Vetenskapsrådet

MIDTERM EVALUATION REPORT OF THE 2008 LINNAEUS CENTRES

VETENSKAPSRÅDET 2014

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PREFACE

The Linnaeus Grant is an initiative of the Swedish Research Council and the Swedish Research Council for Environment, Agricultural Sciences and Spatial Planning (Formas) to strengthen Swedish research by creating strong research centres. Two calls for applications were made and 20 Linnaeus Centres and eight doctoral programmes were approved in 2006, followed by another 20 Linnaeus Centres approved in 2008. The Linnaeus Centres represent all areas of science and were selected based on scientific excellence and potential for scientific renewal. The purpose of the grant is to create centres for basic research which afford synergistic effects. The grants may also influence strategic priorities of the universities and exert a structural impact on the research system.

This report presents the mid-term evaluation of the 2008 Linnaeus Centers, in which the international evaluation panels give a number of recommendations for further development over the remaining funding period. They also give recommendations for adjusting the financial support to some of the Linnaeus Centers. On behalf of the Swedish Research Council and Formas we would hereby like to express our deepest gratitude to the panel members for their thorough work, and for devoting their time and expertise.

Stockholm, May 2014

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CONTENT

1. SAMMANFATTNING

Linnébidraget är ett stöd till starka forskningscentra vid svenska universitet. Förväntningarna är att dessa centra ska kunna påverka de strategiska prioriteringarna vid universiteten, i syfte att stärka Sveriges förmåga att bedriva internationellt konkurrenskraftig forskning. Initiativet togs av den svenska regeringen och genomförs av Vetenskapsrådet och Forskningsrådet för miljö, areella näringar och samhällsbyggande (Formas) som tillsammans har finansierat 20 Linnémiljöer inom alla forskningsområden med start år 2006 och 2008, totalt 40 miljöer. Stödet uppgår till mellan 5 och 10 miljoner kr per år och miljö under en tioårsperiod. Utvärdering av bidragen sker efter ungefär två år, fem år och tio år. Den första utvärderingen av de centra som beviljades medel 2008 genomfördes 2010 och fokuserade på organisation, samarbete och ledarskap.[1] Den aktuella rapporten redovisar resultatet av halvtidsutvärderingen (fem år) av dessa centra. Utvärderingen har sitt huvudsakliga fokus på den vetenskapliga kvaliteten, potentialen för vetenskaplig förnyelse och synergieffekterna av stödet, det mervärde stödet genererar, universitetets stöd och jämställdhetsaspekter på miljöerna. Dessutom har granskarna beaktat vilka strategier för rekrytering av internationella forskare miljöerna använder, och hur miljöerna sprider sina forskningsresultat.

Utvärderingspanelen är imponerad av den höga kvaliteten på forskningen och anser att den i ett internationellt perspektiv är konkurrenskraftig. Panelens uppfattning är att Linnébidraget är värdefullt, i flera avseenden. Det har möjliggjort långsiktig strategisk forskning som ligger i forskningsfrontens framkant inom respektive område. Den är ibland både innovativ och av högrisk-karaktär och genererar banbrytande resultat. Detta är svårt, om inte omöjligt, att uppnå inom ramen för kortsiktig finansiering. Miljöerna samarbetar också brett med andra forskare, laboratorier och Linnécentra, för att ytterligare utvidga sin räckvidd och inverkan på fältet. Vissa centra har helt klart uppnått en världsledande ställning inom ett antal tvärvetenskapliga forskningsområden. Många Linnécentra har också arbetat med att förbättra en ojämn könsfördelning i sina respektive miljöer.

De mest framgångsrika Linnémiljöerna är de som aktivt utvecklar och främjar miljöns identitet via regelbundna möten, seminarieserier, internat och doktorandkurser. Den höga kvalitén på arbetet och den prestige som Linnéstödet ger har utnyttjats som en hävstång för att erhålla ytterligare finansiering, vilken i många fall väsentligt överstiger värdet av Linnéstödet. Dessa centra investerar också strategiskt genom att använda bidraget till att uppdatera infrastrukturer, instrument, mjukvara och databaser. Genom att sammanföra forskare från olika discipliner kan miljöerna ta sig an nya och utmanande forskningsfrågor, generera högre kvalitet och produktivitet i forskningen och därmed även attrahera duktiga forskare från hela världen. Resultatet är ett dynamiskt centrum som strategiskt rekryterar, vårdar och utvecklar yngre forskare.

Utvärderingspanelen identifierade också områden som Linnémiljöerna skulle kunna förbättra, till exempel att omnämna Linnéstödet i publikationer och på webbplatser, rekrytera internationella forskare på alla nivåer, arbeta för en ökad jämställdhet, främja rörlighet – särskilt för nydisputerade forskare, planera för miljöns framtida utveckling genom att ge möjligheter för forskare på alla nivåer att utveckla sitt ledarskap. Flera Linnécentra har låg kapacitet vad gäller att förvalta en forskningsmiljö och saknar strategier, visioner och ambitioner. Inte alla centra utnyttjar möjligheten att söka bidrag utanför Sverige, till exempel från European Research Council (ERC) och EU:s ramprogram.

Baserat på detta rekommenderar utvärderingspanelen ökningar för de centra som presterar högt och där det finns specifika möjligheter som kan realiseras genom ytterligare finansiering under återstoden av bidraget. Det finns också som framgått några Linnémiljöer som uppvisar svagheter. Panelen rekommenderar en ökning av finansieringen för två centra och en minskning för tre. För de återstående 15 Linnémiljöerna rekommenderas bibehållen finansiering på nuvarande nivåer, vilket är ett erkännande av dessa Linnémiljöers höga värde. Specificerade rekommendationer finns i de ämnesinriktade expertpanelernas rapporter, och i kapitel sju.

[1] https://publikationer.vr.se/produkt/first-evaluation-of-the-2008-linnaeus-grants/

Linnéstödet syftar till att påverka universitetens strategiska prioriteringar och är en komplettering av universitetens basanslag. Bidraget utgör en utmärkt mekanism för att främja svensk forskning, med sin långsiktighet och flexibilitet. Finansieringen möjliggör för miljöerna att skapa tvärvetenskapliga grupper och anställa fler doktorander och postdoktorer. Samtidigt öppnar prestigen i bidraget för möjligheten att erhålla ytterligare finansiering, bedriva fältstudier på avlägsna platser och delta i internationella konferenser och workshops. Universiteten kan ge ytterligare stöd till exempel genom att lämna startkapital för datainsamling, hjälpa till med ansökningar om forskningsbidrag och andra stimulansåtgärder. Den kvalitativa analys som presenteras i denna rapport visar att fördelarna av satsningen för Sveriges del avsevärt överstiger kostnaderna.

2. EXECUTIVE SUMMARY

Linnaeus grants support strong research centres in Swedish universities with the expectation that the Linnaeus Centres will influence the strategic priorities at the university and will enhance Sweden's ability to conduct internationally competitive research. The Linnaeus grants are an initiative of the Swedish government and implemented by the Swedish Research Council and the Swedish Research Council for Environment, Agricultural Sciences and Spatial Planning (Formas). These two agencies funded 20 Linnaeus Centres in 2006 and 20 in 2008 across all research fields. Once funded, Linnaeus Centres receive between 5 MSEK and 10 MSEK 10 annually over a ten-year period. Evaluation of these grants occurs at around two years, after five years, and after ten years. The first evaluation of the centres funded in 2008 was performed in 2010 and had a specific focus on organisation, cooperation and leadership.[2] The current report presents the result of the mid-term (5-year) evaluation for those centres funded in 2008. The main focus for the evaluation is scientific quality, potential for scientific renewal and synergic effects of the support, the added value of the grant, the commitment of the university, and gender equality in the centre concerned. In addition, recruiting international researchers and communicating and disseminating research results were also considered in evaluating the centres.

The Evaluation Panel is very impressed by the overall high quality and international competitiveness of the research carried out by the Linnaeus Centres. The panel strongly believe that the Linnaeus grants are valuable in several respects. Linnaeus grants provide an opportunity for long-term strategic research, mostly at the cutting edge in the respective fields and sometimes highly innovative and risky, with potentially game changing outcomes. These are difficult, if not impossible, to achieve within the framework of short-term funding. They also collaborate with other laboratories and Linnaeus centres, further extending their reach and impact. Some centres have clearly achieved a world-class status in cross-disciplinary research areas. Many Linnaeus Centres have also improved their gender balance.

The most successful centres are those that actively promote their identity through regular general meetings, seminar series, retreats and doctoral courses. They have leveraged the quality of the work and the prestige of the Linnaeus grant to obtain additional funding, which often significantly exceeds that of the Linnaeus grants. These centres also strategically invest part of the Linnaeus grant funding into updating infrastructure, instrumentation, software and databases. By bringing together researchers across disciplines, the centres are able to tackle new and challenging problems and produce higher quality research with higher productivity, which in turn attracts talented researchers from around the world. The result is a dynamic centre that strategically recruits, nurtures, and develops junior faculty.

The Evaluation Panel also identified areas in which the Linnaeus Centres could improve. These areas include acknowledging the Linnaeus grant in their publications and on their websites, recruiting international candidates to fill positions at all levels, improving gender balance, encouraging mobility - especially for doctoral students after graduation, and implementing a succession plan to provide leadership opportunities to researchers at all levels and to ensure continuity of the centre. A number of Linnaeus Centres have weak management capacities and a lack of strategic vision and aspiration. While many centres do apply for grants outside of Sweden, such as European Research Council and European Union Framework funding, many do not. Based on these findings, the Panel recommends increases where the centres are performing well and where there are specific opportunities that can be realised through additional funding in the remaining period of the grant. There are also a few Linnaeus Centres that demonstrate weaknesses. Thus, the panel recommends increasing the funding in two centres and decreasing the funding in three. For the remaining 15 centres, the Panel recommends maintaining the current level of funding, thus recognising their worth. Specific recommendations are found in the Subject Oriented Expert Panel reports and in chapter seven.

[2] https://publikationer.vr.se/produkt/first-evaluation-of-the-2008-linnaeus-grants/

The Linnaeus grants are intended to influence the strategic priorities of the university as well as to complement and enhance the basic resources of the university. These grants provide an excellent mechanism to advance research in Sweden due to the long-term nature of the funding, as well as allowing flexibility in how the centres allocate the grant funds. The funding allows each Linnaeus Centre to build cross-disciplinary teams, hire more PhDs and post-docs, leverage the prestige of the grant to obtain additional funding, conduct field studies in distant places, and attend conferences and workshops internationally. Universities can provide additional support using a variety of mechanisms, such as seed money for data collection, assistance with grant preparation, and incentives. The qualitative analysis presented in this report demonstrates that Sweden's benefits from these grants greatly exceed the costs.

3. INTRODUCTION

Linnaeus grants support strong research centres in Swedish universities with the expectation that the Linnaeus Centres will influence the strategic priorities at the university and will enhance Sweden's ability to conduct internationally competitive research. The Linnaeus grants are an initiative of the Swedish government and implemented by the Swedish Research Council and the Swedish Research Council for Environment, Agricultural Sciences and Spatial Planning (Formas). These two agencies funded 20 Linnaeus centres in 2006 and 20 in 2008 across all research fields. Once funded, Linnaeus Centres received between 5 MSEK and 10 MSEK annually over a ten-year period.

Applications for the Linnaeus Grants needed to have official support from the respective university's leadership and were required to include a research programme, an organisational plan, and a leadership/strategy plan. The grant and the conditions are described in detail in the call, appendix 1. Criteria used to assess the applications were:

- Scientific quality
- Scientific renewal in terms of potential synergy effects of the support for the proposed centre
- Gender equality in the centre concerned (as an additional criterion).

Evaluation of these grants occurs at around two years, after five years, and after ten years. The first evaluation of the centres funded in 2008 was performed in 2010 and had a specific focus on organisation, cooperation and leadership. This report presents the result of the mid-term or 5-year evaluation for those centres funded in 2008. Five expert panels were formed to evaluate the Linnaeus Centres including four Subject Oriented Expert Panels for Humanities, Social, and Educational Sciences (HSE Panel); Medicine (M Panel); Natural Sciences (N Panel); and Physical Sciences and Engineering (PE Panel). Also a General Expert Panel (GE Panel) consisting of the chairs of the Subject Oriented Expert Panels and three independent experts was formed. The Subject Oriented Expert Panels were responsible for the evaluation reports of each individual Linnaeus Centre in their field, while the GE Panel wrote the overall report that includes the recommendations to the funding councils. Each Subject Oriented Expert Panel consisted of five members, at least one of which had particular expertise in the research field of the respective Linnaeus Centre. All experts and panel members are presented in appendix 2.

The evaluation procedure consisted of a number of steps. The goal was to keep it as transparent and effective as possible. All centres and vice-chancellors were required to submit a self-evaluation report structured along a set of pre-determined criteria and provide a number of appendices with data and figures. The self-evaluation reports were thereafter forwarded to the international experts who were going to carry out the evaluation. At approximately the same time, the General Expert Panel discussed criteria and indicators for the evaluation by the use of a telephone conference. Further clarification of the evaluation process and the criteria was then organised via telephone conferences involving the members of the Subject Oriented Expert Panels.

Between 26 January and 31 January 2014 site visits were carried out to all 20 Linnaeus Centres, followed by interviews with the vice-chancellors on the 1 February. The site visits lasted one day each and consisted of five discussion sessions with differently composed groups of people involved in the respective Linnaeus Centre. First there was a session with the Linnaeus coordinator and representatives of the Linnaeus Centre. Following a presentation by the coordinator about the Linnaeus Centre and its development since the beginning of the grant, the main topics in this session were then leadership, organisation, added value, dynamics created and anticipation of the future of the work. The second and third sessions typically consisted of a number of short presentations of selected research projects within the centre, and a discussion. The fourth session was reserved for a discussion with a group of doctoral candidates doing their research within the framework of the Linnaeus Centre. The fifth session was with the centre coordinator and other representatives of the centre, dedicated to additional questions and summing up the visit. Interviews with the vice-chancellors were performed via internet after the panels had made all the site visits. The panel raised questions about the role of the Linnaeus Centre in the overall research strategy, and commitment of the university to the Linnaeus Centre. When the reports had

been drafted, the Linnaeus Centres were sent the draft report of their centre to correct factual errors and provide a reply in March and April 2014.

The experts carrying out the evaluation were also asked to make recommendations for each centre - whether to maintain the level of the grant or whether to increase or decrease it. However, any increase or decrease of the grant level could not be more than 20 per cent of the grant and had to remain within the overall total budget for the Linnaeus grants. The Swedish Research Council and Formas decided on the level of support for each centre for the remaining period in June 2014.

A few words about words

In their assessments the Subject Oriented Expert Panels made no attempt to create a hierarchy of, or standardise, the wording used to convey the panels' judgments within a given panel or across panels. However, the panels have carefully discussed the criteria and indicators used in the evaluations and the chairs and generalists have carefully calibrated the findings in the reports.

In the US the head of the university is titled president, the British equivalent is vice-chancellor. The latter term is frequently used in the report; president only once or twice.

In the evaluation-process the word centre (Linnaeus Centre) was used in the invitations to the experts, and is also being used in this report. It is synonymous with the word "environment" (Linnaeus environment) being applied in former evaluations, as a translation of the Swedish "miljö". The British spelling centre is used in the report.

The head of a Linnaeus Centre is normally titled "coordinator" but some centres have chosen "director" and one or two also have a "co-director". There has been no attempt to change or normalise the centres' use of titles.

4. EVALUATION: CRITERIA AND INDICATORS

Based on the call, a list of criteria and indicators was developed for the evaluation. The list was intended to give the Subject Oriented Expert Panels an orientation of what to look out for and to keep the procedure as fair and equal as possible. The indicators for the various evaluation criteria were not meant to be used as a definite checklist but provided an orientation for the discussions during the site visits and the production of the reports. In the list it was also indicated, as a service to each expert, which sources could provide the requested information. The list was structured as follows:

Research performed and planned: Scientific quality

What is the overall quality of the research? Are there key-findings obtained and/or breakthroughs in an international perspective? Has the research had an impact on a national and/or international level? If not, what is the expected timeline for the outcome to occur? Are the methods appropriate and the selections balanced? What is the future potential of the research? Other aspects?

The following should be considered: Bibliometrics, publication lists, CVs, scientific/intellectual merits of the research, unconventional/innovative research, potential for the creation of new fundamental questions and new directions for research, use of new technologies/methodologies, appropriateness of the research methods, access to infrastructures and equipment, potential impact, patent and licences, utilisation of research, invitations to speak on the project topic at conferences, anticipated changes in the disciplinary knowledge base.

Where to find data: Bibliometrics provided by the Swedish Research Council, self-evaluation report, site visit.

Collaboration

Collaborations within the university (departments, other centres, administration) with other universities (national and international) and with stakeholders outside academia. Have they been successful? Assess the synergistic effects of the centre.

The following should be considered: Number of collaborations, new and interdisciplinary/cross-disciplinary collaborations within the centre, departmental collaborations, national and international collaborations, participation in EU-funded projects and networks, role of the centre in national/international networks and size of these networks, national/international visitors and speakers, international research staff in the centres, role in international journals (reviews, editorial board membership), membership in national/international expert panels, role in EU and other international assessments of research grant applications and awards of prizes.

Where to find data: Network maps provided by the Swedish Research Council, self-evaluation report, site visit.

External Communication

Is there a communication strategy in place? Are there specific target groups? Are these identified and have communications channels been opened? Is the knowledge produced at the centre well disseminated to different interest groups? Has the centre noted any effects of its activities, outside the centre? Are there planned or needed actions?

The following should be considered: Number and types of communication strategies (flyers, brochures, general PR) quality of website and frequency of updates, research publications in Swedish and in languages other than Swedish, acknowledgements to the Swedish Research Council and Formas and/or branding of the Linnaeus grant, publications with relevance to a general audience, efforts towards public outreach, media/press releases, interviews given to newspapers, radio, television, flyers, brochures, general PR, organisation of national/international symposia, conferences, workshops.

Where to find data: Self-evaluation report, site visits, web page, and selected journal/research publications.

Participating personnel

What kind of strategies have been in place when recruiting? Discuss the composition of research staff (the proportion of men/women in research groups and amongst PhD-students, the proportion of junior and senior researchers and any other aspects such as discipline, experience and other characteristics). Comment on planned or needed actions. Other aspects?

The following should be considered: Composition/distribution of team by gender and age (compared to the period before the Linnaeus grant), particular efforts to address gender imbalances, mobility and career development aspects

Where to find data: Tables provided by the Swedish Research Council, self-evaluation report, site visit.

Organisation and leadership of the Linnaeus Centre

Is the work at the centre organised with the aim of achieving synergistic effects? How well does the leadership of the centre function? Are there succession plans for key-persons and the succession of generations? What is the proportion of men/women in leading positions? Comment on the commitment of the leadership. Comment on the financial aspects of the centre, for example priorities made and its effects. Are there planned or needed actions? Other aspects?

The following should be considered: General management structure, defined leadership that contributes to the advancement of the Linnaeus Centre, organisational structure of the centre, decision-making procedures to prioritise resources, procedures for resource allocation to benefit the centre, accountability of decision-makers to other members of the group and to the institution, existence of an external advisory board, meetings of the Linnaeus Centre as a whole, meetings with institutional leadership, types of reporting, sharing of outputs and findings, institutionalisation of (regular) seminars and workshops, gender composition of leadership and principal investigators, particular efforts to address gender imbalances, leadership commitment, change in staff composition over time

Where to find data: Self-evaluation report, site visit.

Organisation and leadership of the University

Are there aspects on how the university governs the Linnaeus Centre that should be highlighted? Has, for example, the university provided support to the centre in terms of development opportunities and synergies? Has the centre had an impact on how the university organises and prioritises (for example new strategic priorities, changes in university structure)? How important is the centre for national and international collaboration involving the university? Are there university policies addressing the gender profile on different levels in the organisation and have these policies had any effects on the centre? What are the university strategies for maintaining a strong research centre after the grant period? Ten year aspirations? Have there been follow ups? Needed actions? Other aspects?

The following should be considered: Changes in organisation, new strategies of the university, and additional resources from the university to the centre.

Where to find data: Report from the vice-chancellor, self-evaluation report, site visit and interview with the vice-chancellor

Added value

Is there an added value when looking at the research performed, the collaborations described, the dissemination strategies, the recruited personnel, the financial situation and the organisation? Have there been changes in the structure of the university as an effect of the establishment of a Linnaeus Centre, benefitting the centre and/or the university as a whole?

The following should be considered: Outputs/collaboration/research performed/breakthroughs achieved that would not have occurred without the Linnaeus grant; new initiatives as an outcome of the establishment of a Linnaeus Centre, evidence of risk taking, synergistic effects of a strong research centre at the university level/national level, new research projects, consultancies, industrial collaboration, prizes, awards to the Linnaeus Centre as a whole, additional research income, additional institutional investments, new technologies and/or research infrastructure, evidence of risk taking, spin-offs

Where to find data: Report from and interview with the vice-chancellor, self-evaluation report, site visit.

5. THE GENERAL EXPERT PANEL'S OVERALL VIEW OF THE 20 CENTRES

This chapter presents the General Expert Panel's overall assessment of the Linnaeus Centres. The first part presents the strengths of the Linnaeus Centres and points out the opportunities created by the grant. The second part discusses areas that the centres need to improve.

The Panel is very impressed by the overall high quality and international competitiveness of the research carried out by the Linnaeus Centres. Some centres have clearly achieved a world-class status in cross-disciplinary research areas. The Panel strongly believes that the ten-year duration of the Linnaeus grant and the flexibility afforded by it are extremely valuable. The grant provides an opportunity for long-term strategic research planning and, importantly, the flexibility to carry out innovative research that is challenging to achieve through conventional funding instruments.

Most centres have a clear upward trajectory, having expanded considerably and integrated new and promising research topics. The Linnaeus grants foster collaboration with other laboratories and Linnaeus Centres. The most successful centres appear to be those that actively promote the centre identity through, for example, regular general meetings, seminar series, retreats and doctoral courses. For most of the centres, the Linnaeus grant has provided the necessary leverage to attract additional grants and third party funding, often to an extent that greatly surpasses the Linnaeus grant funding.

The Linnaeus Centres provide other important benefits as well:

- Supporting the development of future generations of world-class researchers through investment in doctoral and post-doctoral positions and junior faculty in strategically important fields.
- Strategically investing part of the grant money into updating infrastructure, instrumentation, software and databases -- a tangible and essential means of providing added value to the research centres
- Restructuring the universities, emphasising collaboration in larger groups and across departments and disciplinary boundaries, resulting in new or enhanced strategic research areas.

There are some areas where many of the centres could improve. For example, a number of Linnaeus Centres have weak management capacities and a lack of strategic vision and aspiration. This was especially obvious where there was no strategic vision about how to sustain the centre after the end of the grant period. Part of this vision could include a holistic approach to succession planning, starting with including PhD students and post-docs on the steering committee, and at the same time developing junior faculty to increasingly take over leadership tasks. Other areas that many centres should improve upon are as follows:

- Acknowledging the Linnaeus grant in their publications and on their websites
- Recruiting international candidates to fill positions at all levels
- Encouraging mobility, especially for doctoral students after graduation
- Applying for external grants outside Sweden, such as the European Research Council grants and the EU framework program, with support from their universities.
- Proactively implementing university policies to achieve gender balance.

We are impressed by the approaches to recruit and retain researchers in order to improve the gender-balance at selected centres. At some centres, they seek out emerging and established researchers of the under-represented gender. As a result of this, they realised that they also need to provide programmes to develop all of their staff - with an emphasis on management and leadership. Centres varied in the range of PhD and post-doc involvement in planning and strategy, from no involvement to actively including these younger researchers. At centres where younger researchers are involved, this ranged from having a representative on the centre's steering committee to being included in regular formal and informal meetings about day-to-day operations and the future directions of the centre. At centres with no involvement, the younger researchers expressed a desire for regular meetings and annual retreats.

Evaluating the financial aspects of the centres has, as in the mid-term evaluation of the 2006 Linnaeus Centres, proved difficult. In the future, the Swedish Research Council should provide greater clarity and follow up about what can and cannot be reported as matched funding from the universities.

A unique aspect of the Swedish research system is that university researchers retain all intellectual property rights, for example, as patents. Establishing a support infrastructure, such as the initiative at Karolinska Institutet, where support is combined with an opportunity to share any potential benefits between the inventor, department and institution, could stimulate a more active innovation process and provide a mechanism to contribute to centre sustainability.

In general, the vice-chancellors appear to support the Linnaeus grant scheme and would support a continuation, with appropriate competitive renewal opportunities. The universities should develop clear strategies for how to progress at the end of the current grants, in order to secure the best centres for the future, including the principal investigator positions and infrastructure.

The role of the vice-chancellor is important for setting strategic priorities, in partnership with the faculties and departments, and staying engaged through use of appropriate management structure, signals, and incentives. For most universities, the vice-chancellor provides clear leadership and support for the Linnaeus Centres. For other universities, the vice-chancellors appear to have little to no involvement with the Linnaeus Centres.

6. THE PANEL´S ASSESSMENTS

6.1 THE HSE PANEL'S ASSESSMENT

CCL, Lund University

Short description of CCL

Website: http://ccl.ht.lu.se/

The Linnaeus Centre Thinking in Time: Cognition, Communication and Learning (CCL) at Lund University is multidisciplinary and focuses on the role of timing in cognitive function. CCL involves 31 (16.5 FTE) senior faculty and researchers, 1 (1 FTE) postdoc, 15 (11.2 FTE) PhD students and 6 (2.2 FTE) technical and administrative staff (as per 1 June 2013). Its total income is about 25 MSEK per year (2012). The grant awarded through the Linnaeus Centre scheme is 6 MSEK per year.

