the most recent expression of a sustained determination to build up research and teaching around the issues of innovation, entrepreneurship and growth. It is, so it would seem to us, to be the third phase in a university-wide policy to bolster interdisciplinary research across several faculties, or in this specific instance, beyond them.

In this context, LUCIE stands as the first initiative in the area of innovation and entrepreneurship and sets the overall frame. CIRCLE, created in July 2004, is the second stage, with IEKC as the third. Since CIRCLE was itself the creation of two substantial grants from VINNOVA and the Swedish Research Council, arguably IEKC is, at one and the same time, both the product of success building upon success in terms of the funding it has obtained in open competition and in the building up of research units as a result.

There is, however, an additional dimension in IEKC’s pattern of cooperation. This is to be seen in the close, even symbiotic relationship it has with CIRCLE. In operational terms, this emerges in both CIRCLE and IEKC sharing a common international advisory board. This has obvious advantages, not least of which the ability to call upon external advice from international experts already implicated in the activities of CIRCLE to be brought to bear on the affairs of IEKC. This is a clear illustration of synergy working from outside in. The converse, we would argue, is no less beneficial: namely, that the research programme of IEKC can very quickly be transplanted into those networks of exchange and cooperation already in place as a result of previous initiatives by CIRCLE. In short, the recognition of CIRCLE as one of the five national Centres of Excellence in Sweden funded by VINNOVA rubs off, or in a less demotic expression, acts as a guarantee for the quality and significance of the work done by IEKC. Thus, the pattern of cooperation is both highly dynamic and invested with an accumulated momentum built up around CIRCLE, just as CIRCLE in its turn seems to have derived much benefit in these same dimensions from the Lund University Centre for Innovation and Entrepreneurship.
CIRCLE’s networks and the traffic of exchange they display in terms of projects and publications are impressive, substantial and bear witness to the rapid mobilization and cross-disciplinarity that impels them forward. Linnaeus research cooperation includes the Science Policy Research Unit at the University of Sussex (UK), Università Bocconi in Milan (Italy) and research on innovation with Manchester University (UK), University of California (Berkeley), the London School of Economics (UK), Universitat Pompeu Fabra, Barcelona (Spain), amongst others.

Yet, it ought to be pointed out that symbiosis also has its disadvantages, and very especially so for the outside observer. It is, for instance, by no means obvious to us how the line may be drawn between those activities, intellectual products and outputs that fall under initiatives generated within CIRCLE and those that might clearly and without ambiguity be attributed to IEKC as a Linnaeus environment. It may well be, of course, that to do so is to impose an artificial distinction, which in reality does not exist. If this is the case, and we are ready to be persuaded by such an argument, it is, we feel, necessary even so that the impossibility of drawing such distinctions be explicitly stated.

Leadership

IEKC has been set up around an ambitious agenda, which “will […] mobilize the whole environment for the renewal of the research area to create a leading world centre in its field.” As the latest stage in an ongoing saga in pushing inter-disciplinarity to its limits, it is in the logic of this goal that IEKC’s basic research framework should be arrayed around three horizontal research platforms intersected by three vertical perspectives. The former are:

- Knowledge creation processes
- Transforming knowledge into innovation
- Turning innovation into growth

The latter three perspectives revolve around:

- Competences
- Regional, sectoral and national systems
- Governance

Each platform is managed by a senior and by a junior researcher, each from a different disciplinary background, a judicious decision since it takes fully into account the strategic importance of sustaining inter-disciplinarity. It was explained to us that the arrangement around platforms and perspectives was an evolutionary construct in the sense that it built out from an earlier focus of CIRCLE on the Swedish national innovation system. IEKC, by contrast, is more clearly oriented towards basic research and towards processes rather than structures. This matrix structure, it was put to us, provides a more satisfactory framework for integration. The three platforms are seen to be more dynamic. And within them, smaller groups are not merely active. They are mobile across more than one platform. In addition, the platforms permit a close
monitoring of both results and output. This, however, is not the whole story. Such a flexible arrangement is at the centre of developing a geographically more extensive coverage and involvement, explicitly mentioned as the specific mission that identifies IEKC: that is, its engagement with globalizing learning economies. Progress towards achieving that goal appears to us to be well in hand, with research that concentrates on innovation policy in Japan as well as R&D policy in India and the Peoples’ Republic of China.

Clearly, between IEKC and CIRCLE the boundaries are permeable and individual researchers are mobile across them. However, what is one individual’s permeability may, like as not, be another’s opacity. We were impressed both by the amount of funding CIRCLE, IEKC and their individual members had succeeded in attracting from both Swedish and European sources. What we missed, and it is a mere detail in itself, was any specific linkage between individuals, the funding of their projects and precisely how this fitted in with the three platforms. Yet, this link, we would suggest, ought to be made. This will allow leadership to gauge the viability of each platform on criteria that – in addition to publications, dissemination and individual movements across platforms – also afford some insight into their funding generating capacity as well.

**Opportunities Created by the Linnaeus Grant**

The opportunities the Linnaeus grant has brought to IEKC and to CIRCLE are substantial and have been acted upon speedily. The Linnaeus grant has provided stability. It has created that leverage which opens up wider possibilities to receive further external support. It has, we were told, opened the way to participating in activities not previously envisaged. It has increased the tempo of exchange with other departments at the Lund University.

In terms of operational, as opposed to perceptual, benefits, Linnaeus money, we were informed, has been invested in the construction of databases, in building up solid ties of excellence with Europe amongst which with such networks as PRIME and DIME (sixth framework programme network of excellence in Sciences and innovation Policy Studies and in Dynamics of Institutions and Markets in Europe). Recruitment has also benefited with six new positions being funded from this source. Noteworthy in this regard was both the number of applications received for these appointments as indeed, their geographical origins for both give us an insight into the attractiveness that IEKC enjoys through CIRCLE. More than 60 applications were received from all continents. The candidates finally retained show a commendable sensitivity towards the issue of gender balance on the one hand and to an equal awareness of balancing home bred talent with international expertise on the other. Of the six retained, three were men, three women and three were from inside Sweden, three outside!

We take note of the developments proceeding in parallel in CIRCLE. And whilst some of them are of undoubted importance in confirming its profile as much within Lund University as without, we
also note that their origins predate the moment when CIRCLE received the Linnaeus grant. The International Master’s Programme in Society, Science and Technology that enrolled 14 students in 2007 and which, following the Bologna format, was extended to two years in that same year, in effect was launched in 2005, likewise, the obvious commitment of CIRCLE academic staff to undergraduate teaching.

We note with approval the launching in 2007 of four courses at the Faculty of Engineering and one for which CIRCLE staff were responsible in the School of Economics and Management. Amongst the topics covered are innovation management, global competition in high tech sectors, tools for innovative management, business planning and innovation systems and regional clusters. These are self-evidently topics of central importance. We would even so be hard put, on the basis of the exchanges we had in the course of the hearing, to decide in what way this activity has been inspired or forwarded by the Linnaeus grant. Juxtaposition in time and place does not necessarily denote causality, though clearly one cannot rule out the indirect and subtle working of inspiration and enthusiasm, either.

**Strategic and International Implications**

IEKC has got off to a flying start. It is clear to us that, if the hopes of its leadership are realized, then the programme – and whatever accumulates around it in the way of new research groups and new points of research concentration over the ten years of the Linnaeus grant’s span – would appear to be well set to flourish in a post-Linnaeus world. As we perceive matters, IEKC has been able to move quickly precisely because it is embedded within a centre which itself stands at the crossing point between the study of innovative processes and the translation of that knowledge into action. Being in a milieu specifically created by interdisciplinarity to advance new forms of that same perspective, the promise of attaining a very high degree of cross fertilization is well within grasp.

We would merely wish to underline a point previously addressed: namely, that if the benefits of synergy are to be appreciated to the full, careful track ought to be kept of the performance, both intellectual and in terms of concrete achievement including the monies earned across the participating groups even as they evolve. Fulfilling this goal, we feel, has yet fully to be met.

**Conclusion**

On these grounds, the evaluation panel would wish to recommend that the grant made to the environment Innovation, Entrepreneurship and Knowledge Creation: Dynamics in Globalising Learning Economies at Lund University to be maintained at the current level.
LUND UNIVERSITY

Hemato-Linnaeus and its Research School

Organization

The Hemato-Linnaeus Environment is located at the Biomedical Centre in the Faculty of Medicine at Lund University and is affiliated with the Lund Strategic Centre for Stem Cell Biology and Cell Therapy. The environment brings together ten research groups under the leadership of five full professors, two associate professors and three research scientists. The environment draws on technical services, infrastructural and other administrative support from the Lund Stem Cell Centre and Stem Cell Programme.

The environment is run by a coordinator who, together with all principal investigators, forms the Hemato-Linnaeus steering group. An executive committee of four principal investigators assists the director in identifying strategic issues, deciding the criteria for recruiting new staff and students, and in allocating the budget. A direct line of regular reporting to the vice-chancellor or the assistant vice-chancellor is in place. The main line of responsibility between Hemato-Linnaeus and the university in general passes, however through the dean – or vice dean – of the Faculty of Medicine who receive regular progress reports from the coordinator. Also along this latter decisional chain pass such matters as senior staff recruitment. The Lund Stem Cell Centre provides general administrative backup and financial servicing. Other administrative issues, relating to personnel, health and safety come under the responsibility of the Department in the Faculty of Medicine to which individual principal researchers are attached. The Environment relies considerably on a scientific advisory board, composed of four external scholars of international pre-eminence in the fields of haematology, haematopoiesis, leukaemia research and stem cell biology.

The scientific advisory board provides advice on identifying areas for future development. It also evaluates the quality of the environment’s output as the basis for considering possible options open to the environment for further development of a strategic nature. Evaluation of the environment revolves on a two-year cycle. The first internal evaluation of the environment was made in September 2007 and involved hearings of senior staff presentations spread over two days. The opinion of one of its members on senior staff recruitment was
instrumental in the final choice of candidates. It is our impression that the role of environment’s scientific advisory board’s role is more extensive than its counterparts elsewhere.

Hemato-Linnaeus’s research programme is underpinned by a special research school in stem cell biology under a director of studies. Management of the research school follows the organizational model of its parent programme. It is headed by a steering group, composed of specialists in stem cell biology, including the coordinator. It exercises overall responsibility for planning the school’s budget and programmes. The steering group meets three to four times per year. A four person executive committee, including the director of the school, oversees course content, and strategic development. It meets monthly and prepares the agenda for the research school’s steering committee.

Currently, the Hemato-Linnaeus Environment brings together nine principal investigators, full professors and junior faculty included, twenty-four post doctoral fellows and research associates, eleven PhD candidates and eleven supporting staff.

Cooperation

Cross-frontier and international cooperation are the life-blood of scientific research, always necessary, rarely sufficient. Clearly, the Hemato-Linnaeus environment is the direct beneficiary of earlier and very solid channels of cooperation that the coordinator and his senior staff have brought with them and which are now focused in and on the environment. An interesting variant in the mode of cooperation appears to be developing in the Hemato-Linnaeus environment. This may be described as “embedded cooperation” – that is, ties between individuals and their institutions have, over the years, acquired a semi-permanent and structural status. The practice of dual appointments is particularly interesting in this regard. Amongst the environment’s principal investigators are senior visiting scholars whose permanent base is elsewhere, at Oxford or the European Molecular Biology Laboratory, for instance. Their role is held to be especially important to the environment’s success. In other instances, long established lines of cooperation have matured into formalized exchange involving contractual ties. Such an arrangement is to be seen in the environment’s link with Keio University, Japan. Other long-term ties with world-leading establishments is no less evident. Amongst these, one may cite Harvard Medical School and Stanford University, California. Equally interesting, though very certainly a phenomenon present in the exchange nexus of other programmes active in the Linnaeus grant scheme, is the clear use the environment makes of these long-term relationships in recruiting its younger and highly promising talent.

A careful reading of the documents presented to us suggests that the environment derives much benefit from its location in the Medical Faculty and from its affiliation with the Lund Centre for Stem Cell Biology. For whilst it has resolutely urged its own international outreach forward, it also benefits from similar initiatives by its host partners. Thus, international cooperation and its recruitment aspects not least, appear to benefit in no small degree from the internal
organizational relationship between the environment, the Centre for Stem Cell Biology and the Medical Faculty and very particularly when the priority on recruitment falls into the clinical domain. It seems to us both natural and desirable that the environment should be able to “piggy back” on the already solid lines of communication and cooperation that the University of Lund has forged with such consortia as Universitas 21 and the League of European Research Universities and that, in its turn, the environment should both draw from and add to, Lund’s claim to be the most prominent amongst Sweden’s universities in the European Framework Programmes for Research.

Leadership

The declared ambition of the Hemato-Linnaeus Environment, we feel, is in keeping with the scientific achievements of its leadership. It is “to become a truly world-leading and dynamic research and training environment in the competitive field of normal and malignant hematopoiesis research.” The vision is clear and the strategy by which it is to be realized, progressing with admirable expedition. In some cases – for example in scientific output – the schedule has been surpassed as also the rate of progress achieved in developing the research school.

Key to the environment’s strategy has been the weight placed on recruiting outstandingly able young principal investigators with particular attention paid to their potential to attract external funding at a very high level. Particularly interesting is the policy of differential allocation of support to new principal investigators. This policy, continued over the three years following their appointment, allows them rapidly to “come on stream” and make their mark with both Swedish and European research funding agencies. The strategy that the leadership has drawn for the long-term is thus aggressive and highly proactive. Here too indications are that the environment’s funding strategy is beginning to take off and the coming years will see increasing attention paid to “grantsmanship”.

The strategy of the environment’s leadership has reached a high level of operationalization especially with respect to internal collaboration and inter-group complementarity within the environment. Since its start up in 2006, some twenty one joint publications give witness to this internal collaborative dynamic, six of which were the outcome of collaboration across three of the environment’s groups – a pointer to the degree of synergy already present.

External positioning, however, is balanced on the one hand by the need (already identified by the environment’s scientific advisory committee) to strengthen the flow of basic science into clinical practice and, on the other hand, most particularly to link in with highly qualified clinicians at all levels from the institutional through to the international.