Recommendations from the first evaluation

Several concerns were raised in the first evaluation.

- A major concern was that the principal investigator (PI) of CCL became the deputy vice-chancellor.
- Gender distribution of the Steering Committee was uneven.
- The previous panel was also concerned about the plans for replacing retiring principal investigators.
- Lack of clarity as to how research areas were prioritized.

In response to the recommendations in the report the following actions have been taken:

- The PI resigned as PI and from the Steering Committee.
- Gender imbalance in the Steering Committee has been addressed through retirement, replacement and recruitment of new members.
- The replacement issue is addressed through Steering Committee members having "deputies" and by the creation of the CCL Reference group, consisting of the deans of the faculties represented in CCL and senior scientists. The task of the Reference group is to oversee the leadership of CCL and to advise on handling conflicts of interest concerning recruitment or funding for sub-projects.
- Lack of clarity in prioritizing research concerning new sub-projects is handled in two ways. In case of disagreement, the decision is made by majority vote. In case of conflict of interest, the decision is referred to the Reference group.

Research performed and planned: Scientific quality

The centre's research activities are divided into five thematic areas, which in turn incorporate a total of 26 projects. CCL makes intensive use of the Humanities Lab, facilities provided by Lund University, that include a wide spectrum of research instruments and techniques (e.g., EEG, eye movement registration, motion tracking). The centre publishes in international forums, many of which are highly regarded in their respective fields (cognitive science, psychology, linguistics, neurosciences and speech pathology). These include journals such as *Psychological Science*, *Journal of Neuroscience*, *Bilingualism: Language and Cognition*, and *Journal of Speech, Language and Hearing Research*. The brain research group also has a paper under revision for *Science*. This study provides evidence for a new type of neural signalling mechanism (in addition to excitatory and inhibitory mechanisms) that is potentially a groundbreaking finding in neurobiology. The bibliometric analysis

recognizes 107 Web of Science articles published in 2008–2013. In addition to publishing in scientific journals, some subgroups (particularly artificial intelligence) also publish in conference proceedings, which is the standard in the field. Therefore, the Web of Science information on publications does not do justice to all areas represented in the centre, and during the site visit the centre provided the panel with a broader analysis of the journal publications of CCL, based on the Finnish categorization system of journals into three levels (basic, leading, top). The analysis showed that roughly one third of the journal articles fell into each of the three categories, which demonstrates that the centre does produce first-class research.

The oral presentations of the performed and planned research were very solid and positively received by the panel and gave a more detailed and coherent picture of the centre's research activities than the written self-evaluation. The centre is aware that the wide spectrum of research conducted at CCL needs to be actively addressed to increase the coherence between different research groups at the centre.

The resignation of the original principal investigator (Strömqvist) has led to some of the proposed research being dropped from the agenda. However, his main field of expertise (psycholinguistics) is still represented in the centre and no major change in the overall research agenda has resulted as a consequence of his resignation.

The centre is working on a detailed plan for the future research, which needs to be further developed, given the centre's desire to have the budget restored to the original level.

Collaboration

The network map analysis based on the Web of Science publications paints a picture of a set of rather independent subgroups. However, an analysis provided during the site visit based on all publications of CCL clearly demonstrates that there is cross-collaboration across the different subgroups. It became evident during the site visit that genuine efforts have been made to increase contacts and collaboration between the different disciplines. There are clear signs that this has improved the internal coherence in the centre. One such sign is that the PhD students from different disciplines communicate with each other on a regular basis. Moreover, most of the interviewed students had a supervisor from two different disciplines. A mentoring program has been implemented. The centre runs a workshop where PhD students receive comments on their manuscripts from senior researchers. The centre reported that working with the different administrative structures in the three faculties represented in the centre creates an additional administrative burden.

New national and international collaborations have been initiated with relation to specific projects. For example, new national collaborations have been initiated with researchers from Karolinska Institutet and Linköping University and new international collaborations have been initiated with several Dutch (Rotterdam, Amsterdam, Utrecht) and American (Stanford, Chicago) scholars. There is room for improvement when it comes to the volume of international collaboration. Yet the centre also attracts foreign scholars.

External communication/dissemination

External communication of the centre's activities is carried out with a brochure which describes the work of CCL; CCL website; seminar series, outreach activities of the university and contribution to that, outreach conference, contact with patient organizations, outreach to schools and teachers, participation in popular media. The outreach work appears thorough and well organized. On the other hand, there is no detailed publishing policy concerning academic dissemination, apart from encouraging researchers to publish in peer-reviewed journals with the highest possible impact factor.

Participating personnel

Most of the participating researchers at CCL are using a substantial amount of their research time for the centre. The expansion in the number of research staff over the first five years has primarily concerned PhD students. Very recently, four post-doc researchers have been employed. The centre is not planning to hire many new PhD students, in order to avoid the possibility that they would remain unfinanced at the end of the 10-year period. The issue of gender balance is taken into consideration in recruiting new people in the centre. Across the entire centre, the personnel are evenly balanced from a gender perspective.

Organization and leadership of the Linnaeus Centre

Significant steps have been taken to clarify and fill in gaps in leadership at CCL. However, given the rather general theme uniting CCL, there is still room for improvement in strengthening and streamlining the common vision of the centre. This could also have consequences on the policies of prioritizing research conducted in the centre. From the outset, the centre has given equal financial support for the five core thematic groups.

Organization and leadership of the university

The letter from the vice-chancellor is supportive of CCL but lacks details on how exactly the university is planning to support the centre. The creation of an institute for advanced studies, Pufendorf, is mentioned by the vice-chancellor but not highlighted in the CCL report. CCL will reportedly be evaluated along with other Lund Linnaeus Centres and other centres of excellence in the university to determine development beyond the funding period. CCL has made tentative plans about how the centre's activities could be continued after the grant period is over. One tentative plan is to form a school for cognitive sciences (not to be mixed up with the Department of Cognitive Science) mentioned both in the written self-evaluation and during the site visit. A further suggestion made during the site visit is to use the Hum Lab as its platform and build closer links with the newly founded department of educational science. It is not clear at this point whether these ideas would gain support from the university.

Added value

The formation of an interdisciplinary centre on cognition, communication and learning has brought about new research projects not envisioned at the time of applying for the funding. Moreover, it has resulted in shared data-collection methods and databases that allow for deepened collaborative work and enables future generations of researchers to build on work carried out under the umbrella of CCL. Expertise in cognitive modelling is also an asset in building and testing theories. Although CCL does not seem to operate as a closely integrated research centre unified by a tightly focused research topic, this does not prevent the individual projects within the centre from making significant and cutting edge research in some of its focus areas.

Recommendations

CCL has recently published or is about to publish groundbreaking findings in some of its focus areas. The centre has made efforts to increase group cohesion, which has had a positive impact on the PhD students who strongly support and contribute to the CCL research environment. The added value of CCL can also be seen in its interdisciplinary collaborations, which has resulted in new research questions not envisioned at the start of the project. The panel's recommendation for the remaining five years is to strengthen the leadership of the centre in order to further increase clarity in the common vision and the common goal to be achieved by the end of the project period.

HEAD, Linköping University

Short description of HEAD

Website: http://www.liu.se/ihv/linnecentrum-head?l=en

The Linnaeus Centre for Hearing and Deafness (HEAD) at Linköping University has its research focus on cognitive hearing science. HEAD involves 25 (7.7 FTE) senior faculty and researchers, 9 postdocs (5.5 FTE), 40 (30.6 FTE) PhD students and 7 (1.6 FTE) technical and administrative staff (as per 1 June 2013). Its total income is about 43 MSEK per year (2012). The grant awarded through the Linnaeus Centre scheme is 7,2 MSEK per year.

Recommendations from the first evaluation

The first evaluation was highly positive, noting that the environment built as a result of the Linnaeus grant had given added value and created new activities among the participating groups. No specific recommendations were made, other than to increase funding and HEAD was accordingly awarded a 20 per cent increase. Funding has been used to expand in several areas including hosting an additional international conference, recruiting additional junior and senior faculty, increasing the number of projects, and increasing dissemination to the general public.

Research performed and planned: Scientific quality

The scientific quality of the Linnaeus Center HEAD is world-leading. Many factors support this conclusion. First, the integrated and comprehensive program of research is model-driven. The main model, the Ease of Language Understanding (ELU), provides direction for numerous experiments aimed at describing and increasing the understanding of the role of cognition in communication. The ELU model was proposed prior to HEAD (Rönnberg, 2003) and early research provided the foundation for the work that was made possible through the Linnaeus environment. A major impact of the work is that the ELU model is now seen as central to cognitive hearing science as evidenced in HEAD's 2013 Frontiers in Systems Neuroscience publication. Indeed, HEAD members have an impressive number of publications, the majority of which are high-impact journals in the fields of cognitive neuroscience and hearing science.

Empirical advances which have led to HEAD becoming a world-leader in cognitive hearing science include the demonstration of the plasticity of the neural correlates of sign language and the role of working memory on low level brainstem responses. The latter was a completely unanticipated finding with implications for understanding how higher level cognitive processes may influence more basic neural functioning. Findings related to the effects of hearing impairment on episodic and long-term memory are viewed as very important, as this research has contributed to an increased interest in cognition, hearing loss, and aging, as discussed in the written report and highlighted in oral presentations to the panel. As noted in the oral presentations, recent research from Johns' Hopkins Baltimore Longitudinal Study in Aging has documented an increased risk of dementia and Alzheimer's disease in older adults with hearing loss and the work at HEAD - bridging cognitive neuroscience, psychoacoustics, engineering, clinical audiology and linguistics - provides a framework for future investigations into the relationship between hearing loss and cognition in aging. HEAD's research is relevant to knowledge translation for technical solutions for hearing loss, as evidenced through increased collaborations with industry.

Another quality indicator is the ability of HEAD researchers to secure external funding for individual projects, increasing from some 12 MSEK in the first full year of Linnaeus funding to over 20 MSEK in the last full year of funding in 2012. The researchers continue to submit major applications to sources such as the Wallenberg Foundation, the FAS/Forte program, and iCARE. During site visit discussions, there seemed to be reluctance by some HEAD researchers in seeking EU funding. HEAD appears to be well-positioned to apply

for funding from the EU as well as other funding agencies, which is important for long-term continuity as Linnaeus funding is time-limited.

The HEAD research program was designed in three phases – short, mid-term, and long-term projects. The written report and oral presentations provided thorough descriptions of research results from the first phase, the ongoing projects in the second phase, and the emerging projects from the long-term phase. The panel members were united in their positive impression of the science from the written report and the quality of the research was confirmed during the site visit.

Collaboration

The initial report was highly complementary of HEAD's collaborative efforts. Since the first evaluation, several new multi-disciplinary, international collaborations have been formed, including eight European, five North American, and two Australian formal projects. Within Sweden, there are new collaborations with hospitals and audiological centres, stakeholder community organizations, and government agencies. International networks have been formed related to work with the WHO and those Nordic groups focused on cochlear implants. Of particular note, due to the potential for knowledge translation, are the growing collaborations with industry. Finally, the HEAD members serve as reviewers for many important journals, are on several editorial boards for high impact journals, and serve on many national and international research councils.

External communication/dissemination

HEAD systematically and effectively communicates the results to the research and general community. HEAD utilizes a variety of strategies, maintaining an up-to-date and comprehensive website. HEAD has organized two major international conferences focused on Cognitive Hearing Science. There was clear reference and acknowledgment of HEAD in the printed materials made available to the review panel, both scientific and from more general print media outlets. A separate listing of the HEAD seminars provided to the panel and accessible via the website showed a distinguished national and international list of presenters, as well as presentations from HEAD researchers. There is international representation of HEAD members at all staff levels, attributed in the coordinator's report to HEAD's announcing and promoting positions through international marketing. To sum up, all evidence supports the conclusion that a well-thought out and comprehensive communication strategy is in place.

Participating personnel

The number of HEAD members has increased from 35 in 2008 to 81 (43 FTE), currently. The initial strategy was to target Post-docs and PhD students. One point of discussion arising during the site visit related to a general difficulty in recruitment of PhD students to "hearing science" related areas. The panel met with five PhD students who were completing their dissertation work. While the students were generally positive about their experiences, there did seem to be some challenges relating to students having to travel great distances while enrolled in the program, as well as some difficulty with access to facilities and equipment needed to complete research activities within the university setting. It was reported that the latter issue has been addressed with new research equipment now available.

The initial HEAD strategy also involved the early recruitment of three distinguished professors and, as noted in the initial evaluation, a prestigious and engaged international advisory board. The increase in personnel, while clearly strategic and reportedly highly desirable, has also led to increased long-term demands on the HEAD budget. Finally, as might be expected, based on historical gender representation in the professoriate and senior researchers, there are still more men than women at these two staff levels although there have been major improvements since grant initiation. No concerns with gender were expressed in the initial evaluation nor are there any significant concerns at this time.

Organization and leadership of the university

HEAD's organization and leadership were highlighted as strengths in the initial evaluation. The HEAD coordinator, Professor Jerker Rönnberg, was perceived by the panel members to be a strong, cohesive leader, with a well-articulated and clear vision for the centre's future. The potential need to develop a plan for a future leadership transition, although not anticipated during the remaining period of Linnaeus funding, was raised by the panel members. Responses during the site visit indicated that the HEAD steering group was aware that they would need to develop a leadership transition plan at some point in the future, but concrete discussions had not yet been deemed a priority. Written communication provided during the site visit to the review panel members indicated that the long-term plans for succession included scientific focus at all levels, development of leadership talent and development of new projects, methods and instruments. The Expert Panel noted that there was less discussion about HEAD's organizational and leadership structure during the site visit than anticipated, as Rönnberg's presentation focused on the group's research agenda. Organizational and leadership descriptions in the coordinator's written self-evaluation, however, allowed the panel to conclude that HEAD has an appropriate organizational and leadership structure.

The vice-chancellor's communications (letter and interview) indicated that HEAD was strategically important to Linköping University, and that it was an identified priority area. HEAD was viewed by the vice-chancellor as a very solid centre which bridged from basic human research in cognitive neuroscience to practical applications with a significant ability to contribute to knowledge translation to industry. High performing professors receive additional support from the university, including those in HEAD. The vice-chancellor has made a written commitment to match any increase of Linnaeus funding to HEAD with funding from the university.

Added value

The Linnaeus Centre HEAD is a strong, productive Linnaeus environment involving multi-disciplinary faculty and trainees and is used well to produce substantial scientific quality. HEAD has high international visibility and the number of important national and international collaborations has grown substantially during the first five years of funding. HEAD research has involved risk-taking, which would not have been possible without the Linnaeus funding. The result has been the generation of important and influential research findings, the development of new methodologies and technologies, and knowledge transfer.

Recommendations

The Linnaeus Centre HEAD is a highly productive multi-disciplinary research centre that has established itself as a world-class leader in Cognitive Hearing Science. The Expert Panel recommends that HEAD continue on its strong trajectory, seeking multiple sources of external funding, engages in strategic recruitments, particularly at the post-doc level, and explores methods for enhancing the experiences of PhD students. The need to develop explicit plans for any potential future leadership transitioning is also encouraged.

IMPACT, Uppsala University

Short description of IMPACT

Website: http://www.crs.uu.se/Research/impactofreligion/?languageId=1

The Linnaeus Centre The Impact of Religion: Challenges for Society, Law and Democracy (IMPACT) at Uppsala University is multidisciplinary and focuses on economic, social, political, legal and religious changes in Sweden and the Nordic countries. IMPACT involves 28 (5.1 FTE) senior faculty and researchers, 1 (0.5 FTE) postdocs, 12 (9.6 FTE) PhD students and 1 (0.2 FTE) technical and administrative staff (as per 1 June 2013). Its total income is about 12.5 MSEK per year (2012). The grant awarded through the Linnaeus Centre scheme is 5 MSEK per year.

Recommendations from the first evaluation

The first evaluation was overall extremely positive about the research undertaken at IMPACT. It made some suggestions for improvement that were primarily woven into the text rather than formal recommendations. The site visit in particular, as well as the centre's written report, made it clear that IMPACT members were responsive and highly effective in resolving these concerns.

In particular, the first evaluation found that the system for prioritizing projects within IMPACT was unclear. The broad spectrum of projects at the start of the Linnaeus grant was a deliberate strategy. It aimed to test out areas of risky research where only some areas were likely to be productive. In the second phase there is a targeted research focus on three theme areas capable of further growth and innovative collaborations.

Questions were also raised about the succession of the (retiring) Director. During the site visit the current Director was absent due to a health emergency. The associate directors gave an impressive performance regarding the leadership, structure and overall management of IMPACT and there was a clear sense of leadership and collaborative energy and the succession planning was highly effective.

Questions were raised about the gender profile, especially in the senior ranks. This aspect has been self-consciously addressed by IMPACT, and the proportion of senior professors who are female has gone up to around 40 per cent.

Dissemination was not as developed as it could be. The goal of strengthening this outreach aspect was regarded as high priority, by publication of a brochure, a weekly update of website materials, presentation of programs at international conferences and the establishment of IMPACT as a network coordinator for religion and society programs beyond IMPACT. During this period there has also been the appointment of a communication officer, whose work has explicitly concentrated on developing dissemination through the website and other popular outlets.

Research performed and planned: Scientific quality

IMPACT has decided to concentrate their research in three main topics: Religion and Law, Religion and Health, and Religion and Education and aims at analysing religion and its analytical relation with legal, social and political science in a way that is truly groundbreaking in the field. IMPACT has undertaken highly risky projects. These have broken open a new field of inquiry linking the study of legal and religious traditions with a focus on contemporary society in Sweden. The different projects are interlaced in order to address the broad question of religious and social changes taking place in Swedish society.

There has been an extensive output of IMPACT publications during the grant period, including a significant proportion of publications in highly prestigious journals and academic publishing houses appropriate for the particular field. The overall output reflects a combination of work from internal collaborations between senior faculty, postdoctoral fellows and in some cases doctoral students as well as external national and international counterparts.

A strategic focus on families, law and society is highly relevant to Swedish society and the changing understanding of the role of families and different models of parenting. Senior faculty are engaged in particular contributions to the legal instruments in Swedish society, including controversial areas such as child marriage, forced marriage and gay marriage in Sweden. The investigation of legal processes pertinent to immigrants, holding a diversity of religious beliefs, is original and innovative research. The area of well-being and health includes psychological data, including values within immigrant communities and refugees. Practical impacts included an influence on Swedish mental health programs. The group working on science and theology had a more theoretical core of a multidimensional model. This is innovation in the field. Overall all projects chose methodologies appropriate for the research being developed and recognized complexity by inclusion of appropriate philosophical and theoretical analysis.

Collaboration

IMPACT has developed a wide range of new and significant partnerships, both domestically and internationally within the academic community and in practical contexts, such as with Non-Government Organizations (NGOs). This has expanded IMPACT's national and international networks. Globally this centre appears to be unique and one of the most extensive collaborative efforts in the Humanities and Social Sciences area, involving six Faculties of Theology, Law, Social Science, Medicine, Pharmacy, Science and Technology, alongside twenty disciplines at Uppsala University. A new course has been developed, "Introduction to Islamic Jurisprudence". A new lectureship in "Law and Conflicting Values" also reflects cross-disciplinary interests. Different theme areas have been instrumental in establishing new collaborative networks with researchers across the Swedish academy.

The international profile of this work is extremely high and has grown exponentially compared with the first evaluation. A major achievement is IMPACT acting as host for a colloquium for leaders of interdisciplinary research programs in Switzerland, Estonia, Norway, Belgium, Finland, USA, Germany and Canada. This provides IMPACT with further opportunities for presenting itself as an international player and leader in the field. More specific impressive international collaborations include NOREL, examining the role of religion in the public sphere, YOMA, on youth in the margins, Religion and Human Rights and the Commission on Family Law. Some were focused on Nordic countries, and RELIGARE Research is European based, but many extended wider than this, including South Africa, Croatia, Iceland and one involved thirty nations. Guest researchers at all levels - faculty, postdoctoral and doctoral students - have been attracted to IMPACT from all over the world.

The Uppsala University Innovation office (UUI) shows a different kind of collaboration that has become possible with the business community, public sector and civil society. UUI has also drawn on significant EU funding to support the collaborative effort between IMPACT researchers and external partners in civil society. Clear achievements include the establishment through IMPACT of the first network for research on youth and religion in Sweden, involving scholars from sociology, psychology, didactics, comparative religion, ethnology, cultural and immigration studies from different university settings. The aim is to establish a Swedish research network on existential and cultural dimensions of public mental health promotion, and a national collaboration between IMPACT and other societal agents focused on cemeteries of the future.

External communication/dissemination

More effort has been given to the external communication and outreach component of IMPACT and this will be intensified during the last five years of the Linnaeus program. The target group is the general public or society as a whole. To aid in these efforts, one part-time communication expert (50 %) has been appointed. Public outreach is devoted not just to disseminating existing research findings, but also to engage potential information users and decision-makers at an earlier stage in the research process. The intention is not just to deal with frequent requests for information from the government and media, but also to become more pro-active. The centre impacts on UUI internally within Uppsala University, but to date there is no detailed recorded evidence of any impact as a result of this dissemination. Individual sub-themed projects made claims

for impact on policy-making and legal policy in Sweden, but the results are not yet quantified. The panel considered that IMPACT would benefit from a sustained attempt to document more formally its ability to impact wider society. Interdisciplinary seminars are already in place, but these will increase in the second half of the project, as well as a major international conference to be organized in 2018.

Participating personnel

There are now more women in leadership positions compared with 2010. The minimum gender balance of 40 percent has been achieved across the spread of personnel categories. Many faculty members participate without particular funding from IMPACT which shows the strength of IMPACT– that researchers find there is particular "value" to being aligned, without funding being provided. The senior professors and research staff numbers have remained relatively stable. Two further visiting international doctoral students from Germany and Finland have sought out the IMPACT community for extended visits. There is clearly a deliberative process in appointing some postdoctoral appointments in some areas and not others. The recruitment strategy to employ those with the highest level of disciplinary competence in targeted theme areas is appropriate. New researchers are required to have their own funding. Additional researchers with IMPACT funding to supplement competency is part of the new project plan for 2013–18.

Organization and leadership of the Linnaeus Centre

Leadership and key personnel reflect a vibrant and dynamic centre that not only has a clear vision and a proactive Director, but provides for a sustainable future by training younger scholars to take leadership positions. Per Pettersson replaced the retiring Director in 2011, but one of the strengths of this centre is its flat management policy that has enabled new potential for leadership to emerge among those in assistant positions. There are therefore no concerns about succession planning for this centre. This centre is well organized and is self-reflective about how to continue to improve in its organization and management. The number of personnel in the Steering Group has now been reduced from six to three members. The rationale for this was to reduce the size of the decision-making body and so enable easier decisions and administration. The change in structural management of IMPACT in order to streamline decision-making is desirable in terms of efficiency, and younger researchers have been brought into decision-making processes through the Scientific Board. The theme areas have been strengthened with a theme leader and an assistant theme leader. The Scientific Board has as much influence on strategic decision-making as the Steering Group, thus showing a relatively flat management policy and a stress on collective identity. The mid-term panel noted that one of the particular strengths of IMPACT was its ability to train young and energetic scholars with the capability for leadership in their respective field.

Organization and leadership of the university

The University of Uppsala stands firmly behind IMPACT and views its work as a high priority. The faculty of theology and the office of the Vice-Rector of Humanities and Social Sciences have both extended significant financial support to the centre. The vice-chancellor expressed a strong support for IMPACT in the interview with the General Expert Panel. The projected increase in grant amount in the second half of the award reflects the desire for more personnel. The vice-chancellor contributed more than the statutory 50 per cent required by the Linnaeus grant, including two post-doctoral fellowships, a visiting faculty fellow and other benefits. The bulk of the funding is for salaries, with an increase in funding designated for premises. The provision of a new and airy building that fostered conversations was perhaps one of the main strengths of the university provision for this program. During the site visit many of the faculty commented on how the building had allowed a freedom of exchange and conversation that would not have been possible otherwise. The vice-chancellor, in the self-evaluation, describes how the university provides support in order to stimulate the creation of successful EU-funded projects that would help secure funding for the post-Linnaeus era. This is exceptional support from the university. The key senior IMPACT Faculty recognize the wisdom of developing particular areas of

strength, and have amply demonstrated the ability to attract internal support from the university as well as success in highly competitive grant applications.

Added value

The IMPACT research environment is poised to make a highly significant contribution to research on religion and society in Sweden and beyond. The fact that the group have now concentrated their research on three topics is itself a remarkable achievement. IMPACT brings together innovative development of theoretical and analytical frameworks and practical relevance. It has been highly successful in attracting large external grants to further its research aims and so boosting its current productivity and securing its future well after the grant period. The research planned is focused, clearly articulated and highly innovative. The strategic publication policy has served IMPACT by enhancing the number of internationally recognized publications and this trend is likely to be continued into the final phase. The new projects suggested and begun in the summer of 2013 are all strategically designed within the brief of the IMPACT research centre.

Considerable time is required to engage in genuinely innovative interdisciplinary activity becoming transdisciplinary. IMPACT is spearheading a paradigm shift in the respective fields. IMPACT research is now coming into world prominence in the field but still has not yet reached its full potential. Identifying the basis for transdisciplinary exchange was the result of patient and persistent efforts at internal and external collaboration and exchange. Linnaeus funding enabled and boosted scientific exchange, publications and collaboration that would not have taken place otherwise. The evidence to support this claim became obvious during the site visit. Funding has been used in strategic and intelligent ways in order to foster collaborative work internally and externally. A synergistic combination of stable funding from Linnaeus with further highly impressive successful large grant applications from the Swedish Research Council, the European Union and other charitable trusts, has fostered and enhanced research of extremely high international quality. Overall, the panel was particularly impressed during the site visit by the extent and level of interaction among different colleagues from very different disciplinary boundaries. This is even harder to achieve in practice compared to theory. Diversity of languages and methods across different subject domains make conversations difficult. IMPACT recognised and discussed these problems and found ways of patiently navigating difficulties. The build up towards this work was in place some years before the Linnaeus grant was put in place. The Linnaeus grant was particularly timely in enabling an astonishing array of innovative research. Further growth is expected after some strategic pruning already discussed. The level of collaboration across Faculties and between departmental units enabled by the Linnaeus grant is impressive and IMPACT has become a hub of national and international excellence.

There has also been impressive evidence of additional research income from other external sources in specific thematic areas. This would not have been possible without the stable research base that the Linnaeus grant provided. Research and collaborative ventures were bold and risky and expanded frontiers of knowledge in new and exciting ways, attracting a new generation of doctoral students. The commitment to the next generation of scholars in IMPACT was impressive. IMPACT is well aware of the importance of building a sustainable future.

Recommendations

IMPACT is an excellent, vibrant and well-functioning centre involving multidisciplinary faculty and doctoral students providing true interdisciplinary interactions across a very wide spectrum of expertise. The researchers at IMPACT collaborate in a way that does not compromise scholarly excellence but serves to enhance it further. The panel was impressed by the self-reflexivity of this group of scholars, who were well aware of areas that needed to be strengthened further and took active steps to address perceived problems. This is a dynamic centre of research excellence with international recognition and an impressive array of networks of scholars, nationally and internationally. Its strategic planning and provision for the future is excellent. Recommended actions are (a) a clearer documentation of interactions at the policy and legal level, (b) a more formal structure for collaborations among all doctoral students and (c) further efforts to improve targeted communication. There

are no serious weaknesses identified for IMPACT and areas for development would be relatively straightforward to achieve.

LUCID, Lund University

Short description of LUCID

Website: http://www.lucid.lu.se/html/about_lucid.aspx

The Lund University Centre of Excellence for Integration of Social and Natural Dimensions of Sustainability (LUCID) is a multidisciplinary centre on sustainability science. LUCID involves 42 (10 FTE) senior faculty and researchers, 6 (2.8 FTE), postdocs 34 (20.3 FTE) PhD students and 5 (2.4 FTE) technical and administrative staff (as per 1st of June 2013). Its total income is about 28 MSEK per year (2012). The grant awarded through the Linnaeus Centre scheme is 7.5 MSEK per year.

Recommendations from the first evaluation

The first evaluation report highlighted three recommendations: (1) Balancing action-oriented and basic research agendas, (2) Improving the communication and outreach components of the centre, and (3) Addressing gender balance in the organization.

In response to these recommendations, LUCID has taken several actions. The participants have initiated and developed a dialogue on the balance, interface, and synergies between action-oriented and fundamental research. The site visit made it clear that the researchers do not seek to blur the line between research and activism. Instead the LUCID participants emphasize that they are researchers interested in social-change processes as a subject of their study and that, first and foremost, they strive to achieve high quality research. Their publication record supports this assertion, as the research productivity as measured by peer-reviewed outlets is quite high. To improve the communication and outreach component, LUCID supports researchers in communicating their published findings to a broader set of stakeholders in creative and unconventional formats, such as films, policy briefs, an annual workshop in the Swedish Parliament, as well as translation of research into a more accessible language and formats. Finally, LUCID has improved the gender balance in the steering committee and in the centre as a whole, complying with a 40/60 ratio as a minimum.

Research performed and planned: Scientific quality

The research at LUCID is of generally high quality. Since its creation, the centre has published more than 100 peer-reviewed articles, chapters and books. A few of these have come out in first-tier academic journals, such as *Science*, *PNAS*, *Conservation Letters*, *Global Environmental Change*, and *Ambio.* The work published in these outlets has showcased some of the centre's unique and path-breaking research, especially in the social sciences. What characterizes most of this research is its effective integration of multiple social-science perspectives into environmental problem analysis. Philosophy is of particular importance to LUCID's work, demonstrating how the integration of a values-and-ethics perspective into sustainability science can help develop a deeper understanding of environmental problems and their potential solutions. One of the major strengths of LUCID is the high quality and diversity of its doctoral students. LUCID has been able to make its doctoral program an internationally well-known program that attracts many qualified international applicants every year (more than 350 applicants in the first cohort). The 34 graduate students associated with LUCID come from eleven different countries – a truly international PhD program. It is clear to the panel that the LUCID doctoral students play a major role in the LUCID research program and much of the high research productivity may be attributed to the high quality of these students. The panel noted a high level of engagement of the doctoral students in all aspects of the centre's work, including presenting research findings and responding to questions from the panel during the site visit.

The panel noted the limited role of the natural sciences in the research questions and projects developed. The panel views this as a drawback for the research in the field of sustainability science, which is premised on a high degree of integration of social *and* natural sciences. A focus on critical approaches to the study of global

change issues may be justified as a way of correcting for the current domination of positivist methods in the sciences. One of the stated aims of the centre, however, and one of the central rationales of sustainability science, is to promote greater integration between the natural and social sciences. Senior researchers' contributions to the interdisciplinary activities have been limited due to their other commitments. During the site visit, the doctoral students explained that this was a problem during the early stages of the centre, and that the situation has since improved. Even so, the panel would encourage more active involvement by senior faculty members in the centre's research, including mentorship of doctoral students.

Collaboration

The panel noted that the national and international collaborations of LUCID were impressive. The *Science* paper ("Navigating the Anthropocene: Improving Earth System Governance", *Science*, 335 (6074): 1306-1307, 2012) that Olson co-authored is a case in point as it shows that LUCID is connected to the scientific leaders in the field of sustainability science, including Biermann, Liverman, Cashore, Tomich, and Young, among others. Another data point that supports the centre's claim for success when it comes to collaborative ties is its collaboration with the Right Livelihood Award (RLA). LUCID is also hosting the secretariat of the *Earth Systems Governance Program*, a highly prestigious, international research program. The fact that LUCID was selected as the appropriate institutional home for this program bears witness to the very good international reputation that LUCID enjoys. Finally, for the doctoral dissertation defences, LUCID has been able to recruit a very impressive list of dissertation opponents, which has meant that several eminent scholars have become familiar with the research carried out at LUCID. Such contacts enable the centre to continue expanding and deepening their collaborative ties with leaders in this field.

External communication/dissemination

This was one of the issues dealt with by the previous evaluation and although a lot of effort has been made to improve this aspect of the centre's work, the panel notes that it is not entirely clear what the centre's strategy is when it comes to ensuring high policy relevance in the research. LUCID has carried out a great many of activities related to outreach. It is worth mentioning having a three-year engagement as Coordinating Lead Author in the IPCC process and having one scientist write one chapter. It is also interesting to note that the centre has embraced a new medium for communication research findings: film. The Right Livelihood Award grant supports an annual seminar at the Swedish Parliament, which appears to be an effective way of reaching high-level decision-makers with LUCID research findings. These achievements notwithstanding, what appears to be missing is an articulation of the centre's overall strategy as regards moving from knowledge to action. The panel got the impression that the implicit strategy is to follow a traditional and quite linear approach to research dissemination that relies on the mass production of published findings in a popularized format, although such approaches have been shown to have limited impact on decision-making processes. The impact of LUCID research may be further increased by engaging in a careful assessment of the existing publication strategy, identifying the needs of decision makers, and developing a strategic approach.

Participating personnel

The panel notes the central role of the doctoral students in LUCID's work. In addition, LUCID has successfully recruited several excellent scholars to the core faculty of the centre. It is also encouraging to see that progress has been made on gender balance since the last evaluation. The centre complies with the 40/60 minimum female/male ratio overall, although at the professor level the proportion of females is still below the 40 per cent mark. It is noteworthy that eight out of 15 incoming PhD students were women.

The panel also notes that a natural sciences perspective is underrepresented in LUCID. Although there are three faculty members with a natural science background (Seaquist, Olsson, and Akselson) who advise several doctoral students, the centre's research program is characterized by strong interdisciplinary research among the various social sciences but not so much between the social and natural sciences. During the site visit, LUCID participants stressed that the integration of natural and social sciences is one of the strengths of LUCID,

however, this is not reflected in the centre's research activities and publication record. The panel recommends that LUCID increases the number of natural scientists and gives them leadership roles in developing interdisciplinary research projects. This is important given the centre's emphasis on cognitive distance and diversity as an approach to creative scholarship.

Organization and leadership of the Linnaeus Centre

One of the main challenges to LUCID's organizational structure in the first five years is the termination of the Department of Sociology of Law (SoL) as a core partner to the centre. It became apparent during the site visit that this delicate process of separation was handled quite well by the steering committee and the separation appears to have been amicable. The split with SoL resulted in a budget surplus and the panel found it interesting how LUCID decided to spend these funds. Rather than splitting the freed-up funds into equal parts and redistributing them to the remaining partners, the steering committee decided that the funds were to be invested into a common research fund that partners and their doctoral students could apply to for additional research funding. However, given that the financial plan included representation by SoL as a core partner, the removal of this partner meant additional resources to the remaining partners of LUCID to do more narrowly focused research.

The centre has an active fund-raising strategy in place and has succeeded in raising external EU grants that bodes well for post-Linnaeus funding streams. In fact, during the site visit LUCID presented a convincing strategy for how the centre will try to mobilize both internal and external sources of support to continue the work they have started with Linnaeus funding. LUCID members also participate in research activities funded by five active EU research grants, which complement the Linnaeus Centre grant.

Organization and leadership of the university

The letter from the vice-chancellor on LUCID seems quite supportive. LUCID is currently engaged in discussions with the university leadership to reach an agreement on the extent of post-LUCID support. The outcome of this negotiation process will depend on an internal evaluation to determine support levels for development beyond the funding period. LUCID has made tentative plans about how the centre's activities could be continued after the grant period is over. The tentative plan is to leverage internal support for the centre to seek support from EU's Horizon 2020 program as well as research program grants from the Swedish Foundation for Humanities and Social Sciences (Riksbankens Jubileumsfond).

The removal of ties with the Sociology of Law program reduced the budget expenditure compared with that laid out in the original proposal. While the centre has made creative use of the additional funding, the panel noted that the freed-up funds were used to provide additional funding mostly for ongoing research activities, not for new areas of research. The plan for how to ensure consistent and substantive involvement of senior researchers in the centre's work needs more attention. The panel perceives a very strong contribution of doctoral students to the LUCID research program.

Added value

LUCID has brought added value to Lund University. It has added diversity, expertise, reputation, and resources. The university also seems to stand firmly behind the centre's plans for the future and, according to the vice-chancellor's letter, is committed to facilitate a sound transition to a functioning LUCID after the funds from Linnaeus end. LUCID has had several accomplishments that have increased its visibility and value nationally and internationally. A significant accomplishment is that LUCID was successful in bringing the international project secretariat of the 10-year Earth System Governance (ESG) project to Lund. Another development is that LUCID was selected by the Right Livelihood Award (RLA) Foundation to become the Swedish Right Livelihood College (RLC). The panel found that one of the most important accomplishments is that LUCID has attracted high quality doctoral students that are conducting excellent research. This would not have been possible without the financial support to doctoral students through LUCID. LUCID has succeeded in

developing its own identity as a research centre, a strong international reputation, and in creating an enabling environment for collaborative research that did not exist before.

Recommendations

The panel found the LUCID environment to be performing well and producing some very high level research and an impressive level of international and national collaboration in the field. The panel was also impressed by the quality and range of its doctoral students. Sustainable development is a topic of great interest across the world, and LUCID is acknowledged as one of the leading Centres addressing vital issues related to that topic.

The panel identified three areas for improvement. Firstly, stronger links to the natural sciences would enrich the centre's expertise in both research and training. Secondly, the panel recommends that LUCID works to articulate a strategy for how to increase the impact of the research on decision-making processes, especially national policies in Sweden. Such an analysis will help centre scholars to conduct policy-relevant research – producing knowledge that is relevant, credible, and timely for decision-makers – without compromising the scientific quality of the research. Thirdly, the panel encourages the articulation of a plan for how to ensure consistent and substantive involvement of senior researchers in the work of the centre.

SPaDE, Stockholm University

Short description of SPaDE

Website: http://www.su.se/spade/

The Linnaeus Centre for Social Policy and Family Dynamics in Europe (SPaDE) at Stockholm University includes researchers from the Department of Sociology, the Department of Human Geography and the Swedish Institute for Social Research (SOFI), thus comprising demography, sociology, social policy analysis and human geography. SPaDE involves 20 (8.6 FTE) senior faculty and researchers, 5 (2.6 FTE) postdocs, 3 (1.3 FTE) PhD students and 5 (3.3 FTE) technical and administrative staff (as per 1 June 2013). In addition to these 33 (15.8 FTE), another 11 researchers and students were affiliated with SPaDE and collaborating in SPaDE research with salary support from other institutions or agencies. Its total income is about 35 MSEK per year (2012). The grant awarded through the Linnaeus Centre scheme is 6.99 MSEK per year.

Recommendations from the first evaluation

The initial review found the Linnaeus project on Social Policy and Family Dynamics in Europe (SPaDE) to be worthwhile and asked for a clarification of the relationship between the Department of Sociology, Stockholm University (its demography unit SUDA) and SPaDE, development of procedures regarding mentoring and, development of procedures for replacing key personnel. To address initial review comments, SPaDE has engaged in activities to increase SPaDE's profile. The steering committee has adopted a procedure for selection of a new coordinator and strengthened implementation of the university's mentoring policies and procedures. SPaDE has high quality publications and presentations, they arranged the 2012 European Population Conference on "Gender, Policies and Population", with 800 delegates, mainly from North America and Europe. SPaDE has also established new collaborations with other leading research institutions.

Research performed and planned: Scientific quality

The overall quality of the research at SPaDE is very high and the affiliated researchers publish in peer-reviewed journals of high quality. The research on families and individuals is organized in terms of four clearly related and well-described policy domains. In addition there is a fifth overarching theme on the gendered character of social policies and family dynamics. The activities within each of the four policy domains were clearly described in the self-evaluation report with the implications for policy linked to the research conducted. The fifth overarching theme relates to increased research infrastructure in terms of building databases for future research. The SPaDE researchers have been securing external support for collecting and organizing an impressive infrastructure (databases) that can be used in future projects, not only on social policy and family dynamics, but also for a wider array of social science research topics.

The centre combines macro and micro research in an original way. The different projects within SPaDE cohere and are in good synergistic relationship with each other. SPaDE has made noticeable impacts at the international level. SPaDE researchers are also involved in a number of comparative projects, including not only Nordic countries, West-European, Central and Eastern European countries, but also East Asian countries.

SPaDE has realistic and good plans for future research which builds logically on work completed, and the panel found that the future plans outlined at the site visit were sufficiently elaborated to conclude that there is high potential for successful completion. The centre has ambitious plans for future work that includes building a common platform for better utilization of register data in the Nordic countries. If supported, this new infrastructure will open up a wide range of research opportunities for the social sciences in general, that will benefit science as well as policy makers, not only on family dynamics, but also on integration of immigrants, labour market research, research on social inequalities, etc.

Collaboration

SPaDE is a founding member of Population Europe, a collaborative network of European demographic research institutes. The centre is the coordinator of "FamiliesAndSocieties", a European Commission Framework 7 project, with 25 institutional partners in 15 countries and three transnational civil society partners. There is also a project on Nordic Family Policy and Demographic Consequences that draws together scholars from Sweden, Norway and Iceland. In addition, the centre collaborates with several public sector agencies, such as the Swedish Social Insurance Agency and the Swedish Public Employment Service.

External communication/dissemination

SPaDE has a well-developed, clear website, easy to navigate, with easily accessible information, including seminars, working papers, and publications. SPaDE researchers present their findings regularly to Swedish and international government and non-government organizations, organizing events for the general public as well as policy makers. SPaDE researchers have also provided consultation and served on advisory boards for government agencies and NGOs inside and outside Sweden (for example within the EU). SPaDE researchers are often asked to write policy notes and reports. The research output from this group is impressive according to bibliometric information. In addition to social policy and family policy, the group also uses geo-data to provide studies of housing segregation. SPaDE researchers also work with the EU commission on unemployment benefits. This is possible due to the data-infrastructure built at SPaDE.

Participating personnel

Nine individuals were associated with SPaDE in 2008; by 1 June 2013 this had increased to 44, out of which 33 (15.8 FTE) had some salary from SPaDE. A systematic recruitment policy has been adopted which includes calls for proposals and inviting potential new members to present their work in a colloquium. International post-docs and PhD students have been hired. According to the vice-chancellor, the centre is one of the university's most international units. 11 of the 20 key researchers are women; among the remaining affiliates and postdoctoral fellows about 60 percent are women.

Organization and leadership of the Linnaeus Centre

SPaDE has a strong leader with a clear vision for future activities. The research group is cohesive with a democratic structure. There is a steering committee and a three-member management group; the former meets once a month, the latter on a daily basis. The members of the international advisory board are elected for a renewable 3-year term. The international advisory board reviews each research project bi-annually, the steering committee will decide upon the project's continuation. The gender composition in the boards is equal. Members of the centre have several seminars to attend: weekly and bi-weekly seminars and three times per year in half-day or full-day meetings. Leadership changes are dealt with effectively, and there appears to be a collaborative approach in determining leadership of the Steering Committee when the current coordinator eventually retires.

Organization and leadership of the university

Stockholm University appears committed to SPaDE, as documented in a very positive letter from the vice-chancellor. In December 2012, the university committed 105 MSEK in the form of postdoctoral research fellowships, sabbatical semesters, and recruitment of leading international scholars to the university over a 5–7 year period. It appears that SPaDE researchers received two of these additional fellowships. In 2011, the university recognized the excellence of its demographic researchers by including Demography as a "leading research area" which gave the centre extra status and increased visibility on campus and beyond. The university also provided substantial support for the organization of the European Population Conference.

Added value

There is clear evidence that the Linnaeus grant has created synergies by facilitating new research collaborations and leveraging grants. The Linnaeus grant has made a tremendous difference in giving new energy to interdisciplinary research across sociology, demography, human geography, political science, and, partly, economics. The Linnaeus grant has been used to build up a vibrant research centre that is well on its way to be one of the strongest research centres for demographic research in the world. The Linnaeus grant also allowed SPaDE – together with external funding – to build a new and very impressive data-infrastructure.

The added value is also seen in SPaDE's research findings which, in all likelihood, would not have materialized at the observed scale, magnitude, or scope without this funding. The collaboration with human geography adds a new, spatial dimension to their research. Novel methods are being developed and utilized, in particular by merging longitudinal and spatial methods to develop new methods of measuring contextual effects.

SPaDE asks important questions that have social impact on family dynamics across Europe. The flat organizational structure of the centre has remained the same, and seems to work well. The Linnaeus grant has significantly contributed to the centre's success in gaining other external funding (e.g. EU). The centre has stimulated interdisciplinary research between five different disciplines. SPaDE has increased the visibility of the Swedish research on social policy and demography. SPaDE has contributed to – and benefited from – increased cross-Atlantic fertilization in family research, where more US-researchers now come to European population conferences. Perhaps the most noteworthy success of the centre is its fund-raising efforts: over the past five years, SPaDE researchers generated 92 MSEK in external grants and the centre has already secured an additional 64 MSEK for the next 5-year period. This bodes well for a transition to a future without Linnaeus funding.

Recommendations

Swedish studies in demography and social policy in Europe are strong and SPaDE is one of the main research groups in Europe. SPaDE is an excellent research environment with specific opportunities for future research. SPaDE is an established, dynamic and productive research centre and one of the world leading centres in population studies. The new spatial dimension added in SPaDE is promising for the development of a wider analytical and theoretical perspective that will grasp contextual effects on individual choices, actions and opportunities. Ambitions should be high for future development. We recommend SPaDE be more systematic in reporting indicators of what kind of difference they make, in particular with regard to media appearances, invited presentations for policy makers, policy impacts, etc. SPaDE has a strong and important ambition to develop a cross-Nordic platform for register data access. If granted resources, this new infrastructure would benefit all quantitatively oriented social sciences, as well as policy makers. A better infrastructure would also increase research efficiency in general and open up new opportunities for all social sciences.

6.2 THE M PANEL'S ASSESSMENT

BAGADILICO, Lund University

Short description of BAGADILICO

Website: http://www.med.lu.se/bagadilico

The Basal Ganglia Disorders Linnaeus Consortium (BAGADILICO) at Lund University builds upon a long-standing tradition in basic, translational, and clinical studies of Parkinson's disease (PD), especially cell transplant therapy for PD. The centre as of June 2013 comprised 25 research groups with 124 staff (100.4 FTE) of which 31 (27.2 FTE) are PhD students. The centre receives a Linnaeus grant of 9 MSEK per year and the total budget of the centre was around 86 MSEK for 2012.

Recommendations from the first evaluation

The first evaluation of BAGADILICO concluded that the centre was excellently organized and recommended further strong support (annual budget was increased from 7.5 MSEK to 9 MSEK per year).

Research performed and planned: Scientific quality

The main goals of the centre's research are to reveal cellular and molecular mechanisms underlying basal ganglia degenerative disorders, to translate discoveries made in basic research to novel therapies, and to apply the knowledge to clinics by inventing and refining clinical tools for accurate diagnosis and prognosis of disease progression. The centre was reorganized in 2010 into four Work Packages (WP) from the original six, upon recommendation from its Scientific advisory board (SAB). The new organization (WP1: Basic science; WP2: Translational science; WP3: Clinical science; WP4: Cultural science) streamlines its research themes and the new system appears to be working very well. In particular, the Cultural Science became a stand-alone WP, which positioned it to perform studies on societal aspects of biomedical sciences while maintaining intimate collaboration with other WPs.

WP1 has made progress in the understanding of Parkinson's disease (PD) pathogenesis, building upon the initial finding of cell-to-cell transfer of alpha-synuclein (**α**-syn) from PD patient cells to grafted cells. That study ignited a series of subsequent research efforts looking at "prion-like" disease spread in neurodegenerative diseases in general. The centre investigators expanded the study by using model animals with an attempt to investigate the disease's molecular mechanisms and to identify potential means to intervene in the process, areas that the review panel highly commends.

Mechanistic studies on L-dopa-induced dyskinesia (LID) have gained significant progress as they discovered the involvement of metabotropic glutamate receptors 5 (mGluR5) and serotonin receptor (5-HTR1) in LID. Importantly, this mechanistic insight has led to clinical trials using mGluR5 inhibitors.

Studies proposed on Huntington's disease (HD) in WP1 were not fully carried through due to the departure of a principal investigator. Nevertheless, progress has been made in identifying changes in dendritic spines that are involved in the development of non-motor symptoms in HD using one of the centre's platforms, two-photon microscopy.

The panel is impressed by the remarkable progress made in WP2. The centre investigators have established a novel strategy for guiding human embryonic stem cells (hESCs) to enriched midbrain dopamine neurons, which led to the production of clinical grade cells through a new EU-funded project (NeuroStemCellRepair). This prepares for future cell transplantation trials in PD patients, an area where this centre has been at the forefront internationally.

They have also established a novel approach in converting skin cells to dopaminergic (DA) neurons. This study was not initially proposed but was encouraged through the competitive mechanism of the centre's task

force funding program. This strategy of generating DA neurons offers a new way of studying PD disease process and for developing cell therapy for PD. They are currently aiming at a safer and more efficient technology for converting skin or glial cells to DA neurons. This is one of the examples that demonstrates how the strategic program of the centre supports high risk/high reward projects. This could potentially become a flagship program for the university.

Major development has been achieved on the gene therapy front. The centre has optimized the strategy for delivering enzymes essential for dopamine synthesis to the brain, which is now moving toward clinical trials via a commercial entity created by a centre member. This is yet another example of how the centre has been effectively translating its basic studies toward clinical application and of its bold move toward commercialization.

In light of these major developments in basic and translational sciences, the centre made its strategic decision to expand the research in WP3 for quantitatively measuring PD progression and identifying atypical PD by developing novel imaging and mass-spec technologies. This is a relatively long-term program that requires a large cohort of patients. Hence, results are expected in the next funding period. The panel raised concerns about the relatively small sample size and the investigators are aware of this and are collaborating with other centres on that issue.

The establishment of the Culture Science Research Team (WP4) and its continued close collaboration with biological sciences has yielded outstanding outcomes. The studies on the societal perspective of new technology development such as genes, stem cells, and neuroscience, as well as the motivations behind medical tourism have significant implications in research and policy-making areas, as exemplified by the book "Atomized Body" (2012). The panel was impressed by this unique collaboration between the humanities and biomedical sciences

Overall, the centre investigators have made remarkable progress in the above core areas of research over the past five years, especially in translating basic research to clinical development of cell and gene therapies for PD. Their international impact is demonstrated by their publication in international peer-reviewed journals, including top journals in the areas of Neuroscience, Psychiatry and Neurology as well as prestigious interdisciplinary journals. It is also evident by the fact that a large number of researchers were invited as platform speakers at, or asked to organize, international scientific meetings. In particular, close collaboration among WPs has enabled translation of basic research to clinical applications, as evidenced by clinical trials and an impressive list of spin-off companies.