Opportunities created by the Linnaeus grant
Our exchanges in the course of the hearing pinpointed one particular difficulty that would seem to lie across the path of research environments whose strategy is based on rapid build up in human resources on the one hand, and, on the other, the necessity of sustaining excellence, once it is attained. It was pointed out to us that the drive towards excellence, a doughty challenge in itself, is certainly made no easier if postdoctoral students cannot be taken on. In the case of the Hemato-Linnaeus environment, the Linnaeus grant provided the resources that allowed each principal investigator to hire a postdoctoral student to work full time. The Linnaeus grant provides therefore that indispensable foundation and infrastructure to lay out long term recruitment policy reaching down to the graduate level. It involves a two step procedure for recruiting students to the environment.

The Hemato-Linnaeus research school is closely integrated into the overall purpose of attracting high ability students into stem cell biology. One feature, which impressed us, is that the process of identifying young talent appears rather more deeply penetrating than other schools engaged in a similar purpose. The research school provides both a short course programme and an advance course in stem cell biology, both of which are up and running.

There are, however, other activities that merit closer scrutiny, both from the pedagogic standpoint and from the no less vital matter of advanced leadership training. The development of an innovatory form of thesis supervision involving three supervisors – one external – would seem to be the logical step to inject into PhD level training the inter-group synergy already noted above. It would appear to represent a major contribution, not just to enlarging a student’s professional network. Its obvious function must be to demonstrate the very real intellectual benefits to be had when small-scale synergies are brought directly and at an early stage, into shaping a student’s personal experience.

This is not the only feature that shapes the particular identity of Hemato-Linnaeus’s research school. As the environment itself demonstrates, leadership skills, project management and inter-group dynamics are necessary complements if scientific brilliance is to become institutional excellence. But in a fast-moving, highly competitive, international environment, there is no little advantage to be reaped from acquiring communication skills, entrepreneurship in commercializing research and, last but not least, being alert to the ethical implications stem cell research poses. These the research also takes into account as part of the environment’s long-term vision of its own place in this domain.

Finally, we were pleased to note an equally significant component in the environment’s long term development, namely, the attention paid to developing a preparatory programme driving down to undergraduate level, aimed at students having the will to embark on research training in the demanding field of stem cell biology.

**Strategic and International Implications**

It is clear to us that the Hemato-Linnaeus environment at Lund is driven forward by a long-term strategy, which holds both the institutional and
international dimensions as key to realizing its ambition to become “world-leading”. International recruitment at senior level has been instrumental in the rapid progress during its start-up phase. That the preparatory programme has already selected applicants for PhD positions shows that the identification and management of high-level human resources and thus the environment’s sustainability in the long-term, are being actively addressed. This is a task that, in its way, is no less difficult that the winnowing out at senior level of outstanding ability through peer review, merit and performance. Indeed, we believe it could well be more delicate and more difficult by far, even if the process of identifying talent at the early stages is grounded in interviews and personal meetings. We note with approval the possibility of opening the preparatory programme so that it may take on a world-wide outreach.

Particularly noteworthy in the Hemato-Linnaeus environment is its attention to the “human”, if not the “psychological”, dimensions that accompany the quest for excellence in an area of research that is highly competitive. These are not negligible, though it is all too rare that provision is made to recognize them, still less to equip the individual to face them and to deal with them, though it has also to be acknowledged that such provision cannot fail to improve the “attractiveness” of making one’s career in such an environment.

**Conclusion and Recommendation**

Hemato-Linnaeus has moved quickly through its start up phase. It appears to us that it has already achieved a significant level of synergy and inter-group exchange, which is evidenced in its productivity. The environment draws on a complex organization of services including grant administration and management already in place. This has been instrumental in placing the Programme firmly on the path towards the vision it has set itself. The quest for excellence is markedly comprehensive. It takes the view that for excellence to be achieved requires that at the same time attention be paid to the long-range task of identifying and fostering talent, the better to attract it into the area of stem cell research, a task that sees an increasing engagement to educating and training, activities that the Linnaeus grant has served to underpin.

On these grounds, the evaluation panel would wish to recommend that the Hemato-Linnaeus environment to be seriously considered for an increase in the grant made to it.
LUND UNIVERSITY

Lund Laser Centre (LLC)

Organization

The Linnaeus environment for Exploring and Controlling the States of Matter with Light is located within the Lund Laser Centre (LLC) at Lund University. The Laser Centre was established in 1995 as a cross link between the Faculties of Engineering, Science and Medicine. The following year, LLC was recognized as constituting a European Large Scale Facility in order to make it eligible to apply for European funds. It is a virtual organization, though enjoying research access supported by the European Union. It is now in its third contract period with the European Commission.

LLC comprises five divisions from the three faculties and hosts the Linnaeus grant. For its part, the Linnaeus grant and the LLC involve the following sections: Atomic Physics and Combustion Physics (within the Faculty of Engineering), Chemical Physics and Atomic Astrophysics (within the Faculty of Science), and the Lund University Medical Laser Centre (LUMLC) – an umbrella organization with participation of many clinical departments as well as bringing the Faculties of Engineering, Science and Medicine together. Amongst the special research areas coming under the responsibility of the Medical Laser Centre are optical spectroscopy and the imaging of malignant disease as well as the spectroscopic analysis of gas in tissues for medical diagnosis.

A twelve member governing board overseas the LLC and the Linnaeus environment. Its chairman and its director are both appointed by the vice chancellor. The director has also been entrusted by the university with coordinating the Linnaeus environment. The LLC governing board is made up of representatives from the three participating faculties, from the Trades Unions and from the Student Union. The board decides upon the research programme. It meets six times a year.
Following the award of a Linnaeus grant, the task of drawing up a research programme for submission to the LLC governing board was laid upon a Linnaeus research committee. The committee was appointed by the board. Currently, it has a membership of eight, six being internal to LLC, and two external and outstanding scientists from within Scandinavia. Amongst its formal administrative responsibilities are to make recommendations to the LLC governing board, to prepare and, where necessary, revise the research programme funded from the Linnaeus grant. It is a matter of record that no formal scientific board is in place. However, this is no oversight. Rather the function of a scientific board appears to be fulfilled within the LLC by the research committee working together with the governing board. In this capacity, it prepares the research programme, budgetary allocations included.

At present, LLC numbers some 90 scientists, including 10 professors, 50 PhD students, 15 post-doctoral fellows and guest researchers together with 10 supporting personnel.

**Cooperation**

Within the field of lasers, spectroscopy and applications, LLC is the largest academic unit in the Nordic countries. It is also in command of a mature and proven series of networks of traffic and exchange with such universities, leaders in these fields, as Stanford Louisiana State, Oregon State, USA, with Cambridge (UK), Groningen (Netherlands), ETH (Switzerland), Université Paris Sud (France) and Université de Liège (Belgium). As part of the European Large Scale Infrastructure since 1996 with members across some twelve countries, very clearly the international outreach of LLC is stable and well grounded. This, one might expect of a centre that has been in active and creative operation for more than a dozen years, a centre which, moreover is heir to, and has built upon, the long and distinguished history that Old Atomic Spectroscopy enjoys at the Lund University since the days of Johannes Rydberg.

A close perusal of the documentation presented to us as well as the exchanges we had with LLC’s leadership, point to the fact that the main thrust of cooperation tends, in the main, to be within the university itself. Effectively, then, cooperation seeks to build new avenues of collaboration across the historic groups within the LLC and, at the same time to reinforce ties between LLC and other groups in the university. In short, the rationale accompanying such tactics is to create new areas that may benefit from the “critical mass” thus generated across the centre generally. “The whole”, we were told, “is more than the sum of the parts.”. The concrete evidence to back this stands well to the fore. It emerges in the research programme the scientific committee proposed for the period 2008 – 2010. The five programmes are:

- Astrophysical/atomic laser spectroscopy
- Advanced diagnostics
- Real-time structured dynamics
- Chemistry, physics and the application of sensitizers
- Attosecond physics, laser acceleration of particles
These new domains, we were informed, represent new combinations of research. No less significant, they bring together groups and individuals who otherwise would never have worked together. This observation is of more than passing interest. It provides an essential clue to the precise nature of the cooperation LLC is urging forward. That such groups would, in the normal course of things, not have envisaged working together, points to the presence of relatively stable – and because stable, therefore commonly accepted – definitional boundaries between the different domains within LLC. Once this condition is taken into account, it would seem clear to us that the identifying feature beneath the type of cooperation LLC is implementing, involves breaking out of a long embedded pattern that has been shaped over the years. For LLC, cooperation is then above all a form of self-mobilization. Moreover, precisely because LLC stands as the centre of an established network, the effects of such self-mobilization can very rapidly be made to work in extending those networks, both inside the university and beyond. Evidence for this is readily to hand: new collaborative ties within the university with MAX-lab, with the Departments of Architecture and the Department of Biology, with Packaging Logistics, not to mention such multi-national firms as Astra-Zeneca and spin-off companies, amongst which are SpectraCure, GasOptics and GasPorOx.

**Leadership**

Over the years, LLC’s leadership has had constantly to face what appear to us to be two major structural issues. The first of these relates to what is sometimes presented as “the span of control” that is, the challenge that comes of having to coordinate a large number of researchers distributed across different divisions and units. The second has to do with the issue posed by scale of funding. These are, so it would seem to us, clearly reflected, though perhaps in an indirect manner, in the basic justification LLC set down in its original application for a Linnaeus grant: “In contrast to its sister facilities within the LASERLAB-Europe consortium, [LLC] is an umbrella organization […] without central funding for joint work, only Access for European research groups is financed.”. Unless we have misinterpreted the exchanges on this point that we had in the course of the hearing, it appears to us that LLC, from the standpoint of funding, falls between two stools. Laser research, it would seem, does not fit easily into conditions required for big grants. It has, perforce, to rely on smaller ones.

This has not prevented LLC, as a centre of excellence, from winning the grants it requires. But such grants would appear, at least up till now, to sustain work within groups rather than across them which may well account for the situation remarked upon earlier, namely, the hardening of definition and operational frontiers between the groups that together constitute LLC. Furthermore, relatively smaller grants, precisely because their duration is shorter, act as a powerful constriction
upon LLC’s capacity to develop a long-term strategic, as opposed to an immediately operational, vision. As one of our interlocutors admitted, “We miss being strategic by the smallest margin.” In short, LLC has been reliant, as indeed have most research groups, on funding that by definition is provisional and as Alphonse Kahr, a French journalist of 160 years ago, observed, “Only the provisional lasts a long time”.

A further series of challenges LLC will have to face during the time the Linnaeus Award runs is the major renewal of its senior staff and very particularly, the most distinguished amongst them. Of the ten co-working researchers supporting the original application, half will reach retirement in the decade 2006 – 2016. In effect, the degree of replacement and thus the issue that ensuring continuity poses, appears to be greater for LLC than for most other environments and centres in receipt of the Linnaeus grant. LLC is well aware of this and it is anticipated that the deputy director will take over the directorship from 2010. Likewise, the search is in hand to fill other senior level positions to complement LLC’s existing expertise, particularly in the areas of optical quantum electronics and atomic astrophysics. Negotiations are also in hand with the medical faculty for a three year adjunct professorship in oncology with a view to strengthening the links between clinical medicine and its laser applications. At the junior level, four graduate students have been taken on.

We note the absence of a formal scientific advisory board that is a feature of other Linnaeus centres. Clearly, this function, as the documentation made plain, is fulfilled under a different format. Nevertheless, we feel that the governing structure may merit a second look in view of the central priority on generating a sustained synergy in selected areas which was one of the arguments originally advanced in submitting for a Linnaeus grant.

Opportunities Created by the Linnaeus Grant

The Linnaeus grant made to LLC has been used primarily to support personnel costs with particular attention paid to the five areas mentioned earlier as having high promise. The creation of a research position at professorial level, a four year appointment in the Atomic Astrophysics Division are amongst the heads to which support from the Linnaeus grant has been put. Clearly, this has been done with two purposes in mind: to ensure continuity after the retirement of senior and portal personalities in LLC and to stimulate further collaboration between the Division of Atomic Physics and the Division of Atomic Astrophysics.

The Linnaeus grant does not figure as a large percentage in the centre’s overall budget, being some SEK 5,000,000 in an annual budget of some SEK 75,000,000 and SEK 13,000,000 in the form of investment. Its impact, however, is deemed “absolutely central” by LLC leadership. It has allowed the purchase of additional equipment. It has been used to support the development of joint graduate courses. Yet the main significance of the grant lies in the fact that it is a collective award, rather than being yet a further example of individual funding. This is important not simply because of the continuity it brings with it. It is important
because it puts in train a series of negotiations between leadership and LLC’s constituent groups. By so doing, it urges LLC on from acting as an umbrella organization towards a constellation of research groups moving towards acquiring a common vision.

Particularly interesting in this regard is the opinion of LLC leadership, which takes the view that the Linnaeus grant opens up new bridges between the various groups and drives towards the creation of a “critical mass” beyond the level already attained. In short, the impact of the award penetrates across the whole of the LLC. This claim, we believe, is well founded. Supporting evidence is to be seen when one breaks down the number of individuals involved in research financed by Linnaeus monies across the five constituent divisions in LLC – Atomic Physics, Atomic Astrophysics, Combustion Physics, Chemical Physics and the LUMLC. This is set out in the table below, which is based on documentation supplied to us.

<table>
<thead>
<tr>
<th>Division</th>
<th>Total</th>
<th>Senior Staff</th>
<th>Junior Staff</th>
<th>Graduates</th>
</tr>
</thead>
<tbody>
<tr>
<td>Atomic Physics</td>
<td>43</td>
<td>66% of 12</td>
<td>75% of 4</td>
<td>59% of 27</td>
</tr>
<tr>
<td>Atomic Astrophysics</td>
<td>5</td>
<td>50% of 2</td>
<td>100% of 2</td>
<td>0% of 1</td>
</tr>
<tr>
<td>Chemical Physics</td>
<td>18</td>
<td>60% of 5</td>
<td>29% of 7</td>
<td>0% of 6</td>
</tr>
<tr>
<td>Combustion Physics</td>
<td>27</td>
<td>44% of 9</td>
<td>% of 3</td>
<td>6% of 16</td>
</tr>
<tr>
<td>LUMLC</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

This table can be read in two ways: as indicating degrees of concentration across the different divisions in LLC or, alternatively, as pointing to degrees of distribution. It is clear from this table that indeed the grant already penetrates into and across all LLC divisions. One might also deduce from the table that the implicit strategy of the centre is to build upon strength, to concentrate first of all on the long-established areas of excellence and progressively bring in others, once that strategy has produced its expected impact in encouraging sustained inter-group collaboration. In short, that the new dynamic, which leadership looks forward to achieving thanks to the Linnaeus grant, becomes thoroughly embedded at the initial point of concentration. In this connection, we note that the present way in which Linnaeus funds are allocated will continue until the end of 2010. We note, with approval, the decision to retain a “strategic reserve” that may be used to support either a project or
a particular appointment. This is prudent. It retains a degree of flexibility that is both desirable as the dynamic of cross group collaboration builds up and a necessary margin of manoeuvre that previous forms of funding have not permitted. In this respect, the LLC has already reaped some of the benefits that the Linnaeus grant was intended to bring.

Yet, marked though the impact of the Linnaeus grant has been upon LLC, we do not find evidence that points towards an overall strategic vision. That LLC is more than the sum of its different activities, few can doubt. And still less can one doubt the sustained excellence and quality of its publications. But it does not seem to us that the Linnaeus grant has so far been used actively and explicitly to coordinate such activities. Rather, they appear to us largely still to coexist.

**Strategic and International Implications**

LLC is a long-standing centre of excellence, widely recognized and long sustained. Its strength internationally, so it appears to us, has allowed it to concentrate on encouraging closer collaboration across its constituent divisions and extending that collaboration to other domains in the Lund University. It would seem implicitly that the approach, which has been employed so far, is “bottom up” and consists in providing incentives that gradually and on a voluntary basis, draw LLC’s constituent divisions closer together around five new cross grouped programmes.

This is a strategy the main characteristic of which is its delicacy, its respect of both established boundaries and of the sustained achievement that has constantly been demonstrated within them. We have not lost sight of the possibility that this is a deliberate and carefully weighed up approach that, in the opinion of LLC’s leadership, is the best way of putting in train those initial steps that can now be taken precisely because the Linnaeus grant has provided the opportunity. If this is indeed the case, then the apparent absence of an overall coordinating vision at present may well reflect the belief amongst leadership that such a vision may only be made explicit and implemented once consensus has been achieved through the pragmatic action which is already under way. Nor has it escaped our attention that the adjustments long-term and sustained funding requires, compared to the usual way of working that short term project financing imposes, is no small challenge to a centre that has been highly successful under this latter arrangement. In short, LLC at the moment is still adjusting to the opportunities the Linnaeus Award opens up. This in no way excludes developing a coordinate and strategic vision later. At the moment, LLC seems to be marshalling its forces. The Grand Strategy will doubtless come later. And that in itself is a strategy.

**Conclusion and Recommendation**

On these grounds, the evaluation panel wish to recommend that grant to the LLC at Lund University be maintained at the current level.
LUND UNIVERSITY

Lund University Diabetes Centre (LUDC)

Organization

Lund University Diabetes Centre (LUDC) is affiliated to the Department of Clinical Sciences, Malmö, which formally provides a channel for reporting to the head of that department. Physically, LUDC is located across two sites – at the Biomedical Centre in Lund and with its major facilities in the Department of Clinical Sciences, Malmö. The latter provides administrative support in the domains legal, financial and personnel related affairs. In addition, LUDC has set up its own specialist support services, which include a communication strategist, a grant manager, a database manager and a systems engineer who assists in building up a large database available to all members of the consortium.

LUDC, which brings together ten research groups is run by a director, assisted by a deputy director. This pattern of administrative and academic back-up is a particular feature of the centre. It also applies to the ten principal investigators, each of whom has a deputy to help organize the individual research areas for which (s)he is responsible.

The governance of LUDC is carried out by a governing board and by an executive committee. It also draws upon a scientific advisory board. The executive committee, consisting of five members including the director who chairs it, is responsible for strategic planning, day to day operations, planning of seminar series, retreats, contact with the scientific advisory committee and the processing of post-doctoral and other applicants for posts in the centre. It prepares reports to, and the agenda for, the governing board. With exception of the director and his deputy, members are elected from amongst the senior staff. Their mandate is for two years. The executive committee meets twice a month.

The governing board is made up of the principal investigators and their deputies from all ten research groups. It approves the budget, new appointments and support for specific projects and, where necessary, shifting resources between groups. It meets regularly once a month. The governing board also holds an annual two day retreat at which group leaders and young staff dissect the centre’s goals, progress
and organization. Retreats take place on an annual basis, the first being held in March 2007.

LUDC also draws actively on the views of its scientific advisory board, which brings together six international luminaries from the universities of Oxford, MIT/Harvard, Helsinki, Yale, Geneva and the Karolinska Institutet. The advisory board gives feedback on the centre’s current strategy, assesses its programme and makes suggestions as to priorities and future developments. In addition, the scientific advisory board has the power, should conditions so warrant, to demand the executive committee either wholly or in part, to step down. This power has been conferred upon the scientific advisory board for the whole time the Linnaeus grant runs.

Currently, LUDC musters a staff of some 200, including 80 senior scientists (post-doctoral fellows included), 61 PhD students together with 60 technical and administrative staff.

Cooperation

Our discussion with the leaders and representatives of LUDC left us with the indelible impression that here was a centre where the activities, traffic of exchange and international networking were extraordinarily intense and, given the short time that the centre has existed, extraordinarily fruitful. This happy condition reflects the energy of the centre’s leadership and members. It also stems, though to what precise degree we did not feel able to estimate, from the centre’s holding very large databases, the All New Diabetics in Scania (ANDIS), which covers the whole of Norden being but one example. Such rich sources of data generate a very particular form of cooperation, not simply because they are part of the European Genetics Archive in Geneva. Cooperation is, we were told, the only way that permitted the rapid exploitation of the sheer volume of information contained in such databanks which, otherwise, was far beyond the capacities of any one group to do. In other words, for the type of research LUDC is committed to, intense cross institutional and cross frontier traffic in data, persons and findings is not, as in other circumstances it might be, an advantage. It is a basic and bare necessity!

Furthermore, though it might be the usual pace that diabetes research sustains and takes for granted, nevertheless we were struck by what appeared to us as extraordinary rapidity in processing new data, though we were also told that different groups varied considerably in their work rhythm.

If the pace of cooperation impresses, so too does its complexity within Sweden, within the Nordic region and internationally. At the latter level, LUDC’s network embraces the Broad Institute.
(Harvard/MIT) and reaches into the Universities of Oxford, Helsinki and Pisa, ties that are further consolidated by the practice of associating world-leading figures directly in the centre’s research via a system of adjunct professorial appointments. The centre’s members participate in large-scale projects, funded by the US National Institute of Health, in the Nordic Centre of Excellence in Disease Genetics and in the European Union’s Interact project, which is part of the 6th Framework Programme, along with five other major projects under the aegis of the EU. The ANDIS project binds the centre to hospitals and health care units in the region. The centre’s active involvement in developing together with the pharmaceutical industry Innovative Medicine Initiatives within the domain of diabetes plus the setting up of a commercial outlet for new therapies, shows the many dimensions in LUDC’s profile of cooperation.

Leadership

One of the eternal dilemmas leadership faces in a fast-moving field is how to capitalize on unpredicted results. The ability swiftly to take just such possibilities into account appears to be explicitly incorporated into the Centre’s strategy. One pointer to the centre’s anticipating such possibilities is to be seen in the remit of the governing board. It includes approving shifts in the allocation of resources.

The centre’s research strategy was presented to us in terms of identifying areas where research seems to “form bottle necks”, that is, the identification of relatively precise, small scale issues and then concentrating on them. Such an approach demands as a prior condition, the presence within the centre of a very high degree of concentrated expertise, resources that may rapidly be assigned and, last but not least, flexibility. It also requires an equally high degree of sustained dialogue between leaders just as it does between individual research groups.

To identify a challenge is already a step towards its resolution. Here, it would seem to us, LUDC has come up with an elegant way to foster a form of collaboration between groups that is dynamic, original and that works. It turns around forming a series of “action groups”. In the world of LUDC, the “action group” has a purpose very similar to that, well-known in military parlance, of a “taskforce”. The essential feature of a taskforce is that it is created for a specific purpose or mission. Once that mission is completed, the taskforce disbands and its units return to base.

Currently, LUDC has seven action groups in operation. They are focused on key research topics. The presence of these mobile and temporary sub-units is, in our view, a powerful instrument indeed for rapidly instilling a “culture of collaboration”, which is not always so
obvious at first glance to highly specialized groups, often engaged in very different, even though complimentary research agendas. These task-oriented units, so it seems to us, are highly important. They are, in effect, a more extensive and organized form of that feature which we have noted time and again in other Linnaeus centres: namely, individuals spontaneously collaborating across groups.

The difference, we would suggest, between the voluntary form and the position they occupy in LUDC lies precisely in the fact that the form they assume here is in their formal status. They are not encouraged. They exist. Activity groups are, by definition, result oriented and, because they seem to be an established feature of LUDC, they uphold that essential flexibility which is the key to sustaining excellence in a domain where competition from industry is as pronounced as it is from other research consortia. Each activity group is assigned a series of annual objectives to be achieved and results to be delivered. Baldly stated, activity groups and the capacity rapidly to assign resources and expertise to them, are the indispensable vehicles for rapidly following up on unexpected breaks through, if they are not themselves the way by which breaks through are made.

**Opportunities Created by the Linnaeus Grant**

The stated aim of LUDC in its application for a Linnaeus grant is that it will “test the hypothesis that different sets of yet-to-be-discovered genetic and environmental factors lead to the chronic hyperglycemia that represents the hallmark of diabetes”. From the time it was constituted as a Linnaeus centre, LUDC has demonstrated what strikes us as a wholly admirable determination in driving forward along the path it has set itself. In the area of whole genome association study, it has completed a gene atlas for type 2 diabetes, a remarkable achievement described by the journal Science as “The Breakthrough of the Year”. The Linnaeus grant has enabled LUDC to strengthen its scientific infrastructure most especially in the area of bioinformatics.

This is a domain of particular significance. It is here that university-based research units find themselves competing with industry. It is also one of the areas the centre has identified as a “bottleneck” in the study of diabetes and where additional staffing is held to be of high importance, not simply in the potential for making new breaks through. By demonstrating LUDC’s place at the cutting edge, it raises considerably the centre’s attractiveness and thus its ability to draw talent from all over Europe.

The Linnaeus grant has also been instrumental in the decision to found a post-doctoral programme, thereby injecting a further stimulus
to researcher mobility within LUDC and between LUDC and the international community of research. The centre’s highly proactive policy of recruitment has resulted in a new appointment at senior level and, as a direct result, the establishment of a new research group, scheduled to come on stream in the current year 2008.

Recruitment at post-doctoral level over the previous year has been remarkably brisk. Since start up, LUDC has taken on 37 new researchers, 24 post-doctoral fellows and 11 PhD students (43% of whom were women). The Linnaeus grant was directly responsible for recruiting eight post-doctoral fellows who have been signed up for two years with the provision for one further appointment to be made in 2008. It was made plain to us during the discussion with members of LUDC that the setting up of a post-doctoral programme had functions other than the manifest one of ensuring that “new blood” and talent continue to flow into the centre. It also has an important and long-term latent function. The latent function involves “embedding” into the induction stage of researcher training that “culture of collaboration” which has emerged pragmatically within the activity groups.

Such a learning programme holds out the promise of a more speedy integration of young researchers into the specific working “culture” that is building up in and around LUDC. In this respect, it bids fair to enhance efficiency further. Yet, this development also strikes us as an important step in raising LUDC’s visibility within the university, on the international scene and vis a vis industry. It confers upon the centre a very specific identity – a strong sign of differentiation, an identity which, grounded in the way the centre literally works, is a natural complement and an additional statement of the centre’s very particular profile and thus increases its value as a partner in transactions academic, clinical and commercial.

Strategic and International Implications

LUDC is at the cutting edge of an exceedingly fast-moving field where international collaboration is a non-negotiable condition for significant contributions to fundamental research, clinical practice and commercial application to be made. It is a world that places an especial premium on organizations able rapidly to switch effort and resources and to be alert to opportunities that cannot easily – if at all – be foreseen at the moment strategy is drawn up and priorities decided.

From the outset, LUDC has demonstrated a keen awareness to this abiding structural issue. It has put in place a formal mechanism – the activity groups – that permits the rapid concentration of persons and resources to meet such unpredictable opportunities. It is currently
engaged, in addition to path-breaking research internationally recognized and internationally hailed as such, in creating a very specific work style – and thus identity – that allies flexibility with its own particular culture of collaboration. Some may care to debate whether this modus operandi is, in effect, the equivalent in the research world to that form of industrial production commonly alluded to as “the just-in-time” delivery method.

It is one thing to “do” research. It is another to be seen to “do” research. Public awareness of what one has achieved is almost as important as how one achieves it. Of this LUDC is well aware. Its attention to communicating to the public – to students, diabetes patients and to the layman – is constant and appreciated. The number of “hits” per month on the centre’s website bears witness to this. That LUDC is planning a series of weekly seminars and meetings for the scientific community in the region of Lund-Malmö, so it seems to us, is a valuable and excellent way of demonstrating both excellence and social responsibility.

**Conclusion and Recommendation**

The Lund University Diabetes Centre is in a high state of readiness. Its publications in the leading international journals are impressive. The prizes its members have garnered internationally, in the Nordic region and at home, eloquently attest as nothing else can do to the place it occupies at centre stage in its chosen fields of investigation. We do not believe that LUDC will be satisfied with these signs that excellence has been achieved. On the contrary, as is well known in folk proverbs, the taste for excellence, like appetite and eating, tends to stimulate the demand to further heights! We note that LUDC hopes to push forward with further recruitment to consolidate its strategic position. As in Dickens’ Oliver Twist, so with LUDC: it is a case of “Please, Sir, can I have some more.”. What is called for is rather more substantial than just another helping of gruel! LUDC seeks four senior scientists with an international track record. Clearly, this is one of the conditions LUDC regards as necessary for excellence to be sustained.

On these grounds, the evaluation panel would wish to recommend that Lund University Diabetes Centre be seriously considered for an increase in the grant made to it.
LUND UNIVERSITY

Nanoscience and Quantum Engineering (NanoQE)

and its Research School

Organization

The Linnaeus environment for Nanoscience and Quantum Engineering (NanoQE) is affiliated to the Department of Physics at Lund University. The environment has two joint coordinators, a four person steering committee, a scientific board, made up of the environment’s senior research staff, and an international advisory board which at first functioned as a three person ad hoc body for the first 18 months. It has since been formalized and its membership raised to five pre-eminent figures from leading research universities in the USA and Germany. The environment draws upon support and information services from the Department of Physics.