Collaboration

The programmatic organization of the centre requires close collaboration between the four WPs. This has been clearly demonstrated by the progression of basic and translational sciences to clinical trials, as well as production of a book that came about from interactions between the humanities and biological science.

The research platforms provide the mechanism that enable collaboration among investigators, particularly graduate students and postdocs. Co-supervision of some students also enables collaboration.

The centre has been working with industries, especially on clinical trials. An important aspect of the centre is its impressive production of spin-off companies. Twelve members of the consortium have been partners in 26 EU-funded networks and projects.

External communication/dissemination

The centre has been very proactive in communicating with the public and disseminates educational information and research news through press releases, monthly newsletters, and workshops/camps on specific topics on multiple internet venues (Facebook, Twitter, YouTube and Wikipedia),

The centre has also created Parkinson and Huntington Cafés (9 so far) in which scientists communicate with patients directly.

The centre's external communication/dissemination strategy has been working well and informs both the scientific community and society. Their approach is regarded as a model for related consortia such as MultiPark

(Multidisciplinary research focused on Parkinson's disease) at the university. The centre's approaches and experience in public education is applauded. Ideally, the Linnaeus-sponsored brand name BAGADILICO should be used in the communication.

Participating personnel

The principal investigators come from three different faculties (Medicine, Engineering, Humanities and theology). The centre has made a strategic decision to be inclusive to investigators in complementary areas. It has now grown to over 100 personnel in total. This inclusiveness enables access to platforms by investigators, especially junior investigators, and the system works well without diluting the fixed budget, which is primarily used for priming priority projects. It indeed gives a feeling of a centre.

The centre has paid particular attention to nurturing and promoting career development of young investigators. This has been demonstrated by a large number of young investigators who are now leaders of WPs or TFs. This is extremely helpful in bridging the generational gap in the centre when some of the eminent investigators are retiring. The panel is deeply impressed.

The centre has also created a collaborative network for graduate students and postdocs and has also set up 'BAGADILICO Young Investigator Talks', which is organized by a group of PhD students and postdocs (5-6 times a year). These arrangements highlight the centre's attention and focus on training new generations of scientists.

The centre has made a commendable effort toward achieving gender balance. At the professorial level the centre has 23 % female and 77 % male professors, which compares well to the average for Lund University of (13 % and 87 %). In the other personnel categories the centre has an excellent gender balance (e.g. PhD students, post-docs, junior faculty).

The centre has attracted a large number of ERC grant awards showing that the BAGADILICO environment is very strong on an international level and is open to new collaborations, both within Lund and with external partners. The centre has also been successful in attracting research council funding. It is remarkable for young researchers to secure these prestigious awards. All these highlight the standing of the centre nationally and internationally.

Organization and leadership of the Linnaeus Centre

The centre was organized into 4 WPs, each of which has autonomy in management, including budgetary allocation and scientific matters. Each WP consists of several tasks and projects and the budget is allocated to these rather than investigators. Hence, inclusion of more investigators does not dilute the overall budget. This organizational scheme is very creative and has proven to work well. Such an organization scheme is highly commended by the panel.

The centre implements a dynamic 2-year rotation term for its coordinator. In this rotating scheme, a vice coordinator will take over the coordinator position when the two-year term of the coordinator is over. They are supported by a board of 10 investigators and an executive team of 5 researchers from complementary fields. It is the board that makes decisions on the priority and budget crucial to the centre, following consultation with PIs. The SAB consists of 7 international experts who attend annual retreats (although not altogether) and who are consulted on important matters.

The consensus is that the leadership system has been working well over the past five years. The centre decided to keep the leadership scheme even though its SAB advised otherwise, a move that the panel agrees with. The advantage is that it offers a great opportunity for young scientists to develop their administrative skills. The age of the leadership is 36-40 years old. It also ensures continuity of the leadership but also allows introduction of new and dynamic styles.

The centre has set up common technical platforms (e.g., two-photon microscopy, viral, model animals, cell cultures) that are made available to all investigators in the centre. These platforms are one of the mechanisms by which the centre creates the cross disciplinary environment. They are particularly vital to the success of junior investigators.

Organization and leadership of the university

The university acknowledges the contribution of the centre in the university's move to cross-disciplinary and interdisciplinary research and education. The centre is also viewed as a new model of academic leadership (a pluralistic culture of transparency, openness, and participation), attention to education of graduate students and postdocs, and establishment of unique technical platforms (e.g., two photon microscopes) that are vital to research advancement. Hence, the centre contributes significantly to the strategic implementation of the university. The centre is involved in "MultiPark" (Multidisciplinary research focused on Parkinson's disease) as a result of the university's call for government funded strategic research areas in 2009. This could be one of the ways for the future of the centre beyond the 10-year grant period. The university has a plan for internal and external review processes for all Linnaeus Centres, in order to determine their future beyond the funding period.

Given the international standing established by senior researchers at the centre and given the efforts taken by the centre to ensure a transition to a younger generation through the Linnaeus environment, it is critical for the university to support the centre's effort so as to maintain the visibility of the centre and the university. Similarly, the platforms built have been instrumental to the success of the centre, and, when the Linnaeus grant ends, the university should provide support to maintain the facilities that are vital to the future of the centre.

Added value

The centre promotes and nurtures career development of junior faculty members with seed grants and access to core platforms, enabling them to secure larger external grants, including prestigious ERC and SRC grants. This was also intended to bridge the generational gap in the centre given the pending retirement of some senior investigators.

The amount of external grants secured by the centre is impressive.

The centre has established core facilities and new infrastructures (e.g., two-photon microscopy). If maintained they will offer long-term support for investigators, especially young investigators, in the centre as well as other parts of the university.

The centre has created an environment for collaboration among faculties, between those from humanities and from medical sciences, between academia and industry, and facilitated outreach through a project office. Collaboration is further facilitated by funding and co-mentoring graduate students and postdocs across disciplines.

The centre has employed an innovative model of leadership and organization in which a large number of investigators are included and are able to get access to critical technical platforms, yet at the same time only innovative (and potentially risky) research projects are supported on competitive grounds.

The centre has been instrumental in the creation of the university's strategic centre "MultiPark", which could potentially be part of the solution for future funding of the centre when the Linnaeus grant ends.

Recommendations

The University of Lund has a long-standing international reputation for work on Parkinson's disease. The Linnaeus Centre, which covers basic, translational and clinical research on Parkinson's and other basal ganglia disorders, has been scientifically productive with some very interesting new developments, notably in the translational area.

The centre is extremely well structured and organized. The rotating leadership scheme is creative and it offers a great opportunity for young scientists to develop their administrative skills as well as their academic life. This is particularly important for the centre in the transition to the younger generation following the retirement of major scientific and clinical figures. There is extensive ongoing recruitment of young PIs with a significant emphasis on clinicians as well as basic researchers.

The centre has made a strategic decision to prime innovative research by allocating Linnaeus funds to high risk/high reward projects. This has borne fruit, with the allocation of prestigious ERC and Swedish grants to young PIs. This is a remarkable achievement and the strategy is highly commended by the panel. The pursuit of

novel high risk projects with support from the centre will be essential in maintaining its international visibility in neuroscience research in general and Parkinson's disease studies in particular.

The research platforms have played critical roles in facilitating collaboration across disciplines and they are particularly vital to the career development of junior faculty / researchers and to the research enterprises of the centre. It is therefore essential that they are maintained and that a financial solution is found beyond the lifetime of the current Linnaeus grant.

It is also important that the collaborative grouping of young researchers is maintained, both to further their productivity and so that this area of research in the neurosciences continues to have an identity in the university context.

CERIC, Karolinska Institutet

Short description of CERIC

Website: http://www.ceric.se/

The Linnaeus Centre for Research on Inflammation and Cardiovascular Disease (CERIC) is located at Karolinska Institutet (KI). The centre studies the pathobiological processes that link chronic inflammatory disorders such as rheumatoid arthritis, multiple sclerosis, psoriasis and Sjögren's syndrome with atherosclerotic disease. The centre has been built on a strong research tradition in autoimmunity, inflammatory mediators, chronic inflammatory diseases and cardiovascular diseases. The aim for the research at the centre is to determine why chronic inflammation sometimes, but not always, causes atherosclerotic cardiovascular diseases. The second aim is to identify novel therapeutic targets for, and investigate their effects towards, chronic inflammatory disease and cardiovascular disease.

As of June 2013 the centre involves 15 research groups with 35 (34.8 FTE) researchers and professors, 51 (45.3 FTE) postdoctoral fellows and 47 (43.9 FTE) PhD students. The yearly budget from the Linnaeus grant is 9 MSEK and yearly overall budget is slightly above 200 MSEK for 2012.

Recommendations from the first evaluation

The first evaluation of the administrative structure pointed out that CERIC was particularly remarkable for translational research in chronic inflammatory disease and cardiovascular disease. The evaluation was positive about the structure of the environment, leadership and collaboration and recommended maintained funding.

The evaluation pointed out some issues that should be improved. One recommendation was that the centre should improve and enhance its outreach program. As documented in the mid-term report and the site visit the centre is now more active in this area and has taken a number of measures in order to improve its outreach program based on the recommendations from this evaluation. New CERIC discoveries published in scientific journals are systematically also made visible for a more general public through the KI press office as well as in their contact with relevant patient groups. Furthermore, they are active in the public debate on issues relating to their research as well as towards research policy in general. CERIC has a website which is much visited, well developed and updated. The principal investigators in CERIC have been active in public outreach for a long time, even before CERIC was established. When communicating with organizations with whom they had prior contact the investigators at CERIC made a strategic decision to primarily use their already established affiliation rather than that of CERIC. Otherwise they would have to make a considerable effort to "re-establish" their affiliation. The evaluation panel agrees with this strategic decision.

Also, issues regarding leadership structure brought up at the first evaluation have been dealt with. Initially all the principal investigators participated in the decision making at the centre. In a recent reorganization, the steering group at the centre now consists of three of the principal investigators (initially 10). All the principal investigators are involved in the strategic decisions of the centre, while the smaller steering group implements these strategic decisions.

Finally, it was pointed out that the gender balance in the Scientific Advisory Board should be improved. In response to this, a professor with competence in vascular biology was appointed to the board.

Taken together, the evaluation committee finds that the issues raised at the initial evaluation have been satisfactorily dealt with.

Research performed and planned: Scientific quality)

The original proposal was built around two major goals: first, to establish a research infrastructure for studies on chronic inflammatory disease (CID) and cardiovascular disease (CVD), including the recruitment of innovative research groups; second, to make major contributions to the understanding of CID and related

pathologies as well as why CID sometimes, but not always, enhances the risk of CVD. From these studies novel drug targets should be identified. Both of these major goals have been reached during the first five years of the grant.

The research at CERIC is at the highest international level, with an impressive output of scientific publications, nearly 1000 during the first five years, mainly in the areas of CID and CVD. This clearly demonstrates that the first of the goals above has been reached, i.e. a research infrastructure and innovative research groups. Several of the publications involving CERIC are in the highest-ranking international journals. In particular, the Linnaeus grant allowed the establishment of a bioinformatics platform that has subsequently allowed extensive and novel use of available patient cohorts. Also, a lipidomics platform has been established.

Jointly, the studies in CERIC combine very elegant epidemiological studies and large numbers of biosamples. Thus, genome studies performed in collaboration with several international groups using wide association approaches revealed a large number of new genes that are associated with pathogenesis of MS, Sjögren's syndrome, and coronary artery diseases. Parallel studies in population medicine suggest that specific environmental factors pose a threat only to those with a specific gene-set, contributing to the pathogenesis of these CIDs. This is a conceptual shift and changes the way the pathogenesis of chronic inflammatory diseases is understood. It will have important impact on the development of therapies. Similar high-quality studies have also been published on rheumatoid arthritis and multiple sclerosis, to mention some of the diseases where the CERIC members are involved. Epidemiological studies clearly link CID and CVD, multiple sclerosis and psoriasis as well as to rheumatoid arthritis. In an important conceptual advance, they have shown that there is a serial progression towards probable death from CVD as chronic inflammation worsens. Thrombotic mechanisms are implicated and this has led to the appointment of a principal investigator (PI) with expertise in coagulation.

Furthermore, regarding the relationship between CID and CVD, the CERIC investigators found that CID precipitates the disease progression and enhances the risk for cardiovascular disease. In this context, it is important that CERIC investigators have gone on to mechanistic studies in order to understand their observations in their epidemiological studies, using patient registries and biobanks. The subsequent mechanistic studies in model animals revealed that leukotrienes, IL17, and other inflammatory cytokines mediate the effect of inflammation on cardiovascular disease progression. Studies have also been performed on how inflammation is affected by the adaptive immune system, including analysis of the role of reactive oxygen species in immune modulation. Cellular immunology aspects of CERIC's work packages have been strengthened by another strategic appointment bringing in more skills in B cell biology - and new mouse models useful for arthritis and atherosclerosis genesis have been developed.

It is not yet clear how useful blocking drugs can be. CERIC members have shown how pro-inflammatory action is counter-regulated by resolvins and also how pathogens can mobilize mediators of leukotriene action. Another important line of research has focused on the role of adaptive immunity in inflammatory disease, with novel results on the impact of the NAPDH oxidase complex and reactive oxygen species on regulatory T cell behaviour and on how an autoantigen implicated in autoimmunity can affect a subset of T cells that play a role in a number of inflammatory diseases. T effector cells have also been shown to play a role in the control of plasma cholesterol levels which impact plaque stability. Altogether, these results provide important mechanistic insights. The aims set for the five year mark - of providing new markers for CVD risk in CID patients and of identifying the mechanistic role of shared susceptibility genes - are not fully attained, but clearly are closer. The work on the development of animal models is essential for validating mechanisms and requires time and resources. In this context the atherosclerosis mouse model obtained by crossing an *ApoB100* transgenic line onto an *Ldlr* mutant background looks promising.

Overall, CERIC has made good progress in its research program. It has been a part of international consortiums for large-scale population analyses. Their own findings have had an impact on the field. Their findings, particularly those from large cohorts of biobanks, clearly link chronic inflammation and the pathogenesis of cardiovascular diseases but in a specific manner. Such an understanding has important implications for future design of treatment options. Overall, CERIC demonstrates an impressive range of very productive research projects, with a very strong focus on the exploitation of combinations of skills to solve important problems in immunity, inflammation and CVD development. Additionally, there has been a very

good production of high-quality primary papers and reviews, CERIC members are regularly invited to major international meetings, to act on editorial boards and to sit on review panels, among other "indicators of esteem".

Due to the progress made with the Linnaeus grant, CERIC expects to attract major grants related to its translation into clinical applications. Three of the CERIC investigators have obtained major grants from AstraZeneca.

There are two aspects of CERIC that should be emphasized and highlighted in particular. First, collaborations from research groups working at the forefront of molecular biology and biomedicine, combined with research groups that are working much closer to the clinical setting. Second, the centre has a broad approach by using genomics and lipidomics as well as transgenic technologies in animal models in their research as well as taking great advantage of the available biobanks. Based on the publication record, the collaboration between the researchers in CERIC during the first five years has increased. The citation analysis on the publications from CERIC demonstrates that its publications are well visible and highly cited by the scientific community. During the next period major advances could be expected in their translational research. Several of the research groups in CERIC were already internationally very well known before CERIC was established. Their collaboration within the Linnaeus program has strengthened their position as part of a centre at the international forefront of research in their fields.

Collaboration

CERIC has expanded and strengthened already extensive collaborations by using the Linnaeus grant to strategically develop and stimulate links with scientific institutions and the adjacent university hospital.

CERIC collaborates extensively within KI as well as nationally and internationally and these collaborations are essential to the success of the centre's mission and also influence the standing of the centre. The Linnaeus grant has also led to new collaborations. Also the collaboration between the researchers participating in the centre has increased since it was established. Thus, CERIC has developed a series of national and international collaborations including the Swedish Science for Life laboratory, the University of Lund, as well as strong research foci in New York, Harvard and Oxford. CERIC members hold a series of EU projects that also involve scientific collaborations. CERIC members have many roles in international science activities, including on editorial boards, through invited lectures in international symposia and on a spectrum of science advisory panels.

CERIC's development of technological facilities, contributions to the organization of the Stockholm Medical Biobank as well as recruitments in cardiology, rheumatology and epidemiology have been very positive. They also run a teaching course on the biology of inflammation. Their work is well known and recognized nationally and internationally as indicated by several prestigious awards to several of the CERIC members.

CERIC members also run projects and collaborations with industry and the public sector. The expansion in the outreach commitments seen in CERIC has enhanced community engagement and dissemination of information and the expertise contained within, and produced by CERIC.

External communication/dissemination

CERIC has responded to the first evaluation and now has a clear and well developed communication strategy in place. First and foremost CERIC communicates to the scientific community via scientific publications. However, it also conveys important scientific papers and discoveries to the KI press office as well as stakeholders in general (including patient organizations, industry and to the general public) as well as through organizing seminars, scientific meetings and conferences. The number of high impact publications produced at CERIC reflects the quality of their science, and the content of the publications is actively shared and distributed to a wider audience. Furthermore, the investigators are participating in public lectures, TV interviews, and the public debate over health care issues. The outreach program for disseminating research findings to public domains is clearly improved since the first evaluation.

CERIC demonstrates a strong commitment in disseminating its evidence-based information on health and disease and engaging with assorted relevant patient interest groups through talks, TV, radio and press coverage. One such example cited was the effect of informed debate on the importance of translational research on planning policy for the university hospital. The modes of external communication with scientists, decision-makers, and the public by CERIC are diverse and the centre deserves credit for its broad initiative. Also, the creation of a visiting lecture series with the involvement of globally recognized researchers in biomedical sciences is positive.

Participating personnel

CERIC has a clear recruitment strategy in place and the staff is balanced with regard to different categories as well as gender. The centre has a clear strategy in using the funding provided by the Linnaeus grant towards recruitment of postdoctoral fellows. Open positions are advertised in the leading international journals in order to attract the best possible applicants. The Linnaeus grant has so far funded 13 postdocs who are jointly trained by participating labs in the centre. At the time of evaluation, 181 postdoctoral fellows have been trained in the CERIC environment.

The Linnaeus grant has also been used to recruit junior faculty members in B cell immunology and in bioinformatics and vascular biology and the centre intends to continue this type of co-funding in future recruitment in order to further enhance the synergy between the research groups.

Based on the report and the site visit, CERIC has provided a good training ground for a large number of researchers, as seen by the high quality research performed. There is a good mechanism of involvement between CERIC members and external advisors in deciding the relevant areas and selection of new candidates. CERIC has focused on gender imbalance in the faculty and steering groups in order to achieve a better balance at all levels.

Organization and leadership of the Linnaeus Centre

CERIC is clearly visible and at the same time well embedded in the KI, subject to governance by its advisory board for research and with direct reporting of the CERIC coordinator to the dean for research. However, CERIC has scientific autonomy. Importantly, the administrative services of the Department of Medicine liberated CERIC to focus most of its activity (and finance) on research. A symbiotic relationship between CERIC laboratories and the centre for Molecular Medicine (CMM) and the University Hospital has created added value in translational medicine and basic ‘omics technology access. The centre is based on two departments at KI: Departments of Medicine and Medical Biochemistry and Biophysics in addition to the centre for Molecular Medicine and Karolinska University Hospital.

CERIC has a well-defined and clear leadership and structure for decision making at the centre. Initially all 10 principal investigators participated in decision making. This has recently been adjusted so that all principal investigators (PI), now 15 after recent recruitments, meet for strategic discussions and decisions normally on a bi-monthly basis while the operative leadership consists of the coordinator, the co-coordinator and one more PI.

The organization has focused on training new and younger scientists by actively incorporating them into the leadership structure of the centre. There is active focus on ensuring gender balance at all levels at the centre.

The Linnaeus grant constitutes somewhat above 5 % of the total budget for the centre and the overall budget has increased by about 10 % since the centre was established.

Organization and leadership of the university

KI has allowed CERIC sufficient autonomy with a requirement for an annual progress report. KI provides the possibility to foster collaboration between CERIC and other research environments at KI. The dean has also provided advice and the approval of the Scientific Advisory Board (SAB) and provided support in the previous evaluation phase. Administrative service provided by the Department of Medicine has permitted CERIC to minimize its own administrative organization, thus focusing its resources on the science.

CERIC is stated to be a role model for translational research at KI. CERIC has been important in recent recruitment at KI in the fields of cardiology, rheumatological epidemiology, computational medicine and clinical treatment research. Also, CERIC has been important in the establishment of Science for Life Laboratories at KI as well as the biobank organization at KI. The presence of CERIC influenced policy on plans for the new Karolinska University Hospital because it represented a solid model of successful dialogue and research, spanning the fundamental science to clinical application spectrum. This also encouraged the building of a biomedical research building for experimental research (Biomedicum). Thus, CERIC is a model facility and the postdoctoral fellows and doctoral graduates who come through CERIC will be trained in an interdisciplinary culture that is based on rigorous science but is also translation-friendly (especially in CVD and inflammation themes). It is expected that success drives success and so the vision is that CERIC will act as a powerful springboard for the acquisition of future external funding that can ensure resilience and longevity for the program. There seem to be good reasons for subscribing to this view, as exemplified by the ability of several CERIC researchers to win significant research support from the pharmaceutical industry.

Within KI, CERIC has allowed disparate groups to come together in a new interactive model that has been very successful in terms of research outcomes and training schemes that span basic research and clinical applications.

The outputs of the scientists and clinicians associated with CERIC are undeniably impressive, as reflected in the CVs and the international profile of some members. This success is encouraging further developments at the KI along similar lines. In general the university is supportive of this centre and sees it as a major success story with very high international prestige and credibility. However, at the same time there is a clear message from CERIC that the contributions from KI have not been in the form of new and added funding after its establishment, but rather by accounting for what the PIs already had available from KI. The panel recommends that the funding to CERIC is matched by KI, which was the original intention when CERIC was established. This is a requirement of the Swedish Research Council.

Added value

There is clearly an added value of CERIC beyond that of enhancing collaboration between already existing research groups. The Linnaeus grant has indeed increased scientific collaboration in a new and interactive way between the groups involved, from basic sciences to clinical research. It has allowed CERIC to set up new technology and in particular a bioinformatics unit that has been instrumental in obtaining synergy effects for the groups within the centre. Also the lipidomics platform and the mouse platform have been instrumental in the research CERIC has been able to undertake, and have helped expand its activity in general and in particular the establishment of the bioinformatics platform has been important for the success of CERIC.

The Linnaeus grant has had a significant impact on the training of postdoctoral fellows and the career development of junior investigators, as well as on the impressive scientific outputs of the scientists and clinicians associated with CERIC. The success of CERIC is encouraging further developments at the KI along similar lines.

CERIC serves as a model for translational research at KI and the changes in research and collaboration between the Karolinska Institute and the Karolinska University Hospital. The success of CERIC has also influenced the recruitment program at KI (in cardiology, rheumatological epidemiology, clinical treatment research, and computational medicine). CERIC was also one of the driving forces when KI decided to invest in reinforcing its biobank organization and in establishing technology platforms. CERIC has had an important influence on the planning of the new Karolinska University Hospital. Within KI, CERIC has allowed disparate groups to come together in a new interactive model that has been very successful in terms of research outcomes and training schemes that span basic research and clinical applications.

Recommendations

CERIC successfully bridges basic and clinical research and is an excellent example of a successful translational centre. Their research has revealed important links between chronic inflammation and cardiovascular disease.

The centre has a very good publication record and is doing cutting edge research, ranging from large scale human genetic studies to analysis of molecular mechanisms. The centre is well structured and has organised scientific activities that bring together the groups working in diverse areas.

They have established new technology platforms that play an essential role in their research. A concern for the future is the maintenance of these platforms and the establishment of new cutting edge technologies. The Karolinska Institute should try to ensure that this is covered.

The centre has also established a successful postdoctoral programme and has been active in recruiting young PIs. These activities are commendable. It is important that new PIs, who were recruited with faculty approval, be integrated into the university after initial salary support from CERIC.

The Karolinska Institute together with CERIC researchers should work towards securing this translational model for collaborative research beyond the time frame of the Linnaeus Centre program. It is a strong recommendation from the panel that in accordance with the requirements from The Swedish Research Council, the funding from CERIC should be matched with funding from KI as was the original intention when CERIC was established.

CRisP, Karolinska Institutet

Short description of CRisP

Website: http://ki.se/en/meb/crisp

The Cancer Risk Prediction Centre (CRisP) at Karolinska Institutet is based on a long tradition of epidemiological research on breast and prostate cancer. The centre currently consists of 12 research groups from 7 departments involving a total of 68 staff (24.7 FTE) including 13 PhD students (6.6 FTE) as per June 2013. The centre is embedded in the Department of Medical Epidemiology and Biostatistics. The centre receives a Linnaeus grant of 9.5 MSEK and the total income in 2012 was 37 MSEK.

Recommendations from the first evaluation

The first evaluation on the administrative structure, organization, co-operation and leadership was generally positive. There was a question about the role of the executive committee. The committee was not implemented and instead, a steering group, including all PIs is operational.