NanoQE stands at the centre of research prioritized by both the Faculty of Engineering and the Faculty of Science. Within the different divisions and faculties, it provides an integrated platform for experimental and theoretical research with a focus on quantum transport and nanophotonics, the development of controllable quantum systems and life science research conducted at the single molecular level. The weight placed upon experimental and theoretical research is reflected in the shared responsibilities of the two coordinators. The steering committee meets twice a month. It debates and plans the environment’s strategy and future development. It organizes joint activities across the participating units. It has the responsibility for distributing and, if need be, re-assigning funds between different focus areas. The scientific board is made up of senior staff in charge of research undertaken within the environment. The steering board and the scientific board together determine research priorities and the budget. They meet twice a year, though more frequent meetings may be held if the issue warrants. The steering committee handles the environment’s day to day administration. It prepares the agenda on budget and priorities.

The environment’s coordinators report regularly to the deans of the Faculties of Science and Engineering through the head of the Physics Department. In keeping with the internal regulations of the Lund University, the environment is subject to internal evaluation every two years.

Currently, the environment’s staff consists of 25 researchers/teachers, 25 junior researchers/post-doctoral students, 48 graduate students and 19 technical and support staff.
Cooperation

NanoQE has over the years built up very solid and targeted partnerships in joint research and staff exchange with the foremost universities in North America – amongst which, Notre Dame, Harvard, UC Berkeley and Montana in the US, the Canadian Institute for Microstructural Sciences at Ottawa – in Europe with Delft University (Netherlands), the École Nationale de Chimie de Paris and the Laboratoire Aimé Cotton (France), the University of Geneva (Switzerland), Hamburg University, TU Berlin and the Max Planck Institute, Halle (Germany). Project-focused cooperation at the European level by the environment’s internal partners with more than ten EU projects, three of which they coordinate, points to a situation with which one may well be satisfied. Likewise in the matter of cooperation within the university. Similar moves within the same three faculties that, in part, are re-coalescing around NanoQE have also been engaged in developing new teaching tracks at master’s level. They have direct implications for the environment’s viability. The faculties of science, engineering and medicine have taken the initiative to develop tracks focused on bio/medicine, materials science, nanoelectronics and nanophysics. These tracks provide an ideal training and a supply of students for the environment. Conversely, the environment, for its part, ensures that state of the art knowledge is fed into teaching a rapidly evolving field. Clearly, the shade of Wilhelm von Humboldt lives on in NanoQE!

In the area of internal cooperation, the environment builds out from an earlier convenant between many of its participating research groups, which had worked together in the Nanometer Structural Consortium, based at Lund University. In short, the environment has built upon and beyond a pattern of cooperation, internal and external, already in place and which had already shown its ability to handle large-scale multi-partner projects internationally. That the environment has been able to benefit from the presence of internally long-established channels of cooperation is reflected, we feel, in the rapid cross-fertilization of ideas between the groups participating. New areas of expertise are emerging. The research environment is taking on a coherence and a density in the traffic of exchange which point to “an intellectual mass in process of going critical”. Joint publications, the organization of shared conferences, seminars and colloquia, all point to the substantial nature of this necessary and indispensable process. That work across groups has acquired spontaneity serves, we feel, to add weight to the claim.

Leadership

The vision of NanoQE leadership is clear and, so it seems to us, combines a well justified ambition with a healthy dash of caution and realism. The ambition emerges in the determination “to create world-leading research” and to do so in “… new research areas where we have the potential to become world leading”. Caution is to be seen in the
intention to “maintain and strengthen our position”. Thus, when we examine the operational outcomes of these stated aims, we see that focal fields such as materials chemistry, nanobiophysics and nanoelectronics are the subjects of consolidation. Emerging areas, amongst which one may note nano- to quantum-electromechanical systems, coherent phenomena in optics and transport and, finally, many-body physics of small quantum systems, represent the forward thrust in the environment’s strategy for vigourously advancing its scholarship on the international front.

To have a strategic vision is one thing. To have the means of realizing it, is another. Our exchange with the representatives of NanoQE left us in no doubt whatsoever as to their sheer ability to advance the strategy they outlined and that con brio. Nevertheless, it was clear to us that the issue of means in the sense of funding has been a matter of considerable concern during the phase prior to setting up the environment. It is understandable – though no less paradoxical – that research groups, which have a high level of outside funding, tend generally to be weakly supported from faculty funds. It was made plain to us that this situation was delicate in the extreme. The difficulty of supporting personnel in faculty – an issue in itself – has direct impact on the type of strategy the environment is able to put in place. In the recent past, it imposed a strategy of “risk avoidance”. It appears to have curtailed the range of projects that earlier could be envisaged, to those having a low “risk level”.

We were, then, not greatly surprised to note a constant anxiety over the issue of internal funding as a source of constraint upon the long-term commitment, essential per se, of sustaining that basic Humboldtian mission of rapidly feeding the latest research findings into the corpus of knowledge destined to bring up the next generation of students and future leaders in research.

Opportunities Created by the Linnaeus grant

However, by the same token, this condition made it plain as ever one might wish, precisely how the Linnaeus grant contributes directly to the environment’s embarking on a strategy both innovatory and pro-active. Internally, it has, we were told, strengthened the environment’s infrastructure in the two basic domains of experiment and theory, which are now in process of melding together to form a strong developmental field. Linnaeus has brought long-term stability. It has added further weight to the environment’s efforts to draw closer lines between theory and solid state physics. It has forged strong bonds with mathematical physics, which resulted in the merger between the divisions of mathematical physics in the Engineering Faculty (LTH) and the Division of Solid State Theory in the Science Faculty. The new Division of Mathematical Physics has its place in both faculties, playing its part in research, in supervising PhD students and in teaching. The “Humboldtian nexus” has assumed its primacy once again!

The use to which the environment has assigned the Linnaeus grant falls into two clear areas of activity. These may be summarized, on
the one hand, as international outreach through research and, on the other, strengthening the internal teaching dimension. In the former instance, it takes the form of support for senior researchers to generate new funding by increasing their personal research budget. In this respect, Linnaeus provides a much-appreciated degree of long-term stability. It has opened up a relatively long-term perspective to "grantsmanship" beyond the usual three year cycle involved hitherto, a necessary development, we were informed "if one wants to be successful in 20 years from now".

Equally important, some of the Linnaeus funds have been assigned to those teaching on advanced courses. In Sweden, we were told, teaching tends to be underfinanced. To this situation, two other factors are present. One is the well-known reticence of students to opt for the natural sciences. This poses a long-term threat to the nation’s competitiveness in these strategically crucial areas. The second, though very far from being exclusive to Sweden, has immediate implications for the environment itself. It is the often marked reluctance of those who excel in research to undertake teaching. The imbalance between teaching and research is a very immediate threat to the viability of the research training system, above all in areas, which – like nano science and quantum engineering – are highly competitive and therefore place a particular premium on being able to retain able, enthusiastic and young talent.

Steps to remedy this situation have been taken. They entail the establishment of a graduate school that dispenses a comprehensive and focused educational programme at PhD level in nanoscience and quantum engineering. Its mission is to provide education to the doctoral level at the “highest international standards”. This it does through the classic combination of a unique research environment with educational skills. As in the environment’s mission, so in its graduate school: much emphasis is placed on strengthening the connections between experiment and theory, between basic research and its application. In addition to its role in strengthening the environment’s attractiveness to international students, the graduate school maintains close ties with the University of Gothenburg and universities in the Öresund region.

The programme is markedly wide-ranging. It encompasses basic lecture courses, courses at advanced theoretical and experimental levels, intensive courses given by leading international experts and others put on in response to special needs, summer schools every second year and monthly student evenings. Two features in particular stand out. The first is the provision made for courses in management and leadership and very particularly in the attention paid to encouraging young women and girls to make a career in science. It is being built back into the graduate school. The second is the major influence students exercise in the area of specially designed courses, often put on at their request, and the initiative the graduate school places upon their setting up their own networks.

The graduate school does not itself provide doctoral positions. Applicants are required to be a registered PhD student already attending university and to have funding. Those whose projects are in keeping with the research interests of the Linnaeus environment and have a first rate
track record may apply to the graduate school. Admission is decided by the board of the graduate school. At present, 35 students have been accepted.

Strategic and International Implications

The Linnaeus grant has clearly fulfilled an essential role in NanoQE. Its primary impact, we believe, is to be seen in strengthening what is perhaps best described as the environment’s internal development. It has spurred on the drive in the environment’s commitment to creating new ties and combinations between its constituent partners inside Lund University. It has allowed the environment to “do a lot, but not all we could do”. The environment has been able to impart a new balance between research and teaching in the comprehensive teaching programme of its graduate school. Most important of all, in our view, the Linnaeus grant has provided a new degree of stability to the environment’s planning horizon. In the opinion of our interlocutors, stability at home is a prior condition to the ability to sustain competition aboard and internationally. With this we would agree.

Conclusion and Recommendations

The Linnaeus environment for Nanoscience and Quantum Engineering has moved quickly to translate the opportunity provided by the Linnaeus grant into operational action. The impact of the grant has been as important internally as it has been in the environment’s activities on the international front. Most significant of all, in our view, has been the fundamental shift in strategy from “risk avoidance” towards an evident self-confidence and spirit of resolve to project, follow up and, in the words of its original submission to the Swedish Research Council, to draw “... the technological road map of the new millennium [...] in the quantum control of nanostructured and atom-like device structures.”.

On these grounds, the evaluation panel would wish to recommend that the grant the Linnaeus environment for Nanoscience and Quantum Engineering be maintained at the current level.
**LUND UNIVERSITY**

**Neuronano Research Centre (NRC)**

**Organization**

The Neuronano Research Centre (NRC) is an interdisciplinary research centre, affiliated to the Department of Experimental Medical Sciences. It brings together neuroscience, nano- and micro-technology, telemetry, biology, neuro-surgery and ethics in a common undertaking. The centre’s scientific staff are drawn from the Faculties of Medicine, Engineering and Natural Science together with the Faculty of Humanities and Theology. The centre is physically located across a number of sites. The Biomedical Centre houses the centre’s administration and executive leadership, together with biocompatibility and neuro-physiological studies. Biocompatibility studies are also carried out in the Faculty of Natural Sciences, whereas R&D into micro- and nano-scale electrodes and telemetry are undertaken by departments within the Faculty of Engineering. The Faculty of Humanities and Theology is in charge of researching into ethical issues posed by the centre’s work.

Administrative support and servicing financial, personnel and other organizational matters are provided by the Department of Experimental Medical Sciences. In addition, the centre has hired a grant manager who also handles all contacts with the media. The centre reports to the head of experimental medical sciences and thence to the head of faculty. The medical faculty has set up a management group, made up of different programme heads, including those of Linnaeus environments. It provides another line of coordination with faculty leadership.

The centre is run by a coordinator who has also been appointed chair of the centre’s steering committee which appears to double as the scientific board (SC/SB). The eight member SC/SB brings together senior members of the research group and meets monthly. It determines programme strategy, the allocation of funds between heads, the recruitment of postdoctoral fellows and PhD students. Each group participating makes a twice yearly progress report to the steering committee. In addition, the steering committee encourages work on patents. There is no self-standing international advisory committee, though plans are in hand for the SC/SB to take on a group of three external scientists as advisors whose views would be called upon in the event that major change in NRC’s main priorities was envisaged. They will be asked to set NRC’s work in a broad global and external perspective. So far, the general opinion appears to be that, during the build up phase, NRC has sufficient expertise “in house”.


The coordinator draws upon an administrative unit for the day to day running of the centre. The remit of this two person unit also covers dissemination policy, grant applications and the centre’s financial administration. In addition it is also responsible for organizing internal seminars and internal communications with the centre.

Currently, the Neuronano Research Centre brings together fourteen researchers/teachers, seven junior researchers/postdoctoral fellows, eight PhD students and six support staff.

Cooperation

The NRC draws upon a rich and well established knowledge network at international and European levels. Amongst them we note the Universities of Tokyo, Charlottesville (Virignia, USA), Duke University (USA), the Technical University of Vienna (Austria), Cork (Ireland), Hokkaido (Japan), Notre Dame (USA), Zurich (Switzerland), Hamburg (Germany), Laboratoire Plasticité et Physio-Pathologie de la Motricité (Centre national de la Recherche scientifique, France) and Université de Marseille (France). Parallel to this are networks linking into industry-based laboratories in Germany, the Netherlands (Philips Eindhoven) and Finland. NRC members have been active as founder members of networks especially in neuroscience within Sweden – the Swedish network for motor research, for instance. They are currently engaged in setting up an international network to study the self-organizing activity of the brain.

NRC, through its members also participates in three European Union sponsored projects, one of which in conjunction with the Faculty of Engineering has direct clinical application. It focuses on restoring sensory feedback from artificial hands. Two other EU projects see NRC collaborating. They focus on brain-machine interface and also constitute areas where NRC networking is evident in the field of neurophysiology.

External cooperation advances briskly both within Sweden and in the international domain, as one might expect from a group of researchers whose collaboration with one another clearly pre-dates the creation of NRC.

What emerged from both the documentation supplied and from our discussion with NRC leadership is its very particular preoccupation with passing on and consolidating across very different disciplinary cultures, both the opportunity for synergy and, no less important, creating the appropriate conditions to maximize cross-disciplinary dialogue and engagement within the centre itself. NRC pays marked attention to organizing and structuring internal occasions for cross-group dialogue and exchange. We surmise that this in part at least, is intended to off-set the fact that NRC members have a dual work place – two days a week at the Biomedical Centre and the other days at their home base.

Formally organized “occasions for exchange” are many. A scheduled lunch meeting takes place every week to keep members generally abreast of what is happening, to discuss new ideas and the current status of different projects.
Research articles touching on NRC work are presented by researchers at journal clubs. So that all researchers participating have the opportunity to acquire basic knowledge within the different fields in which NRC is active, an “In-House Education Programme” has been launched. The presenter summaries the latest findings from the literature, comments on them and provides a reading list. These events take place twice a month. Twice a year, provision is made for “In-House Education Days” when such issues as how the disciplines within the NRC may work together on different research projects.

Reporting back by the projects, as too the procedures involved in their planning and their outcomes, are written according to formal guidelines, including prospective authors of articles thought likely to emerge in the course of investigation. All research activities are run as projects, have a project leader and are undertaken by a team whose members are from at least two different faculties. Each project holds monthly meetings when problems and progress are dissected. General project meetings are held twice a year. All NRC research staff attend. Progress and the general strategy of NRC are discussed and weighed up.

Leadership

The goals NRC set itself are as high as they are complex: “Our intention is to develop brain-machine interfaces [...] using cutting edge micro and nano-technologies. The project includes ground-breaking studies on neuronal network functions, plasticity, learning and memory, and research on animal models for the clinical problems.”.

Grosso modo, NRC’s research programme falls under five heads. These are:

- Technology development
- Biocompatibility studies
- Neurophysiological studies
- Ethics
- Clinical collaboration

Including the ethical dimension as an integral part of NRC is, we believe, unique and a clear sign of the sensitivity of its leadership to the basic issue of social responsibility. For whilst ethics cannot stand aside from the delicate moral issue of the ethical consequences – and risks – that may follow from implanting multi-channel electrodes into the human brain, in our experience such issues are often addressed as it were from a distance by philosophers writing from the outside. The integration of ethics in the work of the centre should therefore bring an enhanced insight and depth to the ethical aspect, if only by giving ethics the opportunity to identify and raise moral issues posed by cutting edge research at the very moment when the frontier of knowledge moves forward.
That said, it is clear that NRC’s leadership is as one in seeing the project as a long-term commitment. At present, the Linnaeus centre remains within the start-up phase. As outlined in its original submission, attention has focused on technology development, biocompatibility and the ethic aspect. It is anticipated that the focus will shift as NRC emerges from this initial phase and move towards neuro-physiological and clinical matters. That NCR takes account of the possibility of a project not developing as foreseen and that reorganisation and/or strengthening may be necessary strikes us as prudent.

Yet, there are other issues involved when the project is viewed from a long term perspective. One of these springs from the fact that of the nine co-working researchers involved in the original Linnaeus submission, four will retire before the grant has run its course. We have the utmost confidence that NRC will take this in its stride and that measures are already in place to deal with the situation. We would simply wish to observe that this situation would seem to have implications that are specific to NCR and more particularly for its current governance structure.

One of the great virtues of having a combined steering committee cum scientific board, and indeed the point is made in the documentation we received, is that it “consists of researchers from several faculties, many of whom have collaborated over the past ten years, (hence) there have been no difficulties in understanding each other and in making responsible decisions.” To put no finer point on matters, this is leadership as its most subtle. It is, we believe, an outstanding example of “management by entente”, based on confidence and appreciation built up over the years. NRC is fortunate indeed in the benefits it has already reaped from it. We would simply note that such a leadership style – or pattern – is singularly vulnerable when just under half its membership faces retirement in the foreseeable future. It occurs to us that NCR may be brought to the point where it has to consider a more formal division of labour along lines, which appear already to be installed in other Linnaeus projects in Lund, and most especially when the start up phase ends and the challenge changes toward sustaining excellence over the long-term.

Opportunities Created by the Linnaeus Grant

The use to which the Linnaeus grant has been put by NCR is mainly in the area of recruiting junior researchers and PhD students in conjunction with other external grants which make provision for hiring employees at that level. Amongst the examples quoted to us were the Knut and Alice Wallenberg Foundation and EU sponsored projects. Recruitment, we were told, is crucial. It has direct impact on the individual project and should not therefore be rushed. The Linnaeus grant will allow 3.5 junior researchers to be taken on as well as 4 PhD students and additional technical staff.

Building up and training young talent or, as it was described to us, “the breeding (sic!) of a new generation of scientists to take over”, is an evident concern to NCR as is their socialization into the centre’s way
of working. As a means of bringing the cross-disciplinary imperative home to PhD students, the centre’s practice is for each graduate student to have at least two supervisors, each from a different faculty. Students are required to meet once a week with their mentors, the importance of these meetings being driven home by the attendance by the director of graduate studies at student supervision meetings once per month. And students, just like their senior colleagues in NCR, are encouraged to take part in discussion.

One side effect of the Linnaeus grant has been to concentrate the centre’s attention to the question of future career planning and very especially with respect to young women. Around 30% of research staff in the area of neurophysiology are women. The situation is less favourable by far in the technical fields where the preponderance of men remains the norm. It was suggested to us in the course of our exchanges that having to take care of the teaching experience (sic!) focused the centre’s attention more on its students. Indeed, the Linnaeus grant has allowed it to do more for students than had previously been reckoned necessary.

On being asked the reasons that had brought about this new awareness, it was explained to us that in effect it was one of the consequences of being able to plan over the long term. In other words, greater attention to students was a direct outcome of being able to plan over the long term and thus “do things in the right order”. Clearly, one of the main objectives of the Linnaeus scheme – to bring a measure of long term stability and the capacity to plan over a similar time scale – is both recognized, appreciated and being met. It does, however, raise the uncomfortable issue of what precisely are the factors, apart from the obvious immediate and pragmatic constraints that arise from short-term “responsiveness” to external pressures. By the same token, this same question would seem to call into doubt some of the more radical attempts, made outside Sweden, to speed up the “institutional response” to the demands of the knowledge society.

**Strategic and International Implications**

NCR is engaged in pioneering, cutting edge research across science, medicine, engineering and the humanities. Its long-term strategy is to improve the quality of life by investigating the concomitants of neurodegenerative disease and pain, on the one hand and the interface between brain and machine, on the other. One measure of the success of the NCR is the four patents it has taken out and the twelve projects started. Its strategy, so it appears to us, is highly goal oriented and based on generating an intense internal synergy. The synergy, as its effects are projected into the very substantial networks – both international as well as in Sweden – will substantiate the centre’s excellence yet further.

**Conclusion and Recommendation**

The Neuronano Research Centre is moving out of its start-up phase, which has concentrated mainly upon internal communication across and
between its participant groups. This is yielding its fruits, both in the area of publications and in a heightened dynamic that, from what we have heard during our exchange with its leadership, can only be admired.

On these grounds, the evaluation panel would wish to recommend that the grant made to the Neuronano Research Centre at Lund University be maintained at the current level.
LUND UNIVERSITY

Organizing Molecular Matter
(OMM)

Organization

The environment Organizing Molecular Matter (OMM) at Lund University is affiliated to the Department of Chemistry which serves as a channel of reporting and accountability to the head of department. The Department of Chemistry also provides support services to OMM in such areas as finance, funding, personnel matters and general administration. The formal line of control passes through the head of the chemistry department and from thence to the head of faculty. In addition, there are further lines of communication to the faculty and to the Department of Chemistry. The former is kept abreast of OMM activities by the vice dean, who also participates in OMM. The latter is informed by OMM members, who are also on the departmental scientific group.

OMM’s governing structure is not complex. It consists of a coordinator, assisted by a three member scientific advisory board, which represents the three main areas of OMM’s research programme. It has a three year mandate and meets four times a year. The scientific advisory board seeks advice from foreign scientists prominent in the areas of its activities. This is a flat structure and, in our view, well suited to overseeing an environment, which is compact in its staffing numbers. Indeed, the “flat structure” seems to be a feature, to which OMM sets some store since particular reference is made to it in the documentation presented to us during the hearing: “All participants are considered as equal partners in OMM.”. Be that as it may, formal decisions within the environment are taken by the coordinator.

The method employed for resource allocation within the environment strikes us as original in its procedure. Twice a year all academic staff are invited to present specific proposals for funding. The submissions are then discussed by the coordinator with the scientific advisory board. The amount to be allocated is then determined. Amongst the criteria taken into consideration is the need to build up a long-term perspective and to sustain it at a high level. The maximum time budgeted for PhD projects, we were told, is four years. In the case of applications made at postdoctoral level, support is maintained for up to two years. Apart from the obvious and non-negotiable criteria of scientific rigour – “Is it good science?” – particular weight is attached to projects which build on cooperative research between two or more members of OMM. Final decisions are taken by the coordinator in keeping with the recommendations of the scientific advisory board.
OMM at present musters a staff of 10 professors, 7 associate professors, 13 junior researchers/postdoctoral fellows and 32 PhD students.

**Cooperation**

International cooperation strikes us as being high level and naturally selective. In addition to its engagement in a joint US/Sweden cooperation project with Duke University (North Carolina) sponsored by the National Science Foundation and the Swedish Science Foundation, members of OMM are currently collaborating on some six European Union sponsored programmes. Four of these are undertaken within the Sixth Framework Programme, two under the aegis of the Marie Curie Research Training Network of the European Union and what appears to be a bi-lateral link with the University of Maribor, Slovenia. These programmes bring OMM into contact with such universities as Southampton (UK), Ludwig Maximilian Universitaet (Munich) and University College (Dublin). OMM members have also been involved in coordinating BIOSCOPE, a project within the EU 6th Framework Programme.

Equally marked is OMM’s involvement in cooperative industrial projects. Of the thirteen or so projects in which OMM is currently associated, five are with firms or public agencies in Sweden, five with companies based in Europe and three in the United States.

A further aspect which reflects favourably on OMM’s standing and drawing power in the world of international scholarship and research is found in an unusual source: the origins of the qualifications held by OMM’s postdoctoral fellows and junior researchers. With one exception, all the remaining twelve postdoctoral students hold foreign degrees. These range from Tokyo to Combria, from Moscow to Dijon and Oxford.

This, we feel, reflects an activity level that clearly recognizes the value of the work done by OMM and its members. What remains unclear to us, however, is how far these initiatives and demonstrated outreach reflect the energy of OMM and the constituent areas brought together by its creation, or whether they are the results of initiatives taken by OMM’s membership in an earlier setting. Succinctly stated, are such collaborative ties inherited or generated wholly or in part by OMM? This, we believe, is important because it provides some insight into how OMM has fared in its start-up phase and the degree of dynamism that may be present.

Still, there is much evidence to show the energy OMM has devoted to building up an internal intellectual coherence. A number of provisions have been made in this regard.

Seminars are held once every two weeks. Presentations are made by OMM members, graduate students and visitors on their research and findings. It is expected that all staff and students attend. Building on this is an annual half-day meeting where the environment’s overall progress is reviewed and future possibilities broached. In addition to
which is an annual scientific meeting that lasts a full day and is dedicated to a focused interaction around special themes.

Leadership

OMM has set itself an important series of goals: “A fundamental strategy of the project is the integration of theory, experiment and application through a close collaboration between individual scientists.” OMM’s members figure amongst the largest users of neutron scattering beam-time in Sweden. In Lund, they are the heaviest users, a not unnatural situation given that neutron scattering is a central experimental technique for OMM. The environment brings together fundamental theory, experimental development applications to biological and technical systems.

Against this background, we note the particular arrangements in OMM’s structure of oversight, which, as we remarked earlier, is uncomplex. The absence of a formal steering committee does not, of course, mean the absence of coordination, any more than the absence of an executive committee means decisions are not taken. They are taken – obviously. But the absence of formal structures makes it very difficult to determine precisely where these functions are located, and whether or not they are ultimately all concentrated in one individual or, as a contrary interpretation, the degree of their real, as opposed to their symbolic, dispersal amongst many.

It would seem to us that the style of leadership exercised in OMM is best described as “organic and historic”. It turns around a variant of dual collectivism split between junior and senior staff. In this respect we would surmise that amongst the latter, many of whom have been working together over decades in building up the standing of the Department of Chemistry, the implicit driving force behind the leadership style is one that rests on mutual understanding, appreciation and respect. It is “organic” in the sense that it does not require formal organization. It exists. It works. It is also historic in two meanings of that term: first, that it has endured over time; second, that it adheres to a notion of research organization that predates the onset of what the Dutch political scientist, Hans Daalder, qualified as “the New Managerialism”\(^1\) – that is, essentially, the formal organization and rationalization of scientific productivity in place of the earlier, undifferentiated model of scientific endeavour.

This situation has direct implications for OMM and we are happy to note that the planning of OMM appears to take some of them into account. Basic renewal through recruitment of young scientists seems well in hand. Dividing OMM’s strategy into the short and the long term with their appraisal around the mid point in the project’s life, is wise and prudent in view of the fact that 40% of OMM’s most senior and distinguished staff will reach retirement in the course of the grant.

Though OMM is small in the numbers of academic staff present, it has a more than usual preponderance of full professors on its

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books which makes renewal an imperative. Small though OMM is at present, it may not, with good fortune, always remain so. Should Sweden be successful in the bid to host the European Spallation Source, OMM’s prospects could change dramatically. In addition to reviewing the state of play at midterm, the opportunity should not be passed up to consider whether the current system of oversight could benefit from an arrangement on the one hand, more accommodating to the possibility of rapid growth and on the other, more formally differentiated and transparent.

Opportunities Created by the Linnaeus Grant

In concrete terms, the Linnaeus grant is seen by OMM leadership as opening up opportunities, creating a focus amongst its membership and giving rise to a coherence in ideas that would not otherwise have been possible. The grant has certainly opened the way to a long-term commitment to supporting students and recruiting at PhD and junior researcher level. In 2008, three new PhD students were taken on as well as one junior researcher. In this area, OMM’s strategy is cautious and, in the use of Linnaeus funds, self-admittedly, conservative. This approach is justified on the grounds that it enables OMM to introduce new PhD projects throughout the lifetime of the grant. It is a strategy that places a premium on continuity and capitalizes on the stability the grant confers.

Yet, it is interesting that senior level positions at assistant professor and beyond remain within the purview of the chemistry department and its divisions. Whether as individuals, newly recruits are subsequently included in OMM would seem to be conditional on their personal research programme falling into the goals that identify OMM. At the same time, it is abundantly clear that those whose research ceases to be in keeping with the environment’s scientific goals no longer have access to OMM funding. Whilst this stipulation is clear as ever one might wish, one cannot avoid asking the question whether such exclusion is voluntary or enforced? And if it should be that exclusion is NOT voluntary – that is, it is NOT self exclusion – where in OMM’s system of coordination and by what body is that decision enforced?

This, we feel, is of more than usual relevance in view of OMM’s strategy to concentrate funding policy on recruitment over the long term. OMM seems well positioned to draw in talent at the post doctoral level. We have already remarked upon its ability to attract junior fellows on what is without the shadow of a doubt, a world-wide recruiting base. The numbers of PhD students, also highly significant as a forcing house for young talent in the medium term, appear to be satisfactory, though we remain somewhat unclear about the finer details involved in mentoring and initiating graduate students into OMM’s “academic culture”. In this, formal procedures and events are only the tip of the iceberg. What is no less important is the effectiveness of those events on the more delicate process of “student enculturation” which tends to constitute the hidden nine tenths of the “student experience”. We note that one consequence of the Linnaeus grant has been the implementation of a master’s programme in chemistry around the theme.
“Organizing Molecular Matter”. Such an initiative back-links OMM into the student body and has the promise to bring OMM’s to students of an earlier age – another important dimension to the long-term strategy of recruitment and renewal.