Another issue raised was gender balance. In response to this recommendation there are now additional female members on the steering group. There has also been a discussion about replacing the current coordinator (male) with new coordinator (female), but this has not, so far, been done. The overall gender balance has not changed over the years. This is partly due to the fact that urological researchers are traditionally often males. The issue has been discussed, but not truly addressed. CRisP foresees that the balance will be fixed over time, since female researchers are dominating in the younger researcher generation. The panel was informed that a large proportion of the next generation of breast cancer surgeons are women.

Research performed and planned: Scientific quality

The CRisP research program focuses on identifying factors that affect risk and progression of breast and prostate cancer. The aim is to reduce mortality and incidence of the diseases. The work packages as laid out in the original application were:

- WP1 To determine the important risk factors that underlie breast- and prostate cancer risk, and to estimate their effects on risk, individually and in combination
- WP2 To identify common genetic variants that are associated with prognosis of breast and prostate cancer and to evaluate these new markers in the context of available prognostic markers
- WP3 To further refine the chromosomal regions identified in WP1 and WP2 by fine mapping, sequencing and functional studies of new genes
- WP4 To develop comprehensive risk models including genetic and environmental/lifestyle factors for these cancers, to allow the prediction of breast and prostate cancer among individuals in the population at large
- WP5 Gene-environment interactions in breast and prostate cancer etiology.
- WP6 Validation of prediction models in available population-based screening studies
- WP7 Testing the prediction models in the clinic
- WP8 Randomized prevention trials using the risk prediction models

Overall, the main 5-year goals have been achieved. The genetic risk and prognostic factors as well as models of breast and prostate cancer have been studied, mostly as part of large international consortia. Also, interesting data on the mitochondrial genome has been published. The gene-environment interaction has been studied, especially in breast cancer, and disappointingly no clear interactions were identified. The identification of prostate cancer protein biomarkers has led to one original finding (i.e. MIC-1). Otherwise, only the previously known biomarkers seem to have clinical potential. In terms of the breast cancer, protein biomarkers have not been thoroughly studied yet. However, such work is ongoing in collaboration with groups outside of CRisP.

For breast cancer, the finding of mammographic density as a risk and prognostic factor is novel and seems to be clinically significant. The problem with measuring the density has been the fact that different mammography machines use their own algorithms. CRisP has now developed their own algorithm that works well in processing raw image data from any of the machines tested. The only original topic that has not been followed is the functionality of the genotypes. This is disappointing, since the functionality of the genetic variants is clinically very important as well as scientifically exciting. However, CRisP is now pursuing this aspect through recent the recruitment of a post-doctoral fellow, who has previously worked in a KI-based group with a proven track record in the field of functional genomics. With this expertise now in place as well as with collaboration with groups at Cambridge and Oxford, CRisP aims to pursue this area. However, functional studies seem not to be a main focus area of CRisP.

Since the main original goals have already been achieved, CRisP has now implemented a new plan with new aims. The overarching theme is to improve the screening platforms of breast and prostate cancer towards more personalized strategies. The plan is to conduct 3 clinical prospective studies. The justification for the new prospective studies, KARMA and STHLM3, is that the existing cohorts, mentioned in the original proposal, cannot be used to answer all the questions raised.

KARMA is a multicentre study of more than 70,000 women. Blood samples, mammography images, life style information based on questionnaires, as well as registry data are collected at a KI-biobank in Stockholm. In addition, freshly frozen tumour samples are collected in the Skåne region, but at the moment not in the Stockholm area. The main end-point of the study is mammography density, which CRisP researchers have shown to be a surrogate marker of breast cancer risk and aggressiveness. The developed automated density measurement will be utilized. Genetic and other markers are studied to identify high-risk women. In addition to CRisP other groups have also had access to the KARMA biobank to test their marker of interest. In the next step, three trials will be conducted on the high-risk women in KARMA to reduce incidence and mortality of breast cancer. In the placebo controlled Prisma-study several doses of tamoxifen for prevention of breast cancer in high-risk women will be tested. The end-point will be mammography density. In following placebo-controlled Karisma-trial, using optimal tamoxifen concentration according to the Prisma results, the efficacy of the prevention will be validated. In the Prognosis-study genetic and other markers of aggressive breast cancer will be tested. The study will utilize screening interval cancers as a group of aggressive disease.

In a prostate cancer study, STHLM3, the aim is to increase screening specificity (i.e. less unnecessary biopsies) without reducing sensitivity of the screening. STHLM3 is based on cooperation between KI and Stockholm County Council. The recruitment will end in December 2014 with an invitation to 100,000 men. The markers will be tested in 4 steps. First, identification of novel markers, then validation of the markers in a small cases-control study followed by larger one, and finally in a large prospective study followed by implementation. The current marker panel in validation consists of family history, 256 SNPs and 6 plasma biomarkers (kallikreins, MSP, and MIC-1). For the genotyping as well as protein measurements CRisP has collaborated with several companies to produce DNA and protein chips. Those will be utilized in the study. According to the STHML2 study, the marker panel would reduce the number of biopsies needed to find Gleason score 7+ cancers by 26 %. CRisP has also already started the planning of the long-term follow up study, STHLM4.

In ClinSeq, deep-sequencing technologies are used in a clinical setting to help select optimal cancer therapy. The trial aims to test and build a structure for personalized cancer care. Novel biomarkers, such as circulating tumour DNA will also be tested. The aim is to provide information within 2-10 days from the operation or biopsy for clinical use as well as build a biobank for future needs. Samples will go through low-coverage whole genome sequencing, exome sequencing of 500 genes, and RNA sequencing. In the first phase the aim is to generate data from 1,000+ cases of breast, AML and other cancers. The study will also provide information that may be useful in understanding functionality of the genetic variants.

CRisP has been involved in several high-impact studies published in top journals. Since large international consortia typically conduct these studies, it is not always clear how significant a contribution CRisP has made. However, a CRisP PI coordinates the breast cancer COGS consortium. In addition to the top-journal papers, CRisP has produced a considerable number of papers in good quality specialized journals. The PIs at CRisP are all well known in their fields. It is clear that the prospective studies initiated will form an important asset to

study risk and prognostic factors of breast and prostate cancer, both in the near future as well as long-term, in their field of research. CRisP has clearly utilized the strength of the Scandinavian health care system and society in general in conducting such large population-based studies.

Collaboration

Seven departments in KI are involved in CRisP. Thus, the centre has promoted inter-department interactions, which otherwise seem to be difficult in the KI environment. CRisP has produced an infrastructure (database, samples, methods etc.) that can be utilized by different groups in CRisP. Otherwise, there seems to be relatively little interaction between the breast and prostate side of the centre. The centre has many national and international collaborations. They are involved in the main international genetic consortia in the research area. There is close interaction with Cambridge and Oxford especially. In addition several larger companies are interested in, and some are actively contributing to, the KARMA and STHLM3 studies, both of which are part of CRisP.

External communication/dissemination

CRisP has attracted extensive media coverage as might be expected given the medical importance of their work. They have also communicated with different political and citizen groups. For example, STHML3 was started with the help of Stockholm county funding through CRisP's influence on the county. The PIs at CRisP have direct contacts with policy makers and aim to influence at the EU level too, for example in the question of the regulation of biobanks. There are active links with breast and prostate cancer patient organizations as well as with clinicians treating these patients. In this respects CRisP researchers have been very active and successful in dissemination.

The CRisP strategy has been to work under the brands of the clinical trials KARMA and STHLM 3 instead of CRisP itself. CRisP does not appear to actively update its website. Instead the information is delivered through the web pages of the clinical studies. The CRisP entity seems to function more as an internal umbrella rather than as centre with a strong identity.

Participating personnel

Recruitment at CRisP follows the procedures of the Karolinska Institutet, and is department driven. The main emphasis is on post-doctoral fellows rather than PhD students. Both have been recruited however. Originally the recruitment of the post-docs proved difficult, but now good candidates have been applying for the vacant positions. The problem seems to have been that epidemiology has not been considered such an attractive area among young researchers. It seems that CRisP, has to some extent changed that perception. There seems to be a good mixture of both Swedish and international researchers, at least at the PhD student level. The students are generally happy with their training opportunities and see a career as a researcher as a worthy future.

CRisP is aware of the gender imbalance at the centre but has not been proactive in correcting it. In general, it seems that CRisP does not have a strongly planned recruitment policy.

One of the original key-PIs has not actively participated in CRisP. This has hampered the studies on the functionality of the risk genotypes. This has now been partly compensated with collaboration and recruitment of a post-doc to perform the functional studies.

Organization and leadership of the Linnaeus Centre

The administration of CRisP relies on the administration of the Department of Medical Epidemiology and Biostatistics, which seems to work well. The coordinator is a credible leader and the organization of the centre appears to be functional. Currently there are 12 PIs involved. They form a steering group, which makes the formal decisions, for example on which projects are funded. The group has meetings 4-6 times a year. The steering group has discussed the rotation of the coordinator position, but this has not yet been decided upon.

CRisP has not implemented the organizational structure suggested in the original proposal and instead, the organization of CRisP is quite minimal and the panel believes that the lack of structure may hamper interaction between research groups. There is no outside scientific advisory board (SAB) for the centre, although both KARMA and STHLM3 have outside advisory boards. Furthermore the panel believes that it is important to engage more with junior faculty, and that the suggestion of creating a junior management structure should be implemented. The identity of the centre is not particularly strong and more effort needs to be made to inform younger researchers on the operation of CRisP.

The panel proposes that CRisP (1) Create a junior management infrastructure to inform and train the next generation of research leaders and to include representatives on the Scientific Advisory Board. (2) Organize more frequent meetings to share information across research groups.

Organization and leadership of the university

KI has given the centre sufficient autonomy in its operation. It is mostly embedded in the department of Medical Epidemiology and Biostatistics. Regular meetings between the Centre coordinator and the KI president occur to discuss strategic issues, including long-term plans, recruitment, and fund raising. The centre plays important roles in several strategic alliances and collaborations between KI and national and international universities and centres. Collaboration with the Stockholm branch of SciLifeLab is one example. Thus, KI's support to SciLifeLab is crucial.

KI is a large research university and thus a centre can have only a certain level of influence on the whole university. Still KI clearly sees CRisP as a spearheading unit. KI has been committed to the biobank operation, which is essential to CRisP. The CRisP coordinator will be the chair of a new biobank initiative, Stockholm Medical Biobank. It is important that KI continues to support that operation. It is also clear that CRisP has positive impact on the visibility of KI through the KARMA and STHLM3 studies. Therefore, long-term support from KI would also be beneficial to the Institute itself. It has also been mentioned that KI is about to go through some organizational changes. CRisP as an interdepartmental centre could function as a model.

Added value

The CRisP program has resulted in more funding for research and thus enabled, for example, KARMA, STHML3 and ClinSeq. The funding has increased tremendously through funding from Stockholm County. It has enabled breast cancer sequencing through an international consortium and provided risk money for new projects, such as the trials, as well as support to new junior faculty. CRisP money is actively used for such novel initiatives.

CRisP has about 4-6 million SEK available annually to support novel projects. Interaction between breast and prostate cancer research groups has also materialized due to funding. The Linnaeus funding supports the involvement of 7 different departments.

Recommendations

CRisP is progressing towards its aims to reduce the incidence and mortality due to breast and prostate cancer through individualized prevention programs. The centre has set up several prospective trials with excellent biobanks and datasets to reach their goals. Although there are not many centre-based activities, the contacts between the two areas of biomedical research generated by the centre are clearly beneficial. The participants play an important role in public outreach with patient groups and policy makers.

The future of CRisP. Since it seems that the role of CRisP itself will be gradually replaced by the trials and the biobank initiative, CRisP members should carefully consider whether these initiatives will be enough to promote the collaboration between the groups or whether there should be a CRisP like umbrella even in the future (beyond Linnaeus funding). This is particularly relevant to the two major areas of breast and prostate cancer research.

Information sharing with junior faculty and PhDs/postdocs. The panel recommends creating a Junior Management structure and including representatives on the Science Advisory Board. The Junior Management Group could meet with PhD students and post-docs more frequently to keep them informed and to share research across groups, in addition to the annual retreat. These two actions would also allow more exchange of information about the ongoing projects.

Research. CRisP has successfully focused on the risk and prognostic markers of breast and prostate cancer and is now moving towards implementation of the findings in prevention and screening. The aspect that is less studied is the functionality of the genetic variants. In order to understand the disease mechanisms better, it is recommended that the centre pursue collaborations on this topic. This would also be important for biomarkers, since often the best markers are mechanism-based ones.

THRM, Karolinska Institutet

Short description of the THRM

Website: http://thrm.ki.se/

The Linnaeus Centre, The Human Regenerative Map (THRM) at the Karolinska Institutet (KI) focuses on cell turnover in different human tissues. The centre was awarded 6 MSEK per year in Linnaeus grant funding and has a total current budget (2012) of about 25 MSEK per year. The research is led by eight senior scientists and as of June 2013 comprises 62 staff (19 FTE) including 19 PhD students (7.8 FTE).

Recommendations from the first evaluation

The previous review of the administrative organization of THRM was very positive. They liked the focused objective and common vision. There was a comment about the Scientific advisory board (SAB), which had not yet met and which has now been rectified. The SAB met about two years ago with THRM in Uppsala and in principle they are consulted more regularly. It was also suggested that more formalized meetings of the PI Council should take place, with minutes of each meeting. Although it is stated in the mid-term report that this is now the case, during the site visit the informal nature of contacts between PIs was emphasized. Clarification, as requested, is now provided in the mid-term report about the roles of the Karolinska Institutet, Uppsala University and the Royal Institute of Technology in the organizational structure of the centre. It was also commented that there was only minor contact with industry. This is addressed in the 2013 report. During the site visit, the panel learned that the centre had responded to another recommendation about holding regular meetings between THRM laboratories. These now take place on the KI campus every week, together with the Developmental Biology for Regenerative Medicine (DRBM) Linnaeus Centre, when PhD students and postdocs have the opportunity to present their work and obtain feedback.

Research performed and planned: Scientific quality

This programme centres on the innovative use of C14, derived from nuclear bomb tests in the period from 1955-1963, which when incorporated into DNA can be measured to estimate retrospectively the extent of cell renewal in different tissues. Unlike other approaches which require the introduction of a marker into DNA, this method is non-invasive and is therefore applicable to humans as well as animal models. At the time of the application the coordinator had demonstrated the considerable scientific potential of C14 dating. The aim was to use this novel strategy to establish a map of cell turnover in the human body. This is of major fundamental interest and also has important biomedical implications for tissue regeneration. The original team consisted of the coordinator - with expertise in neurobiology and neural stem cells - the deputy coordinator, who had previously worked with the coordinator before becoming an independent PI and who is now also implicated in work with adipose tissue, a clinician who is an expert on adipose tissue, a pathologist and forensic expert, and physicists at Uppsala University who are expert in accelerator mass spectrometry (AMS), an essential technique for analysis of C14 in small samples. A number of external collaborators were involved from the start, notably a mathematician working for the CNRS in Lyon who develops mathematical models for interpretation of the data.

In the first 5-year period, very significant scientific results have been obtained leading to major publications in high-profile journals. Thus the extent of neurogenesis in different regions of the human brain – the cortex, the adult olfactory bulb, the hippocampus and the striatum - has been quantified. This gives new insights into neuronal turnover in humans with results on the olfactory bulb, for example, showing relatively little turnover, compared to other mammals. The hippocampus has a relatively high turnover and this rate of renewal is maintained in ageing humans, again in contrast to the mouse model. Turnover in the human striatum might suggest a possible contribution of stem cells from the subventricular zone, of major potential interest in the

context of Parkinson's disease which they are now examining. They have also obtained new insight into cell turnover in relation to brain function. In depression, for example, hippocampal neurogenesis is reduced, whereas proliferation of other cell types is not affected. Other pathological situations under investigation such as stroke are also likely to yield very important insights. They have also looked at the effects of alcohol and cocaine on neuronal turnover with a clear reduction in the case of alcohol exposure. Other projects on the brain include an ongoing study of oligodendrocyte cell turnover. THRM researchers have also obtained very important information on cardiomyocyte cell turnover in the human heart, with a high impact publication. This has been a controversial question with conflicting results based on different approaches in animal models. They show a continuous low (1 %) rate of self-renewal which is less in older humans. This analysis, in collaboration with a cardiologist/pathologist in Lund, is now being extended to different compartments of the heart and to pathological situations. A new young PI recruit at KI brings expertise on the heart as well as skeletal muscle to THRM. C14 dating has also been used to show that adipocytes have a relatively high rate of turnover and that this is not changed in early onset obesity. After this important first result, turnover in preadipocytes and in adipose deposits at different sites in the body will be studied. Collaborations have been established with experts on teeth and bone for C14 analysis of these tissues. C14 dating of teeth has proved to have important forensic impact for estimating the age of victims. Work has also progressed on myeloid cells of the blood. The pancreatic beta cell project which had encountered technical difficulties is now underway again. Other new projects will use C14 dating to follow atherosclerotic plaques or to examine growth in tumours such as meningeomas.

Important technical progress has been made in improving the sensitivity of AMS by the Uppsala group. Improving sensitivity is critical for the THRM project where human tissue samples are precious and a limited number of cells preclude analysis with existing technologies.

Given the fact that C14 dating on freshly isolated human tissues can only be carried out within a limited time window one could regret that this approach is not being extended more rapidly to many other cell types. One way to envisage this is with a wide network of collaborations. However, on discussion it became clear that preparing pure tissue samples for accelerator mass spectrometry is not so easy and that the expertise acquired by the labs of the coordinator and deputy coordinator is central to this endeavour. They have set up a specialised laboratory where cells are purified and processed to prepare DNA samples for AMS analysis. At this level more technical support would probably be important. The second potential bottleneck is the C14 analysis in Uppsala. At present they devote an entire day a week to THRM projects and with the planned acquisition of a second AMS machine this can be increased. Very few AMS centres in the world can do this highly sensitive analysis and the Uppsala centre has proved to produce the most reliable data. It is also possible to use human material conserved in Biobanks but we understood that it is often tricky to extract pure material and the precise information on its source is often lacking. In principle it should be possible to ensure that new material that is conserved is appropriately documented and treated. Creating a usable reserve would prolong the time frame for C14 dating.

THRM is now developing an alternative approach to dating human tissues. This approach involves a method based on DNA sequence capture technology to track somatic mutations, which tend to arise by insertion or deletion at sites of poly guanine repeats during cell division. This state-of-the-art technology will be used to sequence thousands of genomic regions containing guanine repeats, at a single cell level, followed by sophisticated bioinformatic analysis. THRM researchers have refined single cell isolation procedures and DNA preparation for sequencing. Proof of principle experiments with cultured human fibroblasts are underway. Successfully working out this challenging approach, which had previously been developed for the hematopoietic system, for different tissue types will be a major technical achievement. THRM collaborates with the SciLifeLab national sequencing facility on the KI campus and has recruited the expert in this centre as a new PI with whom they work closely. A young PI now leads this project. A major interest of this phylogenetic fate mapping is that cell lineages can be deduced from the data as well as the age and aspects of the behaviour of cells within the tissue.

Other projects using C14 dating do not address cell turnover as laid out in the original project on the human regenerative map but extend now to other components of the cell. This has resulted in very interesting results on lipid turnover. There is also a project to look at histone turnover. Another line of research has addressed the

origin of cells that contribute to a tissue under normal or pathological conditions. THRM researchers have shown that bone marrow cells can contribute to adipose tissue, using DNA polymorphisms which distinguish donor cells in patients who have undergone bone marrow transplantation. Again this has given important new insight, clarifying a controversial subject, and the paper is cited among the most important from the THRM centre. A number of high-profile papers cited do not focus on humans but use the mouse model to analyse the origin and behaviour of cells. Transgenic mice with heritable markers have been used to track cell lineages in the central nervous system under normal conditions and after injury. In an ingenious approach, manipulation of the Ras signalling pathway prevents the generation of cells from a particular cell type thus identifying the functional role of specific cells, for example of pericytes to scar formation after spinal cord injury. These contributions and others that are listed among the ten most significant publications of the centre are all important. They are related more or less closely to the original project.

In conclusion this Linnaeus Centre is doing excellent research. Their highly innovative approach to cell renewal has resulted in major scientific findings published in very high impact journals and to invitations to speak at many international conferences. Their recent introduction of a second approach to non-invasive analysis of cell turnover with an added interest for the definition of cell lineage relationships is commendable. The only regret is that C14 dating has not been extended to many more tissues than those now under analysis. In this respect more support from the Linnaeus Centre or indeed the KI for this flagship activity might help to develop DNA sample preparation into a larger core facility and thus increase their capacity.

Collaboration

Collaborations are set up for analysis of specific cell types and on technical aspects, within the KI. The panel thought that there might be room for more collaboration with other laboratories at KI to bring in expertise on additional tissues and organs for C14 dating. It is important not to lose momentum on the primary aim of THRM. As outlined in the initial project, there are close contacts with the stem cell community and notably with the Linnaeus Centre for Developmental Biology for Regenerative Medicine (DRBM) of which the coordinator is also a member. THRM is a member of the Translational Research Centre at Karolinska and has contributed funds to it. National collaboration with other Universities has been essential for work on the heart. Internationally the collaboration with the mathematician in Lyon has been essential for the modelling of C14 dating. The Uppsala group which is at the forefront of implementing accelerator mass spectroscopy for biomedical applications has extensive international contacts and works with experts in the USA, Australia and Austria, again with joint publications. The THRM centre does not have joint projects with industry, as pointed out by the previous evaluation. However C14 dating of forensic material has led to collaboration with the police in Sweden, Spain, the USA and Canada for generating data of value in the identification of criminals and victims.

External communication/dissemination

Members of the centre have spoken at many international meetings and their high impact publications have attracted widespread interest, with special commentaries in the scientific press. Their C14 dating of human material has also been covered by international newspapers, for example with an article in the New York Times in 2009. Members of THRM, including PhD students, have been very active in communicating to the general public in Sweden with outreach activities in schools and museums. They have taken part in the Swedish national science week and have also presented at the annual Researchers' Night event in different European cities. In the USA they have contributed to a new interactive exhibition for the lay public organized by Chicago's Museum of Science and Industry and THRM scientists have also been interviewed by the Pulitzer nominated author, Lauren Redniss, who featured their work in a recent popular book "Radioactive: Marie and Pierre Curie: a tale of Love and Fallout". The THRM centre has an excellent up-to-date website. Overall their C14 dating approach has captured the public imagination as well as impressing the scientific community, ensuring widespread publicity for the centre.

Participating personnel

Three new PIs have been recruited in the first 5-year period, providing technical and scientific expertise for developing more sensitive mass spectrometry and for the new initiative in phylogenetic fate mapping. Recruitment follows the well-established procedures. Junior scientists recruited by THRM have now been promoted to senior positions at KI or elsewhere. Postdoc and PhD recruitment seems satisfactory. Five female and one male student had undertaken the doctoral examination by the time of this mid-term report. At this time, 48 % of all individuals in THRM were female although at a senior level this percentage is lower (25 %), mainly due to fewer female candidates who are much in demand, so much so that the centre is in competition with other universities for them. Nevertheless the proportion of female PIs in THRM has increased by 25 % over the first five years. Further recruitment of PIs is not envisaged. The male coordinator of THRM who is Swedish is seconded by a female deputy of Australian origin. It is not clear how many PhD or postdoc members have been recruited internationally. However, given the high impact of the research carried out by the THRM centre, there are likely to be many candidates and discussion with PhD students indicated that there were students and postdocs from outside Sweden. The PhD students interviewed were enthusiastic about THRM. It was also to the credit of the centre that they were highly motivated and mostly planning to go on to do postdocs abroad.

Organization and leadership of the Linnaeus Centre

There is strong leadership from the coordinator and deputy coordinator who make most of the decisions. They work with a consultative council of PIs. Any change in the allocation of funds and any new senior recruitment is implemented after consultation with the SAB which is now fully functional and met two years ago in Uppsala. The centre is relatively small which facilitates participation. The infrastructure of the KI provides administrative support as well as teaching and courses. Within the centre there are group meetings, and regular discussions between participants involved in specific research topics – for example, in the phylogenetic approach. There is a weekly seminar with the DBRM centre when PhD students and postdocs have the opportunity to present their work. The Uppsala group could attend but because of the time it takes to travel to Stockholm and their non-biological background they tend not to. A yearly retreat for all participants might help to cross disciplines. Since THRM is a small centre, formalized structures are less necessary. PhD students interviewed by the panel confirmed that the informal structure worked well. The students did not have problems with training or scientific communication, which appeared to work very well on an informal level.

Organization and leadership of the university

KI is fully committed to the centre and indeed the vice-chancellor's report stresses the significant effect of THRM on the prioritization of regenerative medicine at KI. THRM has spearheaded the development of new core facilities and works closely with The Science for Life laboratory which has been set up as a national resource for DNA sequencing; the head of the genomics section is now a PI in THRM. The development of ultra-sensitive accelerator mass spectrometry by the collaborators in Uppsala and the acquisition of high quality post mortem material through a core facility are examples of activities promoted by THRM which have also proved very useful for the wider university community. The synergy that has resulted from collaborations with researchers in KI and Uppsala University is evident. In the case of the Uppsala group they stressed that participation in THRM has motivated them to undertake other biomedical projects and had made them credible as collaborators in the biomedical area. Interesting examples of new projects were mentioned. Uppsala University had originally been hesitant to match extensive SRC funding for THRM, which is partly why the centre budget is relatively low. However the high impact output of THRM should have impressed them with the biomedical potential of their AMS facility and indeed a second machine will shortly be available. Additional support for technical assistance from the university would be helpful for the THRM AMS program. Karolinska should consider support which would help to accelerate the C14 dating project, for example by

setting up a core facility for sample preparation with more technical staff within the coordinator's or vice-coordinator's laboratory. This is a flagship project of the Institute.