Amongst the other outcomes that are directly attributable to the Linnaeus grant, one may note the development of new working ties with a group at Moscow State University.

**Strategic and International Implications**

The key dimension in OMM’s development, we believe, is that of continuity. The start-up, so we were told, has proceeded smoothly. It is also a strategy of caution, itself a necessary dimension if continuity is to be upheld. That OMM has espoused such an approach is in large part, we would argue, a function of transfer. Its setting up has brought together the ties and networks, contacts and an impeccable track record that its members, above all its senior members as individuals, have built up either singly or in inspired collaboration over the long term prior to OMM’s foundation. OMM has been created by excellence. It has, therefore, that excellence as an inbuilt part of it from the first. That its networks are dense, well travelled and mature well beyond the years OMM has been in place is a reflection of the advantages that transfer brings in its wake. They are not to be discounted on that account, nor would we wish to do so.

Yet it would not be right simply to turn aside from what we retain from the exchange we had with OMM’s representatives. The first aspect we feel, whilst we agree fully with OMM in the smoothness of the start-up, is that it is a start-up, which appears to proceed in slow motion as if the centre admits to itself that major change may be necessary in the near future. To put matters bluntly, it is as if OMM were in that situation, well-known to aviators, of being “in a holding pattern.”

The second aspect that we feel in all candidness is best brought out into the open, is the question of ‘value added’. In one respect, this is easily answered. The value OMM adds is to be found in the reinforced collaboration between its members. Yet, when this issue was broached, it was not evident to us of what the value added by OMM consisted, still less whether it was yet to be realized, whether that realization was about to come, was on the point of emerging or in what way it had been achieved already. We were, in short, at a loss to reach any conclusion as to how dynamic OMM was beyond the sum of its individual members.

**Conclusion**

On these grounds, the evaluation panel would wish to recommend that a decrease in the grant made to OMM should be considered.
Organization

The Chemical Ecology group (ICE3) is located in the Faculty of Landscape Planning, Horticulture and Agricultural Science at the Swedish University of Agricultural Sciences (SLU). The faculty consists of eight key areas. Insect Chemical Ecology is a major division within the key area plant protection biology. Save for professorial appointments, which are the direct responsibility of the vice chancellor, assuring high academic standards in faculty research falls into the dean’s purview. Together with the faculty management team, composed of key area heads, the dean in consultation with key area heads appoints academic staff. The admission of PhD and master’s students is submitted by ICE3 to the faculty board, which also has oversight for ICE3 finance and administration, monitored biannually. As from 2008, annual progress reports are to be presented directly to the vice chancellor.

ICE3 is run by a nine member board, meeting monthly with a biannual internal conference lasting two days at which progress is discussed and plans drawn up for the coming six months. The board corresponds to a consensual model of decision-making, failing which the decision is reached by a majority vote. Each project contains short and long term goals and a plan of deliverables for the coming year. Detailed reporting back is made to the board’s biannual conference. The board also evaluates the project. It has direct control over the budget, one feature of which is setting aside a reserve to promote ideas of promise.

Currently, ICE3’s strength amounts to ten teachers/researchers, ten post doctoral, and six graduate students.

Cooperation

There are two clear and separate dimensions to the pattern of cooperation generated by ICE3. As one would naturally expected in view of the standing and leadership of the project, external outreach and scholarly networks are long established and dense. They embrace establishments and research institutes in Egypt, UK, France, Denmark, Germany, \textit{inter alia}. Links within Sweden with the chemical ecology group at Lund are equally important in the context of the Linnaeus grant. Particularly interesting, however, is the role both cooperative and catalytic, ICE3 plays inside SLU. Cooperation with the Department of Forestry and the Department of Veterinary Medicine has opened up new multidisciplinary
perspectives. This has two consequences of note: it opens up new avenues for cross and multidisciplinary research. It imparts a new actuality to the redefined mission of the SLU that focuses on the sustainable management of natural resources.

Leadership

Leadership in ICE3 is more than the sum of its board and its membership, though there are clues aplenty as to the exact nature of that leadership to the sensitive observer. Though the nine members of ICE3’s board all have leading positions, topic leadership is open to junior scientists. And whilst individual leadership experience may concentrate on the scientific and academic responsibilities held by the major personalities, the nature of that leadership is far more subtle than attending courses in acquiring that quality. The evaluation team was struck by what may best to described as the profound collective cohesion which pervades ICE3 and that emerged from our exchanges – a closeness that comes of deep professional and personal engagement in shared enterprises over the years. This is a rare form of intellectual capital, which reinforces communication and, it might be suggested, makes for collective adaptability and thus serves as one of the prior conditions necessary for that readiness rapidly to switch direction when the circumstances require.

Symbolic of this outstanding example of what the British anthropologist of higher education, Becher (1989)¹, would very certainly have seen in terms of an “academic tribe” advancing firmly towards new “academic territory” is the so-called “Lighthouse” Project. This project, launched in 2007, brings together all ICE3 scientists and many post doctoral students. It is in effect, a hot house for generating new ideas and thus creating cohesion and interplay between different projects and perspectives. Since inter-disciplinarity has been an essential feature of ICE3 since the time of its foundation, it is reasonable to suggest that such a project constitutes another level in pushing forward the frontiers of inter and trans-disciplinarity.

Opportunities created by the Linnaeus grant

It would appear to us that the main impact of the Linnaeus grant has taken the form of accelerating and amplifying the scholarly endeavour of ICE3. When questioned on this, the general view emerged that whilst 50% of what had been achieved would in any case have been achieved eventually, it would not have been achieved so speedily. In a field that lies athwart fundamental research and technological application, this

foreshortening of the “productive cycle” is in itself significant. If the grant has permitted the rapid acquisition of new equipment and the build up of personnel, this in part is because networks, ties and links, already built up earlier, could rapidly take aboard the opportunity thus presented.

International recruitment for additional highly qualified post doctoral students and a laboratory manager are the visible outcomes of the grant. For ICE3, the Linnaeus grant seems to have reinforced its profile and brought to the attention well beyond the confines of the Kingdom of Science, bolstering foreign applications to study at both masters and doctoral level. Nor, it seems, was this boost confined to ICE3, but involved other departments of SLU.

**Strategic and International Implications**

ICE3 stands at the intersection of two cross-cutting strategies. The first strategy concerns its collective ambition, in conjunction with the Max Planck Institute for Chemical Ecology at Jena, to emerge as a two pole world leader, building on the principle of institutional complementarity. The second strategy concerns the leverage ICE3 may exert in successfully re-positioning SLU at a new intersection between fundamental research and its technological application to sustaining natural resources.

Seen within the overall strategy of SLU, ICE3 formed a prime agent to reposition it. With an excellent research capacity, a high success rate in grant applications and with a sustained critical mass in interdisciplinarity, its role in forming new knowledge constellations on campus was as important as the leverage it could wield beyond it. The principle of complementarity in the case of ICE3 was itself at one and the same time internal when seen from the perspective of its fellow “clusters” and external, when viewed from the standpoint of the particularly strong links forged with Jena.

**Conclusion**

In this very specific context, the Linnaeus grant would appear to have contributed to advancing two strategies with one grant. It has given greater expedition to the progress ICE3 set itself in its application. In turn, ICE3’s stimulation of its international ties appears to have had a multiplier effect in other clusters within SLU.

On these grounds, the evaluation panel would wish to recommend that the ICE3 be seriously considered for an increase in the grant made to it.
STOCKHOLM UNIVERSITY

Bert Bolin Centre for Climate Research (BBCC)

and its Research School

Organization

The Bert Bolin Centre for Climate Research is formed out of four departments in the Faculty of Sciences, the Department of Physical Geography and Quaternary Geology, the Department of Meteorology, the Department of Geology and Geo-Chemistry and the Department of Applied Environmental Science, each of which have long standing and strong ties with the international scholarly community. Led by a steering committee, chaired by the programme director, its membership consists of five core theme leaders, the director of the research school and a research representative. The director discharges overall leadership, ensures the centre’s coherence, internal communication and dissemination of information.

This is an uncomplex structure built around what may be termed a “facilitatory” rationale that in part represents a “solution” to certain structural and communications difficulties that earlier were perceived as a brake on research potential.

Currently, the centre brings together 35 teachers/researchers and some 25 postdoctoral and PhD students.

Cooperation

Cooperation has a very particular importance, both in the decision to bring the four departments together and in the strategy subsequently developed. This is evident from the operational objective for setting up five core research themes, namely to “transgress” (sic!) previous research group boundaries, create stronger research by setting up new lines of communication across the core areas. These core themes are

- Climate variability
- Atmosphere and ocean circulation
- Geospatial data for climate modelling
- Climate-controlling processes
- Biogeochemical and hydrological cycles

Strengthening internal communication was thus a function of re-designating the core themes, which also serve as the basis for resource allocation as well as the launch points for new research.
Leadership

Leadership style in turn reflects the basic “facilitatory” structure put in place when the centre was established. Core leaders, we were informed, are not seen as representing a ranking list of the most productive so much as representing the interests of a core theme group. Whilst such an arrangement may reflect a well-established pattern of the academic enterprise as a “bottom-heavy” organization, coordination is ensured by the task of internal funding remaining within the purlieu of the core theme leaders. They are responsible for allocating the centre’s resources within their particular core. They are also accountable for the communication and the operational coherence of their cores. Leadership, in short, resides in broad scholarly knowledge and incentive, trust and encouragement rather than upon formal line management.

Opportunities Created by the Linnaeus Grant

Given the centre’s ambition to produce cutting edge research in several subfields of climate science and to do so within a research environment, both strong and sustainable, it is clear that the Linnaeus grant has been central in enabling the centre to set itself on the path towards this goal. One of the more serious bottlenecks in information flow between the generic domains of climate research identified by the centre’s leadership, lay in the less than optimum communication between paleo-research and numerical modelling on the one hand and the potential for improvement between process research and paleo-research on the other. The Linnaeus grant has allowed the creation of five new permanent positions, including three numerical modellers, appointed full time at senior lecturer level, in addition to nine two year postdoctoral posts.

These posts represent an essential step in operationalizing the centre’s strategic goals as well as tightening the links numerical modelling, paleo-research and process research.

Strategic and international implications

The strategy of the Bert Bolin Centre for Climate Research is focused and modest. It consists in improving internal communications and key facilities in the confidence that individuals will readily perceive the advantages to be had by closer collaboration and by the new horizons thus opened. The facilitatory style of leadership is essentially persuasive and rests on recognizing that external impact and future standing of the centre is a function of internal negotiation and voluntarism. It seems also to derive from the pragmatic recognition that at the moment, the referential communities of external scholarship still to a certain degree reflect on a larger scale that fragmentation between them, which had earlier played such a deleterious part within some of the component interests that are now come together in the centre.
Conclusion and Recommendation

In terms of quantity, the climate oriented publications in the centre’s output over the past two years, is impressive. One suspects however, that the transition from coexistence to sustained close internal collaboration has yet to reap its full benefits. But the level of direct collaboration between groups might, one suspects, be improved. The time to do so however is precisely what the Linnaeus grant has made available.

On these grounds, the evaluation panel would wish to recommend that the grant made to Bert Bolin Centre be maintained at its present level.
STOCKHOLM UNIVERSITY

Stockholm University Linnaeus Centre for Integration Studies (SULCIS)

Organization

Stockholm University Linnaeus Centre for Integration Studies (SULCIS) is located at the Swedish Institute for Social Research (SOFI) which, in turn, forms part of the Faculty of Social Sciences at Stockholm University. SULCIS draws on six departments: economics, sociology, human geography, criminology, social anthropology and SOFI, which has a long-term focus on the labour market and social issues, principally social inequality. SULCIS – a happy acronym which at the same time denotes a picturesque region in the southwest of Sardinia – is a multidisciplinary centre. It draws on some 25 members, including some 8 doctoral fellows. It addresses and researches on public policy issues posed by migration and social integration.

SULCIS is run by a director, supported by an administrative assistant. SULCIS is steered by a six member managing group, composed of two members from each of the Departments of Economics, Sociology and from the Swedish Institute for Social Research. The managing group is appointed by the university. It meets twice a month. It has oversight for the research programme, which it keeps track of, and initiates, new projects. Since the managing group is composed of researchers who share the administrative duties amongst themselves, such an arrangement, it is argued, ensures both robustness and continuity in administration should “there be any change in personnel”. It maintains careful scrutiny over current developments within the research programme. It plans for future projects and events. It examines and sets the budget at half yearly meetings. The managing group decides whether the activities of individual researchers are to be renewed. It has the final word on allocating scholarships to post-doctoral fellows.

SULCIS may draw upon the services of a four member international scientific advisory board. A fifth member will be added later. The members of the scientific advisory board are distinguished figures in the areas corresponding to SULCIS’ basic disciplinary fields. Two are from the United States and 2 from the United Kingdom. The remit of the scientific advisory board is to proffer advice on current projects and on the identification and selection of new ones.

Currently, participants in SULCIS break down into the following categories: seven professors, six associate professors, four post-doctoral fellows and four PhD students. Through a system of
affiliated members who hold posts elsewhere than the Stockholm University, SULCIS may draw upon two additional part time members.

**Cooperation**

As we have noted in connection with other Linnaeus centres, the question of ancestry and heritage in the matter of intellectual “trade routes” and ties with institutions engaged on similar work at the international level, are difficult to sort out. There are very obviously international ties that have long been in place and which SULCIS has either inherited as a centre or are the result of individual initiatives, which its members have brought with them in their research portfolio. Since SULCIS’ host institute, SOFI, was founded in 1972 and incorporated into the Stockholm University in 1981, given too its long engagement in labour market and social policy issues, it would be surprising if SULCIS had not benefited from its association with SOFI. Indeed, failure to take advantage of ties established earlier by its participating departments would not have been far short of culpable levity. Be that as it may, whilst acknowledging this methodological difficulty, we would take the line that, in the long run, what matters is SULCIS capacity to build on whatever “heritage” it has received in the area of international outreach and to ensure that in turn, outreach serves to advance its visibility, standing and above all to expand the scope of its research.

That said, one cannot doubt the energy SULCIS had put into developing a cross-frontier exchange centred on jointly shared research projects. Two have been started up in collaboration with Denmark. They focus on introduction programmes for newly arrived immigrants and on cross-country laboratory experiments designed to measure discrimination against immigrants and, more specifically how different procedures raise or lower such behaviour. There are also substantial research ties with the Institute for Social Research, an independent foundation in Oslo, with which SULCIS, together with a Danish university, undertook a study for the Nordic Council. A book on the First 50 Years of the Common Nordic Labour Market, the main outcome of this cooperation, will appear this year. A further report dealing with migration and commuting between the Nordic countries is also shortly due to appear.