Added value

The collaborations have been and are essential for the scientific realisation of the project. KI and THRM have mutually benefitted and indeed THRM has contributed financially to the new Translational Research Centre. The Linnaeus grant has greatly contributed to the collaborative environment of the centre which has led to major scientific advances of high international impact. Strategically the award of funding for a Wallenberg Institute for Regenerative Medicine and the major long-term StratRegen grant are major achievements for KI and for THRM. This multidisciplinary THRM programme depends on the AMS experts in Uppsala and has opened up new biomedical perspectives for their research.

Recommendations

The original aim of THRM was to use C14 dating to analyse the turnover of cells in different human tissues. They have made major breakthroughs with this approach, also extended to looking at cellular components such as lipids. They are now developing a non-invasive phylogenetic approach to study cell turnover and cell lineage in human tissues, with accompanying work on mouse models. This centre is outstanding scientifically with many very high-profile publications. It is relatively small so that its informal organisation works well, with regular scientific meetings on the KI campus.

C14 dating to analyse cell turnover in human tissue, pioneered by the coordinator, is a unique non-invasive approach which is only applicable in a limited time frame. The window of opportunity is closing because nuclear bomb testing and therefore the generation of C14 stopped after 1963. The original ambition of the centre to produce a complete map of cell turnover for the human body, with extension to disease states, is far from being complete and was probably impossibly ambitious. Nevertheless, in this exceptional situation additional funding from other sources should be sought. This is a flagship project for KI and it would therefore be appropriate that they provide additional support. Such support, as discussed in the report, might take the form of a core facility with staff for the delicate processing of tissue samples to prepare DNA for mass spectrometry. The collaboration with the team in Uppsala is an essential component and here further technical support for the AMS facility from KI would help to further C14 analyses.

UCMR, Umeå University

Short description of the Linnaeus Centre

Website: http://www.ucmr.umu.se/

The Umeå Centre for Microbial Research, UCMR, is located at Umeå University. UCMR is an interdisciplinary research centre representing medical and molecular microbiology, molecular and structural biology, chemistry and physics focusing on novel applications in the fields of microbial pathogenesis. The centre was awarded a Linnaeus grant of 9 MSEK per year and in 2012 had a current total budget of around 50 MSEK. The centre draws from 17 research groups, directly involving between 25 and 30 persons, corresponding to 13.9 FTE as of December 2012.

Recommendations from the first evaluation

The general comments on this centre from the first evaluation were positive with supportive opinions on the organizational aspects of the centre, the leadership of the organization, the external image and credibility of the centre (both nationally and internationally) and the integration of the research and postgraduate/postdoctoral training elements of the centre with other activities such as the MIMS (Molecular Infection Medicine Sweden) program and the Nordic European Molecular Biology Laboratory (EMBL) partnership. The EMBL synergy has been further strengthened recently (in a 10-year program from 2013-2023) ensuring the longevity of that collaborative link.

The main recommendation from the first evaluation arose from a concern about gender balance in the membership of the Scientific Advisory Board (SAB), which was exclusively male at the commencement of the centre. This bias was in contrast to the reasonably good gender balance seen at some other levels throughout the organization. The UCMR has dealt with the recommendation to move towards a gender balance in the SAB by appointing three professorial members from Israel, Denmark and France. The SAB has been renamed SAC (Scientific Advisory Committee) to avoid any confusion with the governing UCMR Board. The first evaluation also supported the promotion of collaborative research and translational engagement of the UCMR with physicians/clinicians. In response to this positive encouragement, the UCMR has, through funds for the MIMS program, set up a number of Clinical Research Fellowships with physicians who are affiliated part-time with the UCMR. This initiative is currently time-limited (until 2014) and so there is a sustainability/continuity issue regarding this program. The UCMR perceive the development of the clinical fellowships as a good initiative (as did the review panel in the first evaluation) and so the UCMR is requesting a funding supplement to ensure sustainability of this type of collaborative research and training enterprise.

Research performed and planned: Scientific quality

The overall research quality is strong. The research reflects a broad base in molecular microbial pathogenesis (in human and animal pathogens) driven, to a large extent, by exploitation of chemical biology strategies coupled with a series of modern platform '-omic' technologies and assorted state-of-the-art core facilities (e.g. the UCEM and CLiC clusters, protein expression platforms, NMR, X-ray crystallography and metabolomics, optical tweezers, flow cytometry and imaging systems) and further investment in cutting edge structural biology (e.g. cryo-EM). All of this is supported by advanced training provision in the various technologies. The UCMR approach has enabled significant added-value through the genesis of extensive internal and external collaborative research and training networks. The quality indicators show a series of publications in top rank international journals.). These very high-profile papers are supplemented with a list of outputs in more subject-specific, high quality journals. These outputs show a strength-in-depth reflecting both the historical power of Umeå in molecular microbiology and microbial pathogenesis and the added value that has started to flourish in the UCMR through strong interdisciplinary collaborations with computational biologists, structural biologists,

chemists, physicists and clinicians. The centre has produced several key research outputs in molecular microbiology and virulence, including work covering a spectrum of pathogens such as *Helicobacter* (now with NIH funding leverage) *Borrelia, Listeria*, uropathogenic *E. coli, Francisella, Candida* and multiple human viruses, including adenovirus. In addition, there are seminal papers on molecular switches in transitions from saprophytism to virulence, on genome instability, riboswitch-mediated control, molecular recognition in the SRP, the nature and function of CRISPRs, Type III and Type VI protein secretion and the biophysics of pili adhesins. Many of these research areas are "hot topics" in molecular microbiology and/or pathogenesis. The members of the UCMR are regularly invited to speak at international meetings and serve on editorial boards of international journals, reflecting high credibility and global reputations in their respective fields.

The publication lists show increased outputs since the UCMR was initiated. The move to interdisciplinarity, enabled by the creation of the UCMR, has impacted the nature of the research. For example, some of the group's key papers involve collaborative work between microbiological, structural, chemical, biophysical, and clinical approaches. The nature and content of some of these papers reflects the practical value, indeed the added value, of the interdisciplinary research program that the Umeå group has used skilfully, to great advantage.

Most of the medium-term aims of the original application have been achieved, including creation of spin-off companies and filing of patents; development of animal models of specific infections; development of high-throughput chemical library screening and assay systems; and the generation of a set of expanded and integrated multi-disciplinary technology platforms within a highly accessible infrastructure. Small molecule screens coupled with bioassays have led to the identification of candidate molecules interfering with various processes involved in microbial virulence, including protein secretion systems for virulence factor delivery (e.g. Type III in *Yersinia* and other bacterial pathogens); viral structural components involved in adhesion; and molecules useful for investigating *Chlamydia*-host cell interactions and yeast-mould dimorphism in *Candida* infection. In addition to the use of DOS chemical libraries the group has also pursued bioactive discovery via collaborative bioprospecting of microbial isolates from the Arctic sea, leading to a new candidate anti-viral, but the natural product chemistry area seems to be less developed in the consortium. Much of the chemical biology that has been done has focused on the utility of new molecules for dissecting the basic processes of infection biology and this powerful strategy is already productive and is likely to generate new insight in fundamental cellular microbiology. The development and delivery of bioactive molecules for therapeutics is a far more difficult prospect, but the UCMR consortium appears to be making some progress in that area too. However, unavoidably, this is a longer-term clinical aspiration.

In the general area of microbe-host interactions there are strong research themes in virulence regulation including work on the chemistry and physics of pili and developments in pilicides, coilicides and identification of receptor inhibitors through structural analogues, some developed by international collaborations. There are projects making progress on the biogenesis of membrane vesicles (OMVs) in several bacterial pathogens and their possible roles in virulence factor delivery, immune evasion and as future candidate targets for vaccine development. In line with the prior proof of concept developed by the Umeå researchers on Type III secretion system inhibitors, there are projects on the search for small molecule inhibitors of the Type VI system. The role of small RNAs and riboswitches in virulence regulation is being pursued in *Listeria, Vibrio* and *Streptococcus*. Furthermore, the role of CRISPR interference systems in *Streptococcus pyogene*s is an exciting development. The UCMR CRISPR group has done seminal work on the fundamental nature of the CRISPR system and this is particularly topical, not least given the profound biotechnological impacts of the CRISPR/Cas system in revolutionising aspects of gene engineering in eukaryotic molecular biology. This area was a new development in the UCMR through their active recruitment systems. It is noteworthy that the UCMR group had a pragmatic response to the active retention of expertise in this topic, at least for the next few years, following the recent recruitment of the current group leader to a prestigious international post that should translate into expanded collaboration with another institute.

Collaboration

The UCMR has been a focal point for the development of extensive collaborations within Umeå, nationally and internationally. The interdisciplinarity that has developed and expanded within Umeå (largely, but not exclusively, between Life sciences and Chemistry) in chemical biology has been positive and has led to the identification of small molecules with activity against microbial cell surface components and viral structures that play roles in adhesion or secretion and virulence. Although the UCMR is not uniquely responsible for such collaborations, the centre has acted as a springboard that encourages and supports collaborative activity and thereby creates a local culture of cross-discipline research synergy. The EMBL and MIMS partnerships seem to be especially strong and innovative and this is an excellent model for the postgraduate/postdoctoral training of a cadre of young researchers for whom interdisciplinarity will be a research cultural norm – essentially an investment in the next wave of adaptable research leaders. The UCMR enterprise has helped to act as a nucleation point for leveraging additional funding for research and training in infection biology. The network maps show a strong set of interactions within the core UCMR group that radiates out to involve others - locally, nationally and internationally. This brings significant added value to the operation and enhances Umeå's (and Sweden's) scientific reputation and credibility in the broad field of microbial pathogenesis. Although Umeå has been strong in this field for some years, the development of the UCMR and associated networks, like MIMS and the EMBL connection, has significantly enriched the science done on microbial pathogenicity mechanisms and possible routes to intervention in microbial disease. In terms of their reputation the core leaders within UCMR and peripheral collaborators show many diverse "measures of esteem" including as co-authors of high impact papers, membership of Editorial Boards of high quality journals, and appointments to national and international review, appointment and funding panels. This prestige has also been reflected in the award of national and international prizes to some of the key players in the UCMR.

External communication/dissemination

The external communication mechanisms are well developed for the dissemination of information on the research impacts of the UCMR and associated collaborations. This is assisted by the appointment of an information / publicity officer who can act as a conduit for UCMR outputs to relevant stakeholders and for outreach activities. In addition to websites, publicity vehicles such as posters and media contacts and meetings, the UCMR has been proactive in the development of local "open house" symposia for information transfer on the basic science and the diverse platform technologies embedded in the Umeå program, plus regular meetings and an annual retreat; "UCMR Day". This has encouraged more interactions through networking between UCMR personnel, across the university and further afield. Furthermore, the outreach into schools to encourage high school student engagement in practical experimental science is noteworthy. In addition, as part of the communication agenda, the organization has developed a highly innovative training system to hone the communication skills of young researchers through employing a professional actor, journalist and others in the critical assessment of student presentations with encouragement by direct feedback at these workshops.

Participating personnel

The core members of the original UCMR reflect cross-disciplinary activities, but the current organization has consolidated and broadened the expertise and interests of the program. It is now significantly larger than the original grouping. There have been changes in gender balance (SAC/SAB) and positive proactive recruitment since the last assessment. There has been recruitment of young group leaders at the level of assistant professor on a 5-9 year limited tenure-track system. This has allowed the unit to recruit strategically e.g. in the area of cryo-EM techniques to enable, among other things, developments in prokaryotic cytoskeletal studies and other topics. The gender balance is good and has been improved at the SAC level too. Promotion of gender balance issues within the university and UCMR has been both practical and positive, as reflected in the new appointments and internal promotions. The request for additional funds to cover costs for the gender support program over the remaining Linnaeus funding period is considered to be a more appropriate topic for the

university as it is fully in line with its purported mission regarding gender balance as the employing organisation.

The UCMR also developed guest professorships to recruit very high-profile researchers with global reputations in areas complementary to those of the original core membership. Further (using the MIMS and EMBL models) they instituted various postdoctoral recruitment programs based on competition from PIs for funding of specific research projects. This leveraged multiple new posts, including several extending the international profile of the postdoctoral constituency of UCMR. All of these activities broadened the research appeal of UCMR and enhanced international exposure and visibility.

Organization and leadership of the Linnaeus Centre

The UCMR has a strong organizational structure and is well run, with clear management chains, from the university vice-chancellor through a centre coordinator and two deputies and a scientific secretary appointed by the vice-chancellor. There is an Executive Board (which includes external representatives) that deals with financial affairs. Furthermore, there is also an external Scientific Advisory Board (now SAC) of international scientists and it seems that the SAC has been helpful in encouraging recruitment of international researchers. This organization has a strong collective identity and a transparent chain of command and responsibility - and there is some evidence of a strategy for succession planning with turnover in some positions and approaching retirement for some core members of the UCMR. Information dissemination routes are diverse and effective through e-mail, domestic seminars, symposia, open days, annual meetings, workshops and other communication vehicles, with good engagement at multiple levels in the organization. The infrastructural support for a wide range of technologies is excellent. Co-financing from the university, and grants from external sources, are used to enhance the diversity of research covered and generate added value.

The UCMR is aware of the need to ensure maintenance of gender balance at all levels. The UCMR has a well-developed gender support program to mentor the career development of female scientists and they wish to continue with that program (which was not resourced from the original Linnaeus program). Their view is that continuity would require an additional 3MSEK of funds for the rest of the program. The governance and management systems of the UCMR are effective, integrated and very well developed, and these should continue in the current format. There is no obvious need for change.

The group has developed effective, competitive strategies for external recruitment with a strong international flavour. The governance structure has allowed the executive to drive rapid and responsive development of UCMR, to a large extent liberated from some of the “conventional” departmental and faculty constraints, while also portraying a highly visible brand image for the UCMR, enhanced by the imprimatur and high credibility of an innovative university. The nurturing of EMBL connections and MIMS components under the UCMR umbrella has also helped considerably to enhance the attractiveness of UCMR to international recruits, particularly young, enthusiastic graduate students. For the future development, sustainability and resilience of the UCMR consortium, these significant strengths should be maintained.

The training system for graduate students (and postdoctoral fellows) in UCMR is excellent. It is innovative, easily accessed by students and other stakeholders, and positively encouraged by the group leaders and the support structure created in UCMR, and through the MIMS and EMBL programs and Umeå University in general. The approach is inspirational and highly productive and there is excellent engagement with the myriad of opportunities provided for acquiring skills in very diverse technologies and technology platforms. Of special note here is the combination of relevant classes, coupled with expert hands-on practical skill training on a remarkably wide range of modern techniques cutting across biology, chemistry and physics and other disciplines. The postgraduate training system overall is of the very highest quality, by any international standards, and it is clear that the graduate students value this infrastructure highly and benefit enormously, both educationally and technically, from engaging with these opportunities. The UCMR training system is an exemplar of imaginative innovation coupled with a clear focus on delivering courses that are undeniably “fit for purpose” within a strong culture of interdisciplinarity.

Organization and leadership of the university

The funding from the Linnaeus program has enabled UCMR members to interact more productively with chemists in the Umeå Chemical Biology Centre (LCBU) and biophysicists. In conjunction with other university centres in plant sciences and forestry, these groupings have been able to establish focal core facilities and enhance the university infrastructure covering the sciences and medicine. According to the vice-chancellor this has impacted on university strategy and policy and the university is supportive of the UCMR in principle and in practice.

The university supports the development of the UCMR, not least in the involvement of the vice-chancellor in making several advisory, governance and management appointments for the centre. The impression is that the university will continue to support the UCMR for the future, as long as its research productivity and competitive funding support remain strong.

Added value

There is added value in the UCMR program, as evidenced by the nature and content of the research outputs. In particular the chemistry-biology interface (including, among others, physics and clinical medicine) has opened up opportunities to pursue both the molecular basis of infection biology and the possibility of generating novel bioactives with therapeutic utility in the longer-term. In effect, a significant driver in the organization is a drug discovery program with an aspiration focused on control of microbial infection, while, at the same time, reaping the benefits of using small molecules as chemical probes for the dissection of basic microbiological processes. This approach provides returns for fundamental biology research and, in the longer-term, for therapeutics. The time to development of the latter can be considerable, but, given the paucity and diminishing value of current antimicrobials in the clinic, any positive developments in anti-infectives are desperately required in the face of a global crisis in escalating drug resistance in pathogens. Notwithstanding the good track record of previous collaborative interdepartmental research, it seems unlikely that the Umeå centre would have developed this particularly strong collaborative enterprise quite so positively without Linnaeus funding. Furthermore, these developments are building exceptionally strong added value in the training of young postgraduates and postdoctoral researchers, by educating them about the benefits of interdisciplinary research approaches. Thus the UCMR is a vehicle for the creation of a new generation of early career researchers for whom interactive research across historical subject boundaries will be simply “conventional”. That is a positive development in any training program. Such innovative training programs help to enhance the image and reputation of the university.

Recommendations

The UCMR has a very good international reputation in microbial molecular pathogenesis, a strong brand image, and considerable international prestige. This centre, at all levels from graduate students to world class group leaders, has a tangible collegiate identity in Umeå, and the UCMR is, without doubt, an exemplar of the scientific and organizational advantages to be derived from a practical commitment to the notion of interdisciplinarity in scientific research. The centre enthusiastically tackles some high-risk projects in molecular pathogenesis and is a successful research training centre of high international quality for early career scientists.

The planned development of the clinical research fellows program is reasonable because of the paucity of appropriately skilled practitioners in clinical molecular microbiology. A program that enhances the basic infection biology-clinical research interface is an enriching strategy with mutual benefits across disciplines and with national capacity-building advantages for Sweden. Indeed, the panel was surprised that the infection biology-clinical science research fellowship scheme was not more fashionable nationally to warrant significant input from the hospital’s budget, particularly since this cannot be adequately covered by Linnaeus funds.

The substantial reliance on platform technologies for core research activity in UCMR will create sustainability issues because of the need for ongoing, regular investment to keep pace with technical developments (e.g. in NMR, cryo-EM etc.). Therefore, looking beyond the lifetime of the current Linnaeus funding, there is a need to develop a long-term financial strategy for core technology maintenance, update and

replacement**.** The UCMR group is considering their limited options on how to deal with this demanding issue. A national research equipment initiative dedicated to funding apparatus might ameliorate the concern surrounding sustainability, as could longer-term university commitment to a pan-university domestic infrastructure fund for continuing replacement of apparatus critical to UCMR activities.

6.3 THE N PANEL'S ASSESSMENT

CAnMove, Lund University

Short description of CAnMove

Website: http://canmove.lu.se/node/2

The research theme of the Centre for Animal Movement Research (CAnMove) at Lund University is focused on various aspects of movement ecology, an emerging subdiscipline in ecology, devoted to understanding the complex set of processes influencing animal movement, including physiology, behaviour, energetic, ecological interactions, and demography. The CAnMove Centre is comprised of 15 professors (10.4 FTE), 5 senior researchers (3.3 FTE), 3 junior researchers (2.2 FTE), 9 postdoctoral research associates (6.9 FTE), 14 PhD students (11.4 FTE), and 21 support staff (14.3 FTE), including research support, office, and associated staff members (as per 1 June 2013). Its 2012 budget of 49 MSEK was covered through funding from Lund University (22 MSEK), external funding agencies (22 MSEK), and a Linnaeus grant of 5 MSEK.

Recommendations from the first evaluation

The primary recommendations arising from the first review related to increasing participant number and gender parity among the principal investigators (PIs), scientific advisory board and steering committee as well as clarifying responsibilities of team members through explicit documentation. CAnMove has implemented both sets of recommendations. They increased the size of the science advisory board from 3 to 5 by inviting new members from North America, increasing the supervisory board from 4 to 5 by inviting a junior team member and improving the gender ratio of the steering committee (currently 3 males and 2 females). The CAnMove statement indicates that a protocol was adopted to clarify roles and responsibilities within the overall team structure. The evaluation panel recommended maintenance of the pre-existing funding level.

Research performed and planned: Scientific quality

The overall quality of research has been very good to excellent, certainly comparable to or exceeding that of the other highest profile centres in movement ecology (Max-Planck Institute, Hebrew University). The evaluation panel was particularly impressed by several important advances on the technological front, a central goal of CAnMove's Linnaeus grant proposal. The development of a nano-dot marking system to enable tracking of small individual organisms, such as zooplankton, opens up significant new research opportunities. This is a poorly developed field, but with a wide range of potential applications that span behavioral ecology, stress avoidance and tolerance mechanisms. Of note is the opportunity to test energetic models and characterize new behavioral phenotypes in three dimensions. Similarly, the development of Light Detection and Ranging (LIDAR) applications for the study of insect and bird flight is highly innovative and offers a wide range of potential applications in the future. Packaging of 1 g geolocator units to link temperature, accelerometer, and light availability should be useful, although other laboratories, particularly in the UK and Netherlands are probably competitive with CAnMove in this regard. The Lund University Biosphere Laboratory (LUMBO) facility developed through Linnaeus funding offers a flexible, mobile platform for integrated movement studies on birds, bats, and aerial insects and for whole new non-invasive modes of biodiversity monitoring (e.g., in canopy habitats).

Given the centre's emphasis on pioneering new technologies for recording movement data, much of the work to date has been based on observational field studies, with less emphasis on theoretical, comparative, or experimental manipulative studies. As basic data is acquired, the panel anticipates that the CAnMove Centre will be well-positioned to be a world leader in this new discipline. Several of the research themes stand out as being truly novel. The genomic work identifying the molecular basis of migration in willow warblers compares

favorably with the most advanced labs in the world. Similarly, studies on ecological correlates of fish partial migration are exceptional, opening up the potential for improved comparisons with birds and mammals for which similar demographic data has been available for some time. While few results have been published thus far, the nano-dot application to understand zooplankton movement is a potential world leader. More recent work with modified LIDAR to estimate movement mechanics in flying insects is making impressive advances. The wind tunnel work on avian flight physiology has long been acknowledged as being cutting edge, as attested by the continuing linkage of impressive laboratory measurements with theoretical predictions. Several results obtained to date from the bird migration studies will no doubt be highly influential, including the trans-continental movements of swifts and raptors, joining a rapidly growing list of similar studies coming out of North America, UK, Europe, and Israel. In a fascinating interdisciplinary collaboration with anthropologists and archaeologists CAnMove scientists have explored the historical navigation instruments that Vikings used, including sun stones (Calcite crystals) and sun boards. This research was written up in Nature and also attracted much interest in the popular press. CAnMove also hosts MalAvi, an avian malaria database that is a new bioinformatics resource bridging veterinary medicine and epidemiology and has joined a new National Science Foundation (USA) funded Research Coordination Network to facilitate global efforts in this domain.

The research undertaken by CAnMove has a significant impact on the national and international scientific community. Based on the bibliometric analyses provided by the Swedish Research Council, the mean citation rate of CAnMove researchers is above the world average. A greater than expected number of the centre's publications is among the best 10 % in the world. The panel notes that the number of publications in elite journals, however, falls somewhat below that of some of the other Linnaeus Centres. Highly influential papers in ecology typically produce few citations in the first 2–3 years, because follow up studies themselves are rarely completed within 2 years, so the panel anticipates that this situation will improve over time. CVs of the participants indicate that the quality of journals is routinely above average, with a substantial number of publications that are highly-ranked in ecology, which bodes well for expectations of solid citation rates continuing into the future.

The group is very active in terms of offering symposia. PhD students and postdocs have been heavily involved in organizing these meetings, which have had strong international participation. A PhD school in animal migration has been held every other year, providing state-of-the-art training to a large number of Swedish and international graduate students. There is an active seminar series, with regular participation by gradaute students as well as visiting scientists. A forthcoming edited book (2014) entitled Animal Movements Across Scales by Oxford University Press describes the work of the centre, including two chapters co-authored by PhD students. The training component of the centre is exceptional.

Collaboration

Clearly the CAnMove Centre has acted as a catalyst for a number of new infrastructure initiatives within Lund University. The most obvious would be the well documented collaboration with the faculty of engineering at Lund University, which has been involved in LIDAR and other remote sensing technological innovations with the CAnMove group. The new grant from the Swedish Research Council for a multi-university program for remote sensing of animal movement and landscape monitoring seems an obvious outgrowth of the current Linnaeus program. Several new collaborative research initiatives at Lund University (land-use management, energy conversion, and insect vision) stem from research initiatives by CAnMove.

The CAnMove program has also demonstrated a solid level of collaboration with other institutions within Sweden as well as the rest of Europe. There are demonstrated linkages with several Linnaeus Centres, including Control, Autonomy, and Decision Making Systems (CADICS) and CeMEB. Participation in the nationwide Wireless Remote Animal Monitoring (WRAM) data archive on remote animal monitoring and a well-defined commitment to the network on satellite tracking (ICAROS) and the European Network for the Radar Surveillance of Animal Movement (ENRAM) is being developed to compare animal movement data gathered across Europe. Individual researchers clearly have strong working relationships with other laboratories with a well-articulated interest in the animal movement research theme, such as the University of Exeter, Max-Planck Institute, and Amsterdam University. CAnMove has joined a Research Coordination Network focused on avian

malaria epidemiology with scientists from the USA (University of Missouri St. Louis). There are also long-standing interactions with land-use networks across Europe, although this is not currently a dominant research theme of the CAnMove team. The evaluation panel was somewhat surprised at the limited degree of collaboration with international researchers outside Europe, given the geographical range and spatial complexity of the movements of the organisms under study by CAnMove. The panel anticipates that there may be further opportunities for useful links with Non-Governmental Organizations and industry.

CAnMove has devoted considerable attention to sponsoring international workshops and symposia in research topics central to the CAnMove program. These have been well attended by outside scientists, serving as effective vehicles for the rapid dissemination of CAnMove achievements. Some of these workshops have led to influential published proceedings, such as the 2011 issue of Oikos on partial migration and several published review papers. Perhaps the clearest indication of collaboration is the forthcoming book on "Movement at Multiple Scales" to be published by Oxford University Press. Based on the Swedish Research Council's network diagram based on publication authorship, CAnMove arguably has the greatest degree of within-centre collaboration of all of the Linnaeus Centres. The panel was somewhat concerned, however, that two of the relatively isolated researchers are women, whereas the most connected researchers tended to be men.

Part of the funds for the centre are allocated to a synergy fund evenly distributed to all PIs to "initiate new research constellations and projects". Formation of action groups seems to be a positive means of enhancing collaboration within CAnMove. The panel felt that it might be helpful to explicitly direct synergy funds toward collaborative projects among research groups.

External communication/dissemination

The CAnMove group has an outstanding program for outreach and communication with the public, both in quantity and quality. Through social media and the CAnMove website, exciting new findings are reported in language that the public can appreciate. There have been numerous publications in a variety of popular media, including books, films, and music. Commercial media such as newspapers, radio, and TV have clearly taken advantage of these platforms on numerous occasions. CAnMove has participated in national TV series and contributed to National Geographic films. Several CAnMove researchers have been quite involved in disseminating their work in the popular press. This can be considered a strength of the centre. The centre could capitalize on these investments of time and talent by using them as a base from which to approach industry for collaboration. For example, the huge science education industry could be approached to collaborate on educational applications of the nano-dot marking system in easily cultured zooplankton for classroom use. The telecommunications industry might have an interest in sponsoring CAnMove's tracking technology. The wind power industry could be very interested in using sensors to track impacts on insects and birds. As a consequence, the group has excellent web exposure. Several web pages are sparsely populated, however, and somewhat outdated (e.g., lectures – only 2 from 2010–2011; publications only through 2011). The website provides a link to a YouTube channel with lots of public interest videos about animal movement and centre research methods.

Participating personnel

CAnMove staff recruitment has been clearly guided by a need to fill existing gaps (such as technical people for development of novel instrumentation) and to emphasize postdoctoral research associates with demonstrated strengths in cross-disciplinary collaboration. The latter is clearly seen in the co-supervision of each of the 6 postdocs hired to date by at least 2 different PIs. This has no doubt enhanced the degree of synergy within the group, as well demonstrated by the exceptional connectedness of the network, as measured through co-authored publications. Gender balance is defensible, despite being somewhat skewed in favor of males.

The number of personnel in CAnMove has increased modestly from 55 (22 females) in 2008 to 67 (27 females) in June 2013. The gender ratio is currently 0.67 females: 1.00 males. Males outnumber females in several staff categories, most notably among professors (10 males, 3 females) although the opposite is true for postdoctoral research associates. An impressive number of PhD students have graduated since the inception of

CAnMove (22, including 12 females), although it seems rather unlikely that these students were associated with CAnMove during their entire period of tenure, given the 5-year time frame for this assessment.

Organization and leadership of the Linnaeus Centre

There is evidence of effective program management and leadership. Most of the goals articulated in the initial research plan have produced demonstrable results, with the possible exception of soil insect dispersal and the delayed development of the movement data archives. The remarkable level of collaboration indicated by the network diagram of co-authored publications speaks volumes about the degree of involvement of almost all team members. Linkages among sub-groups are stronger than those in most other Linnaeus Centres in the natural sciences evaluation package in this evaluation. Long-term trends have favoured a (slightly) more even gender ratio in supervisory roles (steering committee and science advisory board) as well as improving gender balance among graduate students and postdoctoral research associates.

Organization and leadership of the university

University support of the CAnMove Centre is well demonstrated, both through ancillary funding, infrastructure development, and university-sponsored research initiatives. The centre is clearly consistent with university goals and long-term research mandate, however there is currently no university commitment to extend the network beyond the 10 year Linnaeus grant lifespan, although, apparently, initial discussions about a possible research institute have taken place.

The organizational structure of CAnMove appears to be sound. It is hierarchical in nature with the director and steering committee reporting to the faculty of science (the dean presumably) and clear separation of technical, administrative, and research components of the centre. The director has demonstrated clear and strong leadership. There is an international scientific advisory board for annual consultation. Over the first five years the PIs had final approval on recommendations made by the steering committee, indicative of a strong commitment to democratic decision-making. The existence of a synergy fund represents a unique and potentially effective means of identifying novel areas of inquiry, although the panel suggests these funds could be made even more effective by more explicitly targeting new research linkages across research groups.

From a gender policy perspective, the centre has two gender equality coordinators (1 male, 1 female). In leading positions, the Steering Committee is comprised of 2 women and 3 men. The centre's director is female. To meet an anticipated increase in research interest in CAnMove, the centre has reorganized the management structure by forming a board, with an increased number of members and executive rights, where strategic decisions are taken. Internal communications and decision-making within the centre appear to be quite effective. There are frequently held meetings involving the director and entities such as the scientific advisory board, postdocs, PhD students, and research personnel. From a financial perspective, the centre has enjoyed an approximately balanced budget in each of its operating years. The Linnaeus funding provides about 10–14% of the revenue per annum.

Added value

It is clear that the CAnMove Centre has provided considerable added value. The demonstrated reciprocity between technological developments and research plans of specific PIs attests to the effectiveness of the Linnaeus funding in stimulating new research avenues. The evaluation panel anticipates excellent potential for continued productivity given the initial emphasis on development of novel technologies and instrumentation. This will pay dividends for years to come. The new research initiatives arising from this program similarly provide evidence of added value, with the CAnMove team becoming a key member of numerous Swedish and European research consortia.

One of the highlights of CAnMove has been the recruitment of postdocs to create successful collaborations by working with multiple mentors. As described in the self-evaluation report, all six of the postdocs (1 man, 5 women) started projects involving at least two PIs with different profiles of movement research bridging the research carried out by the individual PIs. Four of the five post-docs supported by CAnMove have organized

topical conferences (1–3 days) in subjects central for movement research; partial migration, insect flight, genetics of migration, behavioural ecology of animal movements and dispersal of micro-organisms. These conferences, held at the Department of Biology in Lund, attracted up to 100 participants - including many top-profile movement researchers in Europe and North America. All postdocs have found Lectureship positions after leaving CAnMove.

There appear to be constructive and frequent interactions between the centre and the university administration. The Vice-Chancellor reports that the CAnMove coordinator and steering committee regularly meet with the Vice-Chancellor, dean of faculty of science and head of department of biology on leadership issues, research initiatives, synergies, education and programme updates.

Lund University acknowledges and recognizes the value that CAnMove has had for the reputation of Lund University and for Swedish science, noting in particular the contributions that the centre has made to various national biodiversity and animal-monitoring databases. The university also acknowledges the 'added value that CAnMove has provided to Lund University in terms of increased levels of collaborations within the university. Lund University appears to have provided ample financial support since the inception of the centre. On average, and excluding 2008 (the centre's initial year, comprising only 6 months), the university has provided ~39 % of CAnMove's annual income.

Regarding strategic priorities for the university, CAnMove's contribution in this regard is perhaps best reflected by the generic statement by the vice-chancellor that: "Lund University has placed cross-disciplinary and interdisciplinary cooperation at the centre of its strategic plan." and "The Linnaeus environments have significantly reinforced this notion and contributed to its implementation". Somewhat surprisingly, however, there does not appear to be anything specific to CAnMove evident in the university's strategic priorities. In terms of a strategy for maintaining the centre after the funding period has ended, the university is taking a 'wait-and-see' attitude, that is, waiting to see what the mid-term evaluation is like and using it in concert with an internal review process to decide what might transpire in the future.

Recommendations

First and foremost, the evaluation panel encourages CAnMove to develop a strategic initiative for enhancing theoretical modeling expertise. The panel felt that this might be achieved in any number of ways, including a faculty hire, a visiting scientist program, or through workshops led by specialized modellers and/or movement analysts. This seems a potentially valuable way to enhance international collaboration, as well as to maximize research productivity from the burgeoning movement database. If this is initiated sooner rather than later, the centre may further benefit from advice that might be useful in efficient assembly and/or organization of the database.

There was widespread confidence among the panel that broadening the range of partnerships to include industry and NGOs might lead to new funding streams for CAnMove as well as enhance its prestige and value across the university. In a similar vein, it might be useful to consider a joint internship/masters program with computational/engineering groups.

While the panel applauds the CAnMove Centre's initial concept of synergy funds, the panel nonetheless feels that these funds have not been used to maximum advantage in generating new synergies across research groups. The panel suggests that funding priorities should be more clearly articulated with this fundamental goal in mind. One way to do this would be to provide funding for graduate students currently involved with projects based in different laboratories, provided they can identify new collaborative projects that lie at the intersection of their mutual interests.

In summary, CAnMove has undertaken excellent and innovative research, making use of modern technological developments to fundamentally advance the field.

CeMEB, University of Gothenburg

Short description of CeMEB

Website: http://www.cemeb.science.gu.se/about_cemeb/

The Linnaeus Centre for Marine Evolutionary Biology (CeMEB) is located at the University of Gothenburg (UG). The centre's research utilizes the unique marine science infrastructure available at Tjärnö and Kristineberg in addition to the expertise available from UG researchers in Gothenburg. CeMEB encompasses a very broad range of research areas, including genetics, genomics, behavioral ecology, marine ecology, marine biology, ocean acidification, mathematical modelling, zoophysiology/ecophysiology, theoretical biology, physics, and metapopulation dynamics. As per 1 June 2013, there were 59 researchers (34.6 FTE) and 7 technical/administrative staff (4.5 FTE) associated with CeMEB. The centre currently receives 8.52 MSEK Linnaeus funding per annum. The total budget (income) in 2012 was 35.3 MSEK.

Recommendations from the first evaluation

The only recommendation to emerge from the first evaluation was that CeMEB be awarded an increase in funding in light of the accomplishments it had achieved at that time and in light of the positive implications of those achievements for future excellence. More specifically, the first evaluation concluded that CeMEB had developed an impressive array of collaborations, had introduced innovative mechanisms to enhance mentoring and professional development opportunities, and had planned appropriately for future organizational challenges.

Research performed and planned: Scientific quality

CeMEB is a highly productive, well-functioning centre that is producing excellent, high-quality science. The Linnaeus grant has enabled the centre to undertake novel research, important elements of which can be described as being 'risky'; the evaluation panel was provided several examples of this type of research. The primary reasons why CeMEB was able to perform work of a risky nature include the flexibility and long-term time frame that the Linnaeus funding provides.

The questions being addressed by CeMEB are questions of fundamental importance to evolutionary biology, particularly in marine systems. There are many centre initiatives that are likely to lead to scientific work of a groundbreaking nature. Of particular importance in this regard is the initiation of the IMAGO project, the primary aim of which is to sequence and provide the draft genomes for a set of key marine species in Swedish coastal waters. The metabolomics work has considerable potential to increase understanding of the links between gene-expression and protein-expression data. Work on the genomic basis to plasticity is also very attractive and potentially very innovative.

Using citations in the published literature as one means of assessment, the research undertaken by CeMEB has had a significant impact at both the national and international level. Based on bibliometric data provided by the Swedish Research Council, the mean citation rate of CeMEB researchers is well above the world average and a greater than expected number of publications of the centre's publications is among the best 10 % and 1 % in the world.

In summary, the ongoing and proposed research by CeMEB has tremendous future potential and will almost certainly provide a key template for scientific understanding that will guide human understanding of how marine species respond and adapt to natural and anthropogenic environmental change.

The primary purpose of CeMEB is to explore the evolutionary mechanisms underlying adaptations by marine organisms to natural and anthropogenic environmental change. The overarching protocol of the centre is to inform theoretical models and hypothesis testing with empirical data produced from laboratory experiments, field data, and genomic sequencing information. In the broad sense, the intended outcome of the bulk of the

centre's work is to provide a more informed basis for managing marine resources. A secondary intended outcome, applicable to some of CeMEB's work, is to provide information and data of relevance and value to the biotechnology industry and medical research.

CeMEB research is organized under three themes. Each theme is reflected by one of the three parameters of the fundamental breeder's equation used to predict the responses by organisms to selection pressures generated by (i) nature (natural selection), (ii) human-influenced breeding (artificial selection), and (iii) indirectly as a result of human influence (e.g., domestication selection, fisheries-induced selection). The three elements of the equation are: (i) heritability (reflecting the genetic capacity for change); (ii) selection differential (reflecting the extent to which reproductive individuals differ in some aspect from the general population); and (iii) selection response (reflecting the degree to which the average individual's phenotype changes from one generation to the next). The equation provides the conceptual background for CeMEB's studies of how populations and species evolve in response to environmental change.

The three themes are intended to address fundamentally important scientific and societally relevant research questions: What is the potential for evolutionary change in key marine species? How far have organisms evolved following recent large-scale environmental changes? Which mechanisms at the molecular and organismal levels drive rapid adaptation and evolution? How and when do new species evolve?

Research in theme 1 addresses questions pertaining to the roles and mechanisms of local adaptation and phenotypic plasticity at the population, individual, and molecular levels. Examples of CeMEB's work in this area include the following: (i) phenotypic plasticity to changes in salinity and ocean acidification (species examined include barnacles, brown algae, sea urchins); (ii) molecular links between osmoregulatory mechanisms and the sodium-potassium pump in response to ocean acidification; (iii) costs of, and a potential genomic basis for, plasticity; (iv) novel experiments with a marine yeast to further understand the genetic mechanisms behind osmoregulation and salinity tolerance; (v) parallel evolution among demographically distinct subpopulations in the presence of ongoing gene flow; and (vi) mechanisms of gene regulation in brittle stars and a related sea star to assist in the identification of genes involved in general immune defense mechanisms (the results being of potential interest to medical research).

The work undertaken in theme 2 broadly encompasses studies on the ecological interactions (involving biotic and abiotic factors) that can cause selection in a changing environment. Some of this work addresses questions related to species responses to ocean acidification, leading to intriguing results which indicate that shifts in energy budgets can have the potential to negatively influence population and species persistence. Research on ecological interactions and community-level responses focuses on the influence of an invasive red alga (not consumed by native herbivores) on the predation probabilities of native algae and as potential habitat for native fishes. Other work on fishes relates to the evolution of mating barriers and speciation in a coastal fish (goby) and marine snails.

In research theme 3, the focus is on examining the rate of, and capacity for, evolutionary change in the marine realm. One element of the work deals with highly innovative selection experiments, using marine yeast as genetic or genomic surrogates. The intent of this work is to track genes, to ascertain their functional utility during the selection response phase, and to provide a potentially unique means of measuring genomic/genetic potential for evolutionary change. Population genetics coupled with phenotypic profiling is an essential component of research efforts within this theme. Phylogeographic studies and multiple means of examining population connectivity in the marine environment will contribute further to fulfilment of the scientific objectives of theme 3.

A fundamentally important sub-project of CeMEB, and one that provides a key research 'anchor' for future CeMEB initiatives, is the IMAGO Program (Infrastructure for MArine Genetic model Organisms). The utility of IMAGO lies in its potential to develop new model organisms for marine research. By using cultures or organisms and extensive genome information, the IMAGO project will provide an invaluable service to CeMEB scientists and, through the development of open-access databases, scientists worldwide.

Collaboration

CeMEB is comprised of researchers whose interests are exceedingly broad and who were unlikely to have collaborated with one another if there had not been a focal reason for doing so. The Linnaeus grant clearly provided the primary stimulus for the many new synergistic collaborations that now exist in marine-associated sciences at UG. The evaluation panel's opinion is that the degree of collaboration among centre researchers is considerably greater than that reflected by the bibliometric analyses undertaken by the Swedish Research Council. CeMEB has done an impressive amount of work to generate and maintain collaborations outside the centre. This has been facilitated in several ways, including invitations to internationally prominent scientists to CeMEB's semi-annual meetings and international workshops. There are plans for (i) a series of 'jamborees' for the purpose of contributing to the annotation of genomes, (ii) a 'pipeline' for continuous annotation of genes, and (iii) making the metadata available to the scientific community. In addition, the CeMEB Research School provides numerous courses for young scientists, several of which have been international in scope and participation. In addition to the vast number of new collaborations that CeMEB has generated at UG, the centre has initiated interactions with researchers at many institutions within Sweden, including other Linnaeus Centres of Excellence (and including at least one that is not in the Natural Sciences), and with researchers internationally.

External communication/dissemination

CeMEB has a clearly articulated outreach and communications strategy for the dissemination of findings to the public. CeMEB has done an excellent job in disseminating the results of its work to students in and outside the university, the general public, potential end-users of the knowledge generated by the centre, and decision-makers. CeMEB exploits a variety of platforms for communication and public outreach, including visits to school classes, popular science presentations, and the maintenance of a Wiki page and web page. Of further note, CeMEB has collaborated with LinCS (Linnaeus Centre for Research on Learning, Interaction and Mediated Communication in Contemporary Society) at UG to strengthen the means by which it communicates and disseminates its work outside of the peer-reviewed scientific literature. An impressive number of CeMEB researchers write popular articles in Swedish. Research breakthroughs are announced as press releases to the media. Centre scientists have participated in international science festivals in both Gothenburg and Stockholm, giving presentations on evolutionary topics and teaching school classes in experimental evolutionary research.

CeMEB participates in an international outreach effort in collaboration with Stanford University in the U.S. CeMEB research has been featured in U.S. popular-science publications such as Scientific American and National Geographic. It has also been featured on several national television and radio programmes in Sweden. One of CeMEB's principal investigators was awarded a prestigious prize for successful dissemination of knowledge from Ångpanneföreningen's Foundation for Research and Development.

Participating personnel

There has been a demonstrable and dramatic increase in the numbers of participating personnel involved in CeMEB. From an initial base of 18 (11.2 FTE) individuals in 2008, personnel numbers increased to a high of 69 (43.1 FTE) in 2012. The current (mid-2013) number is similar. In 2013 the numerically dominant groups comprised: other 17 research staff (9.6 FTE), 16 professors (6.1 FTE), and 14 PhD students (11.6 FTE). The comparatively low number of current PhD students, relative to the number of professors, can be attributed to the high number of students who have recently defended their theses. The centre has a strategic plan for advertising new PhD positions, beginning in 2014.

The gender balance at the centre is extremely good. In 2008, the ratio of females to males was 0.8:1.0. In 2013, the ratio of females to males was 1.2:1.0 which, albeit female-biased, is lower than the maximum of 1.52:1.00 evident in 2011. At present, the gender ratio is female-biased in 3 of the 7 staff groups: senior researcher/docent (5 females, 1 male); PhD students (12 females, 2 males); and technical/administrative staff (4 females, 3 males). The ratio of females to males among professors is much, much better than the Swedish national average, as reported to the evaluation panels, of 20 % female and 80 % male. At CeMEB, throughout

the first five years of funding, the ratio has generally been 1:1 at the professorial level, changing moderately to the current level of 10 males and 6 females. The resulting gender ratios would appear to indicate that the centre's recruitment strategies are highly appropriate insofar as they are attracting and providing ample research opportunities to both female and male researchers.

Organization and leadership of the Linnaeus Centre

The centre is well organized. CeMEB has a steering committee and a highly competent scientific advisory board. From a gender perspective, the director is female and the ratio of males to females on the steering committee is very close to even. The evaluation panel detected no weaknesses in the organizational structure or leadership of the centre. Decision-making protocols are working very well and are respected by centre members, including the young researchers. CeMEB has a well-established goal of achieving synergistic interactions among members of the centre. This is evident in the breadth of research backgrounds of the researchers and in the multi-disciplinarity evident in the research projects and programmes. The scientific advisory board is well integrated into the centre's organizational structure.

Organization and leadership of the university

CeMEB is organized as a formal research centre within the university and hosted by the department of biological and environmental sciences. CeMEB is formally under the responsibility of the vice-chancellor. The centre's director reports to both the vice-chancellor and the deputy vice-chancellor. The vice-chancellor, deputy vice-chancellor, dean and head of department are regularly updated through the CeMEB newsletter and by meetings with the CeMEB director. UG is providing strong leadership and strong support for CeMEB. Of critical importance has been the long-term commitment to infrastructure support of the marine facilities at Tjärnö and Kristineberg. These facilities are vital to the functioning and research excellence of CeMEB. The centre has also benefited considerably from other financial support from the university.

Added value

The primary added value is the increased level of interactions and collaborations amongst researchers of different expertise. This appears to be primarily in the form of integrating expertise in molecular biology and bioinformatics with expertise in ecology, evolution, physics, and physiology. The strong synergy within CeMEB is unlikely to have been realized without the Linnaeus grant. The added value for the university is considerable. By integrating many disciplines and in many ways, the centre shapes an integral part of the university's profile, by focusing on the excellence of its marine researchers. The university administration appears to acknowledge CeMEB as a cohesive unit that can serve to catalyze an expanded commitment by UG to supporting research in marine biology. The evident increase in publication rate, expansion of publications to include more collaborative papers, and growing linkage of empirical data with more theoretical work suggests that there has been demonstrable added value resulting from the Linnaeus grant to CeMEB.

Recommendations

The evaluation panel concludes that the overall performance of CeMEB is excellent. It is successful, dynamic, and highly productive. It provides a stellar example of how the Linnaeus funds have permitted a remarkable expansion of multi-disciplinary collaboration while simultaneously being used to produce top-quality research from an international perspective. It is an excellent, well-functioning centre that involves multi-disciplinary faculty and trainees that provides for interdisciplinary interactions across an impressively broad spectrum of expertise. The evaluation panel offers the advice that the centre's excellence could be further strengthened by considering expanded work on interactions between species and by quantifying empirical data on metrics of evolutionary fitness in the field. The evaluation panel looks forward to the application of CeMEB's findings to the management of marine systems along the Swedish coast, the northeast Atlantic, and the world's marine realm at large.

CeMEB is an excellent, well-functioning centre involving multi-disciplinary faculty and trainees providing true interdisciplinary interactions across a very wide spectrum of expertise.

LUCCI, Lund University

Short description of LUCCI

Website: http://www.lucci.lu.se

The Linnaeus Centre evaluated for this report was the Lund Centre for Studies of Carbon Cycle and Climate Interaction (LUCCI), located at Lund University. The research area is the carbon cycle and climate system with 82 (27.6 FTE) researchers and 45 (15.3 FTE) PhD students as per 1 June 2013, with a Linnaeus grant of 5 MSEK per annum and a total budget of 65.8 MSEK in 2012.

Recommendations from the first evaluation

For the first evaluation, it was noted that the international advisory board (IAB) was male dominated. Dr. Jennifer Harden (USGS, USA) was added to address this concern. Dr. Harden is a first-rate soil scientist with extensive expertise in northern systems. If another IAB board member were to be added that would also add breadth.

It was also recommended that to further dialogue between Linnaeus coordinators, the deputy vice-chancellor be invited to participate. The LUCCI leadership has implemented these suggestions.

Another recommendation was to ensure succession in respect of the current director, as he plans to retire soon. Daniel Conley and Vivi Vajda, were named as co-deputy coordinators to facilitate this. Daniel Conley resigned in 2012. Vivi Vajda is the current deputy director.

Research performed and planned: Scientific quality

Overall, this centre has achieved impressive results. Their overarching theme – to integrate process understanding with regards to the carbon cycle from observations, measurements and experiments to models from deep time to current and future – is a grand challenge which this group has approached with great success. They noted difficulties in developing a collegial collaboration across disciplines and work packages and are earnest in their desire to improve this collaboration. There are five LUCCI work packages:

1) **Understanding today's carbon cycle and its interactions with the climate system and ecosystems.** There appear to have been important and significant findings with respect, in particular, to: (i) the role of ectomycorrhizal fungi in carbon storage, finding it represents a previously unaccounted for route of carbon from plants to soil; (ii) temperature sensitivity of soil microbial growth as a key parameter in predicting future net ecosystem exchange; and (iii) clarification of the roles of wetlands as carbon dioxide (CO_2) sinks, boreal forest soils as a sink for methane, and effects of clear-cutting on CO_2, methane (CH_4)and nitrous oxide (N_2O) release as a function of the wetness of the clear-cutting site. The first statement in the self-evaluation report, however, on the negative feedback between biosphere, aerosols and climate is rather bold, vague and not backed up by citations. There are, however, other considerations with regards to land use change (including some crops that will decrease emissions but some plantations that are high emitters that will increase emissions). These should be considered separately, but in addition to the forested and arctic systems which are the focus of this group. Models suggest significant cooling of climate as a result but the impacts of increased volatile organic carbon (VOC) emissions on aerosol and especially clouds are uncertain, and observations are lacking, so it is difficult to determine the strength of the feedbacks (i.e. is it significant or detectable). The evaluation panel reviewed the LUCCI highlights page and it does not appear that these evidences of progress are considered as highlights. Perhaps this statement is an emergent property from other activities such as the aerosol dynamic and gas phase chemistry model (ADCHEM) and the Lund–Potsdam–Jena (LPJ) biogeography model integration activities, but this is not clear.