SULCIS also takes part in international projects beyond Norden. One of its members is the Swedish representative to a project, organized by the European Trades Union International at Bruxelles, into labour migration from the new member states of the European Union. The same person is also writing a report on “circular migration” and the “brain drain” for a Stockholm-based independent think-tank, the Swedish Institute for European Policy Studies.

Internal cooperation within the Stockholm University has also made a start, with SULCIS members organizing, delivering and examining a master’s course in the University’s International Graduate Programme. Entitled “Immigration and Integration in a Welfare State” it
provided the opportunity to take on three graduate students who will continue their research with SULCIS.

Of particular interest because of its potential for adding further weight and attractiveness to SULCIS as a partner in research are the four databases transferred from the now defunct Swedish Integration Board. SULCIS’ members, together with Statistics Sweden, are currently developing this material for future research. Two others, with data on young immigrants, have already been transferred to SULCIS.

This, in our opinion, is of central strategic importance for the future of SULCIS and very particularly so in the possibilities it opens up, not only for adding to its international networks, but also intensifying the traffic that passes along them. There is good reason for paying the utmost attention to this aspect in SULCIS development plan. The reason why we think so stems from a closer examination of the patterns of cooperation already evident. Of the examples of research collaboration presented to us, few have gone beyond Norden. And fewer still appear to involve research collaboration at the international level with establishments similar to SULCIS as a university centre.

There are, to be fair, two obvious exceptions that we know of, thanks to the documentation presented us. These are SFI (the Danish National Centre for Social Research) and the University of Aarhus. Rather, much of the collaboration that SULCIS presents is internal to Sweden and has to do with government agencies or think-tanks. We understand the reasons for this special orientation. SULCIS is committed to research issues of direct public importance. A research centre it most certainly is. But it is also a policy research centre so it is natural that agencies with public responsibility or bodies that have a remit to inform public opinion in this arena should be amongst SULCIS prime interlocutors.

Seen from this perspective, SULCIS has, in effect, a dual obligation and a dual mode of cooperation, as a research unit and as a body the findings of which are injected into the public policy debate. These are two very different constituencies. Having said that, whether the ties that are built up around one set of engagements should be made subject to either balance with the second, or whether emphasis should be placed on one as opposed to the other, is clearly a matter for SULCIS leaders to determine and decide. Either way, this “dual allegiance” ought to be made more explicit, if only to ensure that, in the future, evaluations of SULCIS’ organization and its intellectual output are grounded in criteria that take this duality fully into account.

Leadership

"SULCIS has set itself a programme that is focused, operationally driven and above all, empirical. Whilst it brings to bear the classic disciplinary perspectives usually associated with the study of Immigration – amongst which sociology, economics and political science – the issues it currently addresses are largely shaped by the mainstream of current social concern: how do immigrants gain access to the labour market? What are the dimensions of discrimination against new comers? What role do
social networks play in the process of social integration and how do they differ from those of the autochthonous population? What are the consequences for integrating the second immigrant generation into Sweden's public sector? And in what way has integration evolved for the employment of the second immigrant generation?

These are key questions of natural concern to the communities involved as they are in shaping the nation's readiness to seek remedy to the situations thus revealed."

Nevertheless, there are two points we would raise in the area of leadership. The first is the question of renewal of senior cadres. Of the ten original co-working researchers who lent their names to the application for a Linnaeus grant, five will reach retirement age in the ten years the grant will run. We note the decision to ensure continuity and stability throughout this period by maintaining the director in post to the end. This is certainly a delicate and humane solution. But it avoids the fundamental problem, which will, surely, be whether renewal is simply to be a matter of age progression alone or whether it is to be made strategically, that is with the explicit aim of building upon the undoubted advances in technique and scholarship that the centre’s energy allied with the stability the Linnaeus grant, will bring about over the years that are to come. So long as SULCIS retains a commanding purchase, national and more significantly, international, over the areas of integration and immigration clearly, internal promotion may be envisaged. Yet, integration and immigration have a decidedly European dimension as well. In the advancement of scholarship, SULCIS is not alone. And since attractiveness and visibility are the secret to recruiting outstanding senior scholars, this merely reinforces the point made earlier about the need to seek new implant points in SULCIS international outreach. Thus indirectly, leadership renewal is dependent on an active and sustained development of international outreach.

The second point we would raise has to do with SULCIS readiness to act as a vehicle for interdisciplinarity, that is, nothing less than its specific identity. By definition, integration and immigration are multidisciplinary. Multidisciplinarity is not the same thing as interdisciplinarity. The difference lies, so it seems to us, in the first bringing to bear the techniques and approaches from particular disciplines. The second seeks to create a coherent corpus, which at a minimum seeks to develop perspectives that merge to form a new problematique. The first involves juxtaposition of already defined areas of knowledge. The second seeks to re-define the boundaries, content and perception that emerges as a result.

To move from one to the other is not a challenge to be met in the twinkling of an eye. It takes time. Very often it demands extensive induction for young researchers. It demands incentives if individuals are to buckle down to what, in essence, is nothing less than reshaping their own identity as researchers and as scholars. It is also an essential function of leadership and a direct product of the vision leadership entertains for the collective identity of the enterprise on which they and their colleagues are engaged.

Whilst we saw evidence a-plenty of induction, or to be more precise, the first steps in induction at the student level, we could detect
no direct evidence of incentives, whether positive or negative (though the former are always preferable) to encourage marked progress towards interdisciplinarity. We note the large number of research projects SULCIS is currently handling – 17. But we have yet to be convinced of the overall coherence of the research questions, which underpinned them. On the contrary, the impression we retain from examining them is that they are more in keeping with the juxtaposition of established areas of knowledge than active examples of seeking to go beyond that condition.

Opportunities Created by the Linnaeus Grant

The most obvious benefit the Linnaeus grant has bestowed upon SULCIS is to be seen in the retaining of two researchers. And, as we were told in the hearing, it opened the way for new projects to be developed. As we have already intimated, whilst the numbers of projects impress, they do not seem to us as yet to act as the essential driver towards interdisciplinarity. Thanks to Linnaeus, the number of PhD students has, we were informed, doubled to eight, though documentation mentioned only four. Still, the fact that of the four recruited, that three held foreign qualifications is an excellent sign. SUCLIS intends to raise the number of its PhD students. Interestingly, though it adds grist to the mill in the issue of multidisciplinarity vs. interdisciplinarity, PhD students have two supervisors, but, we were told, from the same discipline. Clearly current patterns of supervision would not appear to be conducive to progress on this front.

Apart from student recruitment, it remained unclear to us whether – let alone how – SULCIS had benefited from the Linnaeus grant nor how the Linnaeus grant had contributed to the centre, other than allowing it to do more of the same as far as projects were concerned. We do not claim we can explain this situation, other than by surmise in default of direct evidence. One possibility that occurs to us, is that leadership itself reflects departmental and disciplinary allegiances and identities that in effect see interdisciplinarity as juxtaposition of disciplinary coherence. But we have no way of ascertaining it.

Strategic and International Implications

SULCIS strategy is project based but appears to us to be without the necessarily agreed and established goals formulated for each project which link it explicitly to a long term strategy other than the elaborating on what has been done before. And though the accumulation of projects is praiseworthy in itself without such explicit linking together – above all in relation to a more radical definition of interdisciplinarity – number is not necessary strength. It can just as well be a form of dispersal. This situation may well reflect a basic assumption that because integration and segregation have in earlier settings been assumed to be interdisciplinary, no more requires to be done. One of the purposes of the Linnaeus grant is precisely to restate the concept of interdisciplinarity.
such that earlier models that went under the name of “interdisciplinary” are now superseded by other, finer constructs. SULCIS appears to have inherited an interpretation of interdisciplinarity, which, today, is seen as multidisciplinary, based on the juxtaposition or coexistence of established discipline based boundaries. Interdisciplinarity, as we have pointed out above, defined in this way also redefines what previously passed for interdisciplinarity as multidisciplinarity.

SULCIS, we would suggest, stands firmly in multidisciplinarity and has yet to demonstrate clearly its readiness to move on to interdisciplinarity. It is then in a stage of coalescence that is transitional from one to the other. We expect, given the stability which the Linnaeus grant brings with it, that this transition will be amongst the major achievements SULCIS will be able to show when the grant expires.

**Conclusion and Recommendation**

On these grounds, the evaluation panel would wish to recommend that the grant made to SULCIS be maintained at the present level.
UMEÅ UNIVERSITY

Ageing and Living Conditions Programme (ALC)
and its Research School

Organization

The Ageing and Living Conditions (ALC) Programme is located in the Centre for Population Studies at the Umeå University. Already identified by the Swedish Research Council as one of the nation’s ten Centres of Excellence, the centre contains the Demographic Database, which, together with others in the programme, is a key resource for ALC and is the largest and most comprehensive population database in Europe. Lines of collaboration have been established with the Departments of Psychology, Public Health and Clinical Medicine, Statistics, Cultural Geography, Econometrics and the Department of Historical, Philosophical and Religious Studies.

The programme is run by a director who acts as ALC’s main coordinator. He is also acting director of the Centre for Population Studies (CPS) and the Demographic Database. ALC comes under the oversight of a six member international board, chaired by the vice chancellor. Apart from the vice chancellor, the vice dean of the Social Sciences Faculty and the director ex officio, members of the international board are drawn from international figures highly prominent in the programme’s contributing fields from France, Germany, Denmark and the USA. Meeting twice a year, the remit of the international board oversees the Programme’s budget, long-term strategy and goals. Members also act as mentors to younger researchers and may act as evaluators when tenure track appointments, graduate and post doctoral studentships are raised. The international committee has a four-year mandate, renewable once. It meets twice a year.

An advisory board assists the international board and the director of the programme. Consisting of five pre-eminent scholars, it is convened once a year at the same time as one of the meetings of the international board. In addition to its advisory capacity to both the international board and to the director, its members serve as reviewers for nomination to staff positions. Additional meetings of both boards may be held on the proposal of the chairman or the director.

In daily administration of ALC, the director is advised by a steering committee composed of chairholders from four of the departments contributing to the ALC programme.

A broadly similar structure oversees the doctoral programme in Population Dynamics and Public Policy, which is answerable to
ALC’s international and advisory boards. The board of the doctoral programme is made up of members from the eight collaborating departments with an executive committee, which includes the managing director of the doctoral programme and an admissions’ committee which vets and ranks applicants.

Currently, as of 2008 ALC’s brings together 15 professors, 7 senior lecturers, 7 post doctoral fellows 2 PhD students and two administrative personnel. The governance structure is complex and impressed us with certain unique features: the close involvement of the vice chancellor, though we were also informed this arrangement might be modified in the future: the active engagement of its international personalities both in the process of reviewing for appointments, and as mentors for younger researchers. The latter suggests that ALC is sensitive to the opportunity the contact with scholars of world stature has for enhancing ALC’s attractiveness for young talent.

Cooperation

ALC is an excellent example of “resource-driven” cooperation. The four sets of databases at the Centre for Population Studies are, as was pointed out above, unique in the range of material they contain. They are longitudinal, currently being combined with new data and extended to new age groups, which permit wide-ranging and complementary analyses of such domains as health, social and economic living conditions and life style. The detail contained in the data sets is massive, comprehensive and, we were told, the only example of such complexity brought together in one place in the world. Nor is ALC content to stop there. Over the next four years, ALC will add further longitudinal data reaching back to the early 18th century. This will permit analysis to focus on long-term genetic and social inheritance.

It is the possession of such unique data and the development of cross- and inter-disciplinary techniques to “mine” it, which underpins cooperation both internal and external. It is also the central rationale for ALC. It brings to bear such fields as psychology, econometrics and economics to exploit the same unique data collection from widely different aspects over very different time scales. If such considerations have brought departments together internally, they are, if anything more powerful when applied to external cooperation.

It is precisely this latter dimension which enhances ALC’s international and overall strategic importance. For whilst Sweden amongst Western European countries is the country with proportionately the largest population over 65 years of age, similar trends are only too evident across Europe. The implications this has for the continent’s competitiveness, capacity to innovate, efficiency, let alone research funding, health and pensions are amongst the central concerns of the European Union. The Umeå databases and the research nexus set around them, are well placed to act as a vehicle for the development of pioneering techniques and for researching issues which have immediate relevance to the fundamentals of public policy at a European level.
ALC, we were told, has been particularly active during the start up phase. One of its partner institutions in Umeå, Epidemiology and Public Health, via a World Health Organization network, is already engaged in a study on Health and Ageing in 8 countries in Africa and Asia.

**Leadership**

The stated aim of ALC is “to widen the disciplinary scope, create a world-leading centre for the study of ageing and its conditions in an international, contemporary and historical perspective and to foster a new generation of interdisciplinary researchers in the field.” The challenge is no less weighty. ALC draws on eight departments. Yet, departments have their own disciplinary perspectives, identities and agendas. We are of the view that the programme’s long term goals have very assuredly mobilised high enthusiasm and consensus. But, the process of melding the different perspectives into a state of readiness that leads on to substantial inter-disciplinary exchange and the identification of research issues, solidly reflecting an established trans-disciplinarity, have yet to reach the stage at which the full benefit of such collaboration may be enjoyed to the full. This might be a legitimate explanation for the fact that in the first year, only seven scientific publications were produced (though a further eighteen are forthcoming in 2008).

Leadership is sensitive to this. The documentation submitted to the hearing made this abundantly clear. When set in this context, the complex governance structure with its extensive involvement of leading international scholars in recruitment and mentoring assumes its true worth. It acts as a species of counterweight to the natural focus of the departments in partnership with ALC upon their more disciplinary specific responsibilities. We do not doubt the capacity of leadership to press forward with developing a fruitful inter-disciplinary dynamic. Good leadership has been shown as regards the development of dissemination strategies and structures. Achieving an authentic synergy between the different domains and methodologies is simply a matter of precisely that commodity the Linnaeus grant provides – time.

**Opportunities Created by the Linnaeus Grant**

The Linnaeus grant, coming in the wake of two major grants to two of ALC’s partner departments, has opened the path to the consolidation and further building up of the programme. It has also opened the opportunity for ALC to plan its future, not simply within the decade the Linnaeus grant covers, but also beyond. The impression we retain from the hearing is that of a programme whose present strategy has inbuilt to it a flexibility and readiness to adapt to circumstances, which whilst not clear at the moment, will very certainly arise in the foreseeable future. Changes will require appropriate adjustment to the range of specialized knowledge ALC will need. Thus, the programme demands a dynamic staffing policy. That new disciplinary fields will need successively to be introduced is an integral component of that strategy cannot be doubted.
Flexibility is upheld by putting researcher appointments on a two-year footing, at the end of which they are evaluated by both the international board and the advisory board. This procedure retains the possibility of bringing in new recruits in the event that an individual is found wanting. Six postdoctoral students have been recruited on a four year contract from amongst the more promising PhD students. They will be evaluated at the end of 2008.

ALC is supported by the doctoral programme in Population Dynamics and Public Policy. At present, it has 16 PhD level students who form the first wave of ALC student body. Through a continuous seminar, it links into the ALC programme. It encourages students to attend international conferences and workshops, establishes and builds up links with other research units, nationally and internationally. It forges ties with interests beyond academia in the community. Particularly noteworthy amongst developments over the past year has been active graduate involvement in research projects in conjunction with the University of California (Berkeley), and with the Vrije Universiteit (Amsterdam). This is encouraging and should, in the future, well serve the purpose of bonding the inter-disciplinary perspective into the normal frame of reference for young researchers in ALC.

**Strategic and International Implications**

That said, whilst the doctoral programme overlaps thematically with part of the ALC project, its focus is not specifically on ageing. Thus, the opportunity to create momentum at the PhD level is not being capitalized on. Clearly, in addition to the doctoral students funded by the project, a number of other students are being supervised by project members in the area of ageing. It would appear to us that if ALC, in keeping with its stated ambition, is to become a world-class centre for the study of ageing and living conditions, the question of supervision may well require further attention. Even so, we note with approval the condition demanded of this year’s recruits, all of whom came from Sweden, that they spend six months in a foreign university.

**Conclusion and Recommendation**

ALC is poised to become a nodal point in the strategically vital area of the study of ageing, a field of central concern to the future of Europe. Ageing is a domain in which the full implications of cross- and multi-disciplinary research and collaboration have yet fully to be explored and mapped out. As we have noted, ALC stands in a somewhat different relationship with its internal partner departments in that many have yet to achieve the degree of creative synergy that their collaboration holds in store. Nevertheless, the way in which its strategy has been operationalized and is currently proceeding gives confidence that this condition shall be attained within the period the Linneaus grant will run.

On these grounds, the evaluation panel would wish to recommend that the grant made to the ALC Programme at Umeå University be maintained at the current level.
UPPSALA UNIVERSITY

Uppsala RNA Research Centre (URRC)

Organization

The Uppsala RNA research centre (URRC) is located in the Uppsala Biomedical Centre (BMC) and is administratively tied to the Department of Cell and Molecular Biology. The URRC is composed of twelve principal investigators (PI) and ten research groups – nine from Uppsala University and one from the Swedish University of Agricultural Sciences (SLU). Two of the PIs have been recruited since the original application for a Linnaeus grant was made. The Board of the URRC is appointed by the Science and Technology Faculty council. The Board has a membership of eleven. It is responsible for strategic decisions and is chaired by the dean of the Biology section of the Faculty of Science and Technology. Board members represent the departments involved in URRC, namely Bioorganic Chemistry, Department of Cell and Molecular Biology, Department of Molecular Biology and the Department of Molecular Biology at SLU. It is an arrangement that firmly ties URRC into the university administration.

URCC board membership also includes representatives from the three Faculties of Science and Technology, Medicine and the Faculty of Natural Resources together with Agricultural Sciences at the SLU. In addition to one graduate student representative, the board counts three researchers from URCC amongst its ranks. The board submits an annual report of activities and other documents as required to the Department of Cell and Molecular Biology. In turn, the Department of Cell and Molecular Biology reports to the boards of the faculties participating in URCC. Responsibility for the centre is exercised by URCC’s director, together with the head of Department of Cell and Molecular Biology. The board is answerable for the strategic decisions taken by URCC and very particularly in the areas of recruitment and funding. It meets twice a year and is kept abreast of on-going activities by the director of URCC.

The scientific committee is made up of URCC’s twelve principal investigators. Also included as members are one representative from industry, another for PhD students and a third as representative of the centre’s postdoctoral fellows. The scientific committee is chaired by a director, elected from amongst the principal investigators. It wields executive responsibility for the centre. The committee oversees new recruitments, organizes conferences and workshops. It ensures these different competences are applied across research projects involving more than one group. The scientific committee operates on a consensus model of decision-making. It may also call upon the advice and opinion...
of three external advisors chosen for their prominence in the international scientific community.

Administrative support for URCC in such matters as accounting, funding and personnel affairs is provided by two administrators, based in the Department of Cell and Molecular Biology who work with the director of URCC.

At present, the URRC’s strength rests on some 78 individuals, 12 research group leaders, 12 PhD students, fully or partially funded by URCC. In addition are, 21 PhD students, 12 post-docs and 2 researchers integrated with the center, 11 shared PhD students and 7 scientific collaborators with URCC.

Cooperation

The setting up of URCC has taken place against a background of Uppsala University’s embarking upon a major reshaping of its research priorities and the laying down of new organizational structures with the purpose of maintaining its research at the top level internationally. A key development in setting new priorities has been the physical concentration of related disciplines either in shared common buildings or to ensure they are in close proximity to one another. The drive to optimize cross-disciplinary flows and cross-fertilization of techniques and projects, scientists and methods has lead to the creation of campus areas for science, technology, medicine and pharmacy. The Biomedical Centre in which URSS is located, is one of these reconfigured “campus areas”. The Biomedical Centre is one of Europe’s largest research laboratories in the life sciences. It brings together some 19 departments across three faculties.

Equally important in the factors to be born in mind when drawing up the university’s long-term strategy for prioritizing its research profile, has been the need firmly to insert those areas identified as being particularly suitable for sustained cross-disciplinary exchange and collaboration within the traditional university structure. New initiatives are then to build on the established knowledge structures of chairs, around programmes of graduate and undergraduate education and, finally, of administration.

Reform in what is to be done at the same time as maintaining a commitment to the long-established structures that retain their validity, introduces another dimension into cooperation. Like most exercises that seek to combine the best of the old with the promise of the best of the new, it is delicate. We note in this connection, that the URCC has recently been organized in May 2007. The purpose of the revision was to ensure efficient communication between research centres and units on the one hand, and the university’s academic and administrative management on the other. As has been noted above, this has resulted in the URCC being tied to a department rather than, as had originally been outlined in the Linnaeus application, with the Faculty of Science and Technology. We do not question the wisdom of this decision. On the contrary, it appears healthily robust. The lines of accountability are clear and the constituent interests at faculty and departmental levels, as well as
senior staff, students and industry are all brought together in the scientific committee. We note, however, that the presence of URCC representatives on the Board differs markedly from arrangements found elsewhere in the balance accorded them.

It is clear to us from the documentation submitted and the exchanges we had with leadership of both the university and URCC that the major focus of current effort lies in driving forward with integration within the centre. Attaching such weight to “cooperation within the base unit” strikes us as fully in keeping with the centre’s aims. Arguably, it reflects the necessary consolidation on the one hand, and the necessary preliminary for the further enlargement of external cooperation, beyond its already established traffic, on the other. Noteworthy in this regard is the provision for an annual meeting, organized by senior staff, in the presence of external advisers, at which research findings are discussed. Similar provision has been made for PhD students and post-doctoral fellows to organize an equivalent event with speakers invited. In addition are monthly “RNA seminars” addressed by internal as well as external presenters and finally “RNA club meetings” designed to bring both academics and industry based researchers together.

Horizontal information flow clearly takes place at different levels, thereby increasing integration. Particularly interesting in as much as it extends integration to PhD level students, is the centre’s intention to set up a series of “mini courses”. Their purpose is to raise the skill level amongst future researchers, the better to equip them to work in the different laboratories that make up the centre.

As is to be expected, contact with industry is impressive in its extent. Amongst the firms with which URCC is actively engaged are New England Biolabs, Biaffin in Germany, Cepheid in the USA as well as 3H Biomedical AB and Bioimics AB, and Astra Zeneca in Sweden. Also to be noted in the context of URCC’s international outreach are the rapidly developing links with the Peoples’ Republic of China and Japan.

Leadership

The vision that drives the Centre is unambiguous. It is to bring together research groups that have a long-term interest and a recognized standing in RNA research. Operationally, it has entailed identifying three focal themes: RNA and infectious diseases; RNA and chemical biology; RNA and Systems Biology. The task of encouraging cross- and interdisciplinary “spin off” between the centre’s ten research groups, the identification of areas of promise and planning their take-up, fall under the responsibilities of the scientific committee. It is, however, appropriate to note that whilst the principle concern of the scientific committee lies very much in the short-term and the operational, the overall vision is explicitly grounded in the long-term even to the extent of including an “exit strategy” in the event that the opportunities created by the university’s reform and more particularly those opened up by the Linnaeus grant, do not fully mature.

This foresight is wholly commendable and prudent, not just on its own account, but because URCC cannot avoid the fact that of the ten
original co-working researchers who submitted the original application for a Linnaeus grant, five will reach the official age of retirement during the decade that the grant is to run. In short, the challenge to derive the benefit of synergy by closer collaboration between the centre’s constituent research groups is compounded by the no less unavoidable challenge of renewing its senior and most experienced academic staff.

With foresight, however, challenges even of the most radical kind, may be converted into opportunities. On this the centre is acting with resolution and determination. Two new groups have been recruited into URCC. And recruitment of three assistant professors in each of URCC’s three broad operational areas is well advanced. No less important for ensuring continuity of high-level leadership throughout the period the Linnaeus grant will cover, is the intellectual and scientific promise of those called to take up the cloak of Elijah. From what we are able to judge, it appears to us that the outstanding calibre of those newly recruited – or with whom negotiations are on-going – can leave no shadow of a doubt whatsoever that the scientific quality of URCC’s groups, already assessed by two external advisers as very high even outstanding in the international perspective, will remain so.

This is one dimension in URCC’s strategic development. There is another. It is by no means exclusive to the centre. Rather it is generic to any domain that is subject to that process which has sometimes been termed “Subject Parturition” – that is to say, the deliberate redrawing of the boundaries of knowledge, which is precisely what inter- and cross-disciplinarity seek deliberately to achieve. It is here that student training comes into its own as a way of ensuring the long-term sustainability of those domains that emerge from inter-group collaboration. URCC’s stance here is uncompromisingly pro-active. Its aim is to increase the recruitment of highly able PhD students by taking part in the second year studies in Uppsala’s Master of Science degree. This will take the form of a URCC Graduate Research School, offering supervised projects, seminars and course closely integrated with its own research thrust. Advanced interdisciplinary training in RNA research will open a new curricular pathway to doctoral level study and thus ensure in the medium term a reservoir of young and trained talent for the centre to draw on.

Opportunities Created by the Linnaeus Grant

As with other Linnaeus centres, URCC has drawn considerable benefit from the grant. The most evident benefit the centre has derived lies in the area of hastening and deepening the drive towards inter-disciplinarity. Given resources, a challenge may with imagination and vision, swiftly be converted into an opportunity. This the centre has embarked upon. It would appear to us, however, that in the particular case of Uppsala, an additional factor is present and has acted as a species of “multiplier effect” to the impact the grant appears to have had. This “multiplier” we

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would argue, is to be seen in the reorganisation of the university’s research centres, a revision put in train with much the same objectives as the Linnaeus grant itself. That is, to push to new heights and to new levels both efficiency and innovative output, to increase the intensity of exchange and the traffic of ideas between research groups whose strength and repute were achieved to a large extent in degrees of splendid isolation from one another.

What strikes us as highly noteworthy must be the revision the centre has made to its original plans. And here it is obvious that the Linnaeus grant was not foreign to this overhaul in ambition and strategy. Thanks to the Linnaeus Grant it has been possible for the centre to recruit a number of prize-winning young researchers who will certainly mobilize the centre and galvanize existing groups further. These new appointments open the way to extending the centre’s research agenda into areas previously not contemplated. At a slightly less exalted level, but one important to the support and thus the pace at which integration proceeds within the centre, is recruitment at PhD level. The Linnaeus grant, we were told, allowed some 13 PhDs to be taken on, together with 7 scientific collaborators. This, when placed against the centre’s policy of putting new arrivals in the same building as others, is a powerful indicator of the priority placed upon integration from the start of an individual’s academic career. And this in turn, is urged onward by the university’s funding policy for new posts which sets priority on those recruited on an interdisciplinary basis.

**Strategic and International Implications**

The strategy employed by URCC to nurture specific skills and abilities draws heavily upon initiatives, working together and publishing together which, in our view, constitute academia’s classic working mode, that is, from bottom-up. Indeed, this way of working could indeed be seen as one of the “traditional structures” which Uppsala has gone to such pains to preserve. We have already referred to this in connection with the centre’s policy to encourage “horizontal” communication through annual meetings, monthly RNA seminars, monthly RNA club meetings as well as by the transfer of funds to projects particularly well integrated. That the research groups within URRC are all located in the same building is a necessary prior condition for interaction to become more intense. There are, furthermore, other indications that point to the essential strength that resides in “bottom up” collaboration. In a centre that has placed especial weight upon recruiting young and outstanding talent it would seem reasonable to suggest that it is from this source that the future dynamism of the centre will rest. And that the greatest adjustment may well have to be made in the future by those already long in place. We were told that one of the major changes that would seem to stand in the offing is a move away from research based on competition to research based on synergism and cooperation. This may well be so. That this was what young people want is of more than passing interest. It is of interest not just because of the implications it may have for the future of dynamic research environments like URCC. It is interesting because to those of
us who have been close observers of life in Sweden, it appear to be a reassertion of a very old and deeply rooted attitude that has long been associated with Swedish exceptionalism.

**Conclusion and Recommendation**

The Linnaeus grant has brought about a significant level of integration between small specialized research groups. URCC appears to us to be moving steadily towards realising the strategy it has set itself, whilst being alert to the opportunities for extending its collaboration to other cognate areas, which, as yet, have not been brought into its ambit. The future possibility of working with the Berzelius Chemistry Centre is one example. Its ambition has clearly been strengthened most substantially by recruitment of future leaders in the field. The result looks very promising.

On these grounds, the evaluation would wish to recommend that the Uppsala RNA Research Centre at the Uppsala University be seriously considered for an increase in the grant made to it.