2) **Climate and carbon cycle variability during historical time and calibration of proxy records to instrumental data.** Studies include: (i) vegetative-methane interactions; field measurements of CO_2 and CH_4 exchange in a high- and a low-Arctic fen site (both in Greenland); (ii) monitoring in northern Sweden and Svalbard.
3) **Late Quaternary climate and carbon cycle variability.** Highlights of work: (i) neoglaciation in Iceland might have been associated with changes in North Atlantic circulation; (ii) reconstruction of history of hypoxia in Baltic Sea and coastal ocean acidification in Skagerrak; and (iii) work on peat deposits and sun-climate linkages.
4) **From a greenhouse to icehouse world – The climatic evolution during the past 70 million years.** Studies of the evolution of the Earth trough provide the perspective of deep geological time, targeting the causes and patterns of major global environmental perturbations, such as the forcing and feedback mechanisms of the global carbon cycle, reconstruction of various astronomical parameters; and comparative analysis of carbon budgets during the Paleozoic and the Cenozoic. One notable breakthrough appears to be the identification of the first terrestrial Cretaceous-Paleogene boundary clay in the Southern Hemisphere.
5) **Modelling of present and future processes and conditions with a background of Holocene and pre-Holocene scenarios and data.** Studies include: (i) discrimination of climate and human land uses impacts on terrestrial ecosystem carbon balance changes and land-atmosphere feedbacks through the Holocene and (ii) various modelling efforts to better account for multiple biogeochemical feedback mechanisms under future greenhouse forcing and simulations through the Holocene.

It is clear that the LUCCI Centre is focusing their research on high latitude systems, which are one of the two primary regions of the globe where our understanding is low and uncertainties of the future carbon cycle dynamics are high. Therefore, this centre is contributing to an international and global grand challenge for understanding and quantifying the carbon cycle in the context of the climate system. This group is the premier group in the world that can meaningfully attack this question by integrating measurements with models, however, there does not seem to be a strong dynamic between the observing and modeling teams at this point.

Collaboration

The centre has realized that it is especially difficult to establish productive cooperation because of the diversity of topics. Therefore, they have endeavoured to enhance cooperation via postdocs jointly mentored by different principal investigators. They established a forum of young researchers that meet to brainstorm to identify promising topics of future cooperation. (See R3I - Research Integration, Innovation and Inspiration at http://www.lucci.lu.se/r3i_group.html). They also have an annual centre day to discuss joint topics. However, a common seminar series or school could also contribute to synergism within the centre.

They have established many partnerships and collaborations: different departments (geosciences, biology, physics, nuclear physics and geography) and centres at Lund University, inside Sweden, Europe and overseas. For instance, LUCCI faculty have been successful with a strong emerging National Science Foundation (NSF) (USA) interest in funding mechanisms for international collaboration: A collaboration project through the bi-lateral agreement between Sweden and USA manifested through the NSF's GROW programme, was granted between LUCCI and University of Florida – Synergy: New methods in soil science with focus on stability of soil carbon. They are also very active in international scientific programmes and organizations. They have been successful at obtaining significant external funding (e.g., through Biodiversity and Ecosystem services in a Changing Climate (BECC) and ModElling the Regional and Global Earth system (MERGE) as listed above), including prestigious awards. There was no mention, however, of how the LUCCI Centre clearly contributes to other international activities in the arctic, such as the Arctic Monitoring and Assessment Programme (AMAP), etc.

Examples with stakeholders outside of academia include collaboration with a small company in Ockelbo, Sweden to develop instrumentation for *in situ* measurements. Not-for-profit stakeholders include a collaboration with the National Heritage Board (Lageras) and the marine branch of the Swedish Geological

Survey (SGU). One mechanism for success in formulating synergistic collaborations while providing unique training and exposure for young researchers: R3I (Research, Innovation, Inspiration and Integration); a group consisting of young researchers within LUCCI with the explicit aim of developing cross-disciplinary ideas. Synergy within the centre across sub-disciplines includes a collaboration between geology and physical geography to investigate linkages between soil respiration, CO_2 emissions and possible influences on uptake of trees of old carbon (an R3I project). Another R3I project resulted in a new Baltic Sea study covering primary productivity in the early part of Holocene where expertise from WP3 and WP4 were combined. The evaluation panel was curious to see if the Baltic Sea project might also contribute to, or provide a collaborative springboard to work with, the CeMEB Linnaeus Centre in Gothenburg.

External communication/dissemination

Researchers at LUCCI appear to have been quite involved in disseminating their work to the public and to various potential end-users of their research. There do not appear to be any obvious weaknesses with respect to external communication or dissemination. Indeed, this is arguably one of the strengths of this centre. That said, as mentioned earlier in this report, within the submitted self-evaluation report there was no literature cited to back up statements of success, and there was no organized list of publications provided, except in their annual reports - which provided a list within each section describing work package accomplishments.

Participating personnel

Gender balance has been well documented from the outset and team management activities over the course of the first 5-year period demonstrate a continuing commitment to gender parity. One young professor noted that females still face challenges in pursuing their research, but there was not time to elaborate on this further.

Organization and leadership of the Linnaeus Centre

The leadership of this centre is well structured with co-leads for each of the 5 themes. This allows for flexibility in attending organizational meetings. Implementation of a new “synthesis” oriented WP (LUCCI R3I) and elevation of its role is impressive and shows forward thinking. This involves many more junior researchers ensuring LUCCI remains vital and sustainable into the future. For example, LUCCI opened an internal call for project ideas resulting in three cross-disciplinary R3I projects. Two are still ongoing and one is finished. The R3I group also has activities aimed at stimulating collaboration such as special workshops, social activities etc. The LUCCI annual meetings also provide an excellent arena for exchange of knowledge and ideas.

Organization and leadership of the university

LUCCI is formally the responsibility of the vice-chancellor. The work package coordinator appears to be responsible for communicating with the vice-chancellor, on behalf of the co-leaders of each of the 5 work packages. Communications appear to be somewhat “informal”, and the vice-chancellor appears to be of the opinion that this is fine. As of 1 July, 2014, the current work package coordinator will step down and the work package deputy coordinator will take over his responsibilities. The current work package coordinator will remain as a consultant during the transition period, but it is unclear who will step into the deputy coordinator position. It is perhaps noteworthy that the work package deputy coordinator, beginning in 2014, is also a co-leader of work package 4. Whether this has the potential to generate a conflict of interest is unclear.

The university appears to have provided ample financial support since the inception of the centre. On average, and excluding 2008 (the centre’s initial year, comprising only 6 months), the university has provided ~36 % of LUCCI’s annual income.

Regarding future aspirations involving LUCCI, it is unclear what the link is between the LUCCI research areas and two collaborative and strategic research areas with Swedish government funding: BECC and MERGE. There is text to the effect that LUCCI could be part of an initiative to create a “very strong research unit of top international standing”. But details, even of a broad and general nature, appear lacking.

Added value

The LUCCI Centre demonstrated considerable added value derived from the Linnaeus funding to LUCCI, most obviously through leveraging of an impressive range of additional grants, programs, and multi-lateral institutional linkages. Nonetheless, it is hard to see from the existing self-evaluation report and other documents on the website clear examples of synergistic research outcomes that wouldn't have occurred without Linnaeus funding.

Recommendations

The evaluation panel believes that the centre has a strong programme and the exposure of the students across the disciplines is clearly productive. The panel agrees with the need to increase collaborations across the work packages, and applauds the response to proposals. The panel strongly encourages the centre to consider re-thinking its strategy for allocating the Linnaeus funding within the centre, and consider a priority strategy for external and Linnaeus funding.

The panel recommends the centre move beyond the observational and descriptive and think more deeply about addressing questions of fundamental importance that emerge from the centre's research. For example, the opening statements in the self-evaluation report and site visit stated that cloud droplets get smaller but cooling is not observed. Is this an Arctic focus? Or a global focus? There seems to be a mismatch between the objectives in the scale of WP5 and other regional activities. The various work packages do not appear coordinated. There was no overarching or compelling vision expressed. What transformative questions does the centre want to answer over the next five years?

The panel recommends that the LUCCI Centre increase collaboration between modeling and experimentalists/observationalists. LUCCI now has an experienced carbon cycle modeler. The panel recommends that it would be beneficial for the centre to enhance its collaborations and interactions between WP5 and the experimentalists with a new cohort of modelers and experimentalists, perhaps through the post doc call. This will help thinking about scale issues.

The centre would benefit by providing additional opportunities for its PhD students. The panel recommends the centre consider a new cross-disciplinary class, perhaps initially led by the leadership with strong contributions from the existing cohort of students. In the future, these classes could be led by LUCCI students. This could be an opportunity for the LUCCI students to develop leadership skills and gain ownership of this new interdisciplinary partnership. It would also likely be attractive to students across Sweden. Further to the general point of additional interactive opportunities for students, the panel notes that there is not a regular seminar series within the centre. The panel recommends that LUCCI consider inviting international scientists on a regular (perhaps monthly) basis.

Interdisciplinary collaboration remains a challenge for LUCCI. The panel would like to encourage further interdisciplinary and cross work package activities. The current director and co-director have implemented some innovative strategies to foster collaboration. The new director and co-director will have an opportunity to contribute to a vision for a deliberate strategy to capitalize on new directions for collaboration across the work packages.

This group is the premier group in the world that can meaningfully attack the question of understanding and quantifying the carbon cycle in the context of the climate system. The LUCCI Centre is clearly well functioning and producing important outputs and collaborations.

SUPRA, Chalmers University of Technology

Short description of SUPRA

Website: http://www.chalmers.se/chem/supra-en

The Linnaeus Centre for Bioinspired Supramolecular Function and Design (SUPRA) is located at Chalmers University of Technology. The centre's research focuses on bioinspired supramolecular systems for studying nanoscale chemical and physical processes of biophysical and technological relevance from a fundamental, methodological, and application perspective. A key component in achieving this objective is to bridge the "chemical" (molecules) and "physical" (lithography) dimensions of nanoscience. SUPRA encompasses a broad range of research areas, including theoretical physics, spectroscopy, biocatalysis, materials science, enzyme immobilization and catalysis, DNA hybridization, nanotechnology, photophysics, and various elements of life science, e.g. cell biology and immunology. As per 1 June 2013, there were 23 researchers (10.3 FTE), including 9 (7.6 FTE) PhD students, associated with SUPRA. The centre currently receives 7 MSEK Linnaeus funding per annum. The total budget (income) in 2012 was 78 MSEK.

Recommendations from the first evaluation

The first evaluation made several observations of a critical nature about the centre. The administrative function of the host department was unclear and this was not satisfactorily explained. The authority of the coordinator was not well defined and the centre did not have a deputy coordinator; the coordinator had a very high degree of authority. Although the main research activities were divided into three clusters, they were without leaders. A key recognised challenge was to prevent the clusters from becoming isolated from one another. There was a need to install a mechanism to sort out potential conflicts of interest between university priorities and centre interests/budgets. A scientific advisory board (SAB) was lacking. The gender profile of SUPRA was male-biased. The "flat" organizational structure of the centre was considered to be a weak element of SUPRA and to make it vulnerable in the long term.

As a consequence of these observations and conclusion, the recommendations resulting from the first evaluation were as follows: (i) a deputy coordinator be appointed; (ii) a SAB be formed with responsibilities related to research activities; (iii) that the centre should identify and strengthen responsibilities at the different levels. Based on these recommendations SUPRA took the following steps:

1) a group of 6 active associated principle investigators (including 3 women) are supported by the SUPRA Centre to initiate integrated research for the centre
2) an outreach platform as well as a process to evaluate intellectual property was established
3) a scientific advisory board with 3 well-known scientists was established.

Research performed and planned: Scientific quality

According to the original plan the centre should deduce inspirations from nature considering chemical and physical processes on different length scales. Chemistry and physics approach from the 1 nm and the 100 nm length scale, respectively, and in the intermediate range, supramolecular assembly takes place. This has the virtue of being controlled by weak interactions which enable reversibility and stimulus response, and promises many applications from materials to energy and life sciences. Applied areas are in special micro-reactor and enzyme technology, medicinal and sensor applications, bottom-up molecular nanotechnology, nanooptics and molecular electronics.

The original proposal involved systems based on nucleic acids hosted by lipid membranes, exploiting electronic properties and intermolecular recognition mechanisms, to achieve non-periodic structures with designed functionalities.

It was proposed that close collaboration and integration of widely different competencies should yield true synergism and new insights of great fundamental as well as applied impact.

The centre has focused on basic research with a small but relevant subsection of biomimetic supramolecular systems, a broad and modern field. Research was organized within 3 clusters, loosely described as:

a) Enzyme-catalyzed reactions in confined media
b) DNA-lipid-based supramolecular systems
c) Photophysics at the interface between molecules and nanostructures.

In cluster **a**, the work has been promising as regards bridging the science of colloids and mesoporous particles with biotechnology. In this case, enzymes are incorporated (and protected) within particles to enable reactions in otherwise adverse media. The interdisciplinary cooperation has led to a novel approach to PhD projects where 2 students with complementary expertise jointly study a topic. This cluster produced many publications, but not many in very high impact journals.

This is in contrast to cluster **b** where many papers appeared in high impact journals (PNAS, Science, Nature series). This is partly due to the fact that the coupling of biomembrane science and DNA arrangement is unique to Gothenburg. Among the many highlights are single molecule force spectroscopy with DNA attached to a membrane, curvature selective pore formation in membranes, and studies of their time dependent opening by peptides, or the reversible hybridization of DNA with porphyrins when attached to a membrane.

The latter is also a system where clusters **b** and **c** are linked. Here, optically active molecules are brought into contact via a supramolecular template mutually or via a plasmonic structure that enables long range energy transfer or enhanced optical absorption. This may lead to new biosensing devices as well as to new light harvesting devices. Cluster **c** also encountered the most drastic changes, incorporating new expertise from young physicists. This is most welcome, although due to this focus initial plans with research on polymer photovoltaics have been defrayed. It will be a matter of discussion within SUPRA if this will remain a core activity. It also depends on new principal investigators (PIs) that might be integrated into the centre's activities.

The research has profited very much from the development of sophisticated advances in instrumentation, predominantly based on optical spectroscopy and microscopy and Raman spectroscopy with plasmonic enhancement, where Chalmers has always played a leading role.

Regarding future directions having great potential promise, SUPRA has identified areas between disciplines, i.e. not only between physics and chemistry, but also at the boundary of life sciences and towards applications, particularly in the areas of medical diagnostics and energy conversion.

SUPRA PIs have published a considerable number of publications since the inception of the centre, many in very good journals. As a whole, the centre can be classified among the world leaders. According to the bibliometrics data provided by the Swedish Research Council, SUPRA has the lowest mean citation rate but the highest number of publications, compared to the other centres within this evaluation. On the other hand, there is a high number of publications among the top 10 % of citations and a number of publications in high impact journals.

SUPRA researchers have received several prestigious ERC grants and a number of other awards of high recognition, such as those from the Wallenberg Foundation and the King Abdullah University of Science and Technology.

Collaboration

The use of active associate PIs (API) as a mechanism for bringing needed expertise and collaboration into SUPRA seems very successful, although these individuals receive a lower level of financial support from the centre. This was of some concern among the evaluation panel insofar that it has the potential to create a kind of "second class" group of PIs with respect to funding, yet who may be contributing greatly in terms of collaboration. The centre intends to remove this by a scheme to promote some APIs to the PI level. Women are more strongly represented in the API than in the PI group, and their promotion could reduce the problem of high gender imbalance.

Development of collaborations within SUPRA is at a surprisingly early stage. The self-evaluation mid-term report argues that this is due to the newness of the collaborative associations, but other centres seem to have formed more productive collaborations during the same time frame. Nonetheless, on average, more than 40 % of SUPRA publications were co-authored by more than one PI. The publication based collaboration map, provided by the Swedish Research Council, shows many very "thin" lines, and these concerned mostly the collaborations within clusters rather than between clusters. To enhance internal cooperation, SUPRA has developed a "twinning" model, whereby 2 students with complementary skills and interests work on one project supervised by 2 PIs. This initiative appears promising, but to date has been implemented in comparatively few cases.

Collaborations within Chalmers range from various chemical disciplines to applied physics and biophysics as well as theory. SUPRA bridges research fields in physics and chemistry. The Linnaeus Centres, LINNEQS and SUPRA have collaborated in helping to secure a national grant for a nanoscience and a materials science program.

Collaborations between SUPRA PIs and colleagues at other institutions, including hospitals, are claimed to have leveraged external funding. The PIs also cooperate with industry and obtain industrial funding. However, it is unclear if these collaborations are the result of SUPRA or would have happened in any case.

At the international level, it is most convincing that SUPRA has hosted/facilitated many large scale projects, e.g. collaborations with faculty at Oxford, Berkeley and Florence universities, involving clusters of SUPRA PIs. The centre is involved in 10 EU projects and has contributed to the initiative that resulted in Chalmers being granted the coordinator role in the EU flagship project "Graphene".

External communication/dissemination

An outreach organization "Molecular Frontiers Foundation" has been founded by the director to popularize research, including SUPRA's research, especially among young people. This is a promising initiative. However, although there is some engagement with the media, the centre could be considerably more active in disseminating the results of its work to the public. The PIs organize various workshops and conferences at which student participation is mandatory; this is an element of the centre that students value. More frequent interactive opportunities among all researchers within SUPRA would be of great benefit. The primary channel for dissemination appears to be through publication of scientific papers and, to some extent, with potential end-users of the research in industry. However, the role of SUPRA, as an independent entity and centre, is not always clear and well-defined.

Participating personnel

Since the acceptance of PhD students in 2009, the total number of researchers at SUPRA has remained roughly constant at about 23–25 individuals. PhD students and professors comprise the two largest groups and make up about 80 % of the total. The ratio of PhD students to professors is about 1:1. The PhD students were very enthusiastic about their research. They have developed many links among them and also profited a great deal from the annual meetings. They expressed the wish to have more meetings to learn from each other. However, they are not represented on any decision making board. One observation of potential concern was the low number (3) of PhD students that have graduated. However, this could be explained by the fact that in the fifth year of existence of SUPRA the first generation of students have yet to complete their theses. The student body is very international in scope with more than two-thirds of PhD students originating from outside Sweden.

The gender ratio of males to females favours males by a ratio of approximately 2:1. If anything, the gender "balance" had diminished slightly over time. Among professors, there are 9 males and 1 female. Among PhD students, however, the ratio is closer to 1:1. This is a serious concern, and the centre needs to take proactive measures to address this. The promotion of APIs may assist in this regard.

Organization and leadership of the Linnaeus Centre

A director has been appointed by the vice-chancellor of Chalmers to "lead" SUPRA for a three-year-term. The centre has a "board" which is comprised of SUPRA's 10 PIs. Although this appears to be an unduly high number, the PIs claim that this structure is functional. Although a three-person, international SAB has been established, there is a need for the SAB to interact with the centre more frequently than the current one. The SAB has been helpful in advising on appointments and on selection of project proposals.

The director of the centre is the most prominent scientist, and hence an accepted authority. However, even if decisions are made after discussion, the leadership provides the impression of being unduly hierarchical. Although the centre has an even age distribution, there appears to be a need to further engage younger PIs. Of key importance, there is currently no strategic plan for succession of the SUPRA director. This is a critical issue upon which the future functioning of the centre depends.

On the positive side, the decision-making process appears to be transparent. The funds were initially distributed evenly among the PIs. However, the centre has realized that there should be competition of ideas, and they are encouraged to begin the process of selecting proposals in accordance with promising new directions.

Organization and leadership of the university

Chalmers has supported the Areas of Advance Nanoscience and Nanotechnology, and Materials Science and this can be interpreted as being indicative of being supportive of SUPRA. However, it is not clear that Chalmers is supportive of SUPRA as a Linnaeus Centre. In addition to its research, SUPRA has been instrumental in bridging researchers between the departments of physics, chemistry and biology disciplines. But it is not obvious how this singular function has been recognized by Chalmers. It is also not clear how Chalmers intends to take advantage of this and to ensure that these productive interactive relationships are maintained. From a financial perspective, SUPRA is not as well supported by Chalmers as Linnaeus Centres at other universities evaluated by this panel are.

Added value

The added value results from the fact that new research at the border between previously disparate disciplines has been stimulated. SUPRA has also resulted in the creation of new linkages among research groups that had not interacted much before. The main advantage of the Linnaeus funding is that it allows for research of a riskier and more innovative nature than that provided traditionally by project-specific grants that are available for relative short time frames, such as 2–3 years. This is particularly important for research undertaken by SUPRA clusters **b** and **c**, where sophisticated structures and mechanisms are studied; the results of this work will probably not be commercialized in the next decade. In view of this, the Linnaeus Centre is unique in the university structure. Chalmers has defined eight areas of advance and among four of these (materials science, life sciences, nanosciences and energy), the centre intends to find a role as a bridge between these areas. The long-term role of the SUPRA Centre in this regard, however, remains unclear.

Recommendations

SUPRA has been very important in bridging a gap between researchers in physics and chemistry at Chalmers. It has also strengthened Chalmers' position in an innovative and promising area of science, laying the foundation for many applications. The scientific quality of SUPRA research in the different clusters ranges from being very good to excellent.

However, the evaluation panel has identified several areas of deficiency. There is a clear need for a strategy to replace and recruit core personnel in the centre. Further steps will need to be taken to address gender imbalance within SUPRA. The centre needs to strengthen its visibility and dissemination of information, as a Linnaeus Centre, within Chalmers and to the public. Additional improvements at the structural level would include a greater frequency of SUPRA interactions that involve all centre personnel, increased contributions by

younger scientists, and greater explicit participation by PhD students, such as inclusion on the SUPRA steering committee.

In summary, the SUPRA Centre is academically excellent and forms a bridge between different disciplines. However, there is a lack of Linnaeus branding, and an uncertainty about the future governance.

UCEG, Uppsala University

Short description of UCEG

Website: http://www.uceg.uu.se/?languageId=1

The Linnaeus Centre evaluated for this report is the Uppsala Centre of Evolution and Genomics (UCEG), located at Uppsala University. UCEG draws researchers from the Evolutionary Biology Centre (EBC) and Biomedical Center at Uppsala University. Research in UCEG aims to understand how evolutionary change at the DNA level influences phenotypes and their distributions in populations, species and among lineages. UCEG comprises 67 (55 FTE) researchers and staff total with 15 (15 FTE) postdocs and 20 (20 FTE) PhD students as per 1 June 2013. They receive an annual total award amount of 4. 96 MSEK per annum in Linnaeus funding and a total budget of 99.6 MSEK in the year 2012.

Recommendations from the first evaluation

There were several concerns from the first evaluation. These issues led to a 20 % decrease in funding. At that time, UCEG did not appear to have strategic mechanisms in place promoting cross-fertilization among its members. Thus, collaboration among groups within the centre appeared to be only incrementally enhanced relative to its status prior to Linnaeus funding.

UCEG was not a pre-existing research group, and collaborations took time to develop. The centre has since taken several steps to speed-up this process, including weekly informal lunch meetings, a monthly seminar series that brings in top flight researchers, an annual retreat; awarding of postdoctoral fellowships in strategic integrative areas, as well as a major role for the graduate school for PhD students. These mechanisms have produced a culture of collaboration and cross-fertilization: based on bibliometric analysis conducted by the Swedish Research Council, 82 % of the UCEG researchers have co-authored articles – a level comparable to other high functioning centres.

The first evaluation concluded that outreach activities in UCEG were largely similar to those of individual investigators that preceded the Linnaeus grant. This remains an area of concern, as virtually no specific new outreach programming is evident for the centre as an entity. Instead, UCEG has largely relied on generic channels of communication at Uppsala University to share their research and expertise with the public.

The first evaluation remarked that there was no clear plan to build on centre identity and indeed the director appeared to see the centre as having a limited life span that should end with the termination of Linnaeus funds. There was also no clear plan for succession of leadership or for engaging junior scientists in the strategic planning process. The involvement of investigators from all research domains in the steering committee of the centre addresses this in part, though somewhat indirectly. A lack of formal mechanisms for planning is also manifest in the absence of an external scientific advisory board. Though researchers identify themselves strongly as members of UCEG, the centre is less visible from an outside perspective.

Research performed and planned: Scientific quality

UCEG addresses a longstanding question in evolution, how does evolutionary change at the molecular level relate to phenotypic changes in development, life history and fitness related traits? The centre focuses on evolution in natural populations. The organisms studied range from marine bacteria to wolverines, providing opportunities for tests of generality and for comparative work. There are three primary research themes: (1) genomics of fitness differences in and among natural populations, (2) genomics of speciation, and (3) deep evolution including origins of multicellularity and genomics of large-scale morphological evolution.

UCEG researchers have collaborated in the development of novel genetic resources that provide a strong base for national and international collaborations. One example, sequencing and assembly of the collared flycatcher genome, has spurred a new collaboration of three UCEG research groups bringing genomics,

developmental biology and ecological capacities together to probe molecular mechanisms promoting divergence. Two findings of note are links between sexual selection and level of genetic diversity and linkages between recombination and genome contraction. These accomplishments are outstanding and have led to co-authored publications in top tier journals (Nature, PLoS Genetics, Ecology, and Evolution among others).

Of similar high quality, work in plants using the model genetic organism (*A. thaliana*) has probed the genes underlying species range boundaries and distribution using a combination of field experiments, genomics and quantitative genetic analysis for populations that inhabit drastically different climate zones in Sweden and Italy. The results, published in 2013 in PNAS are novel in showing that trade-offs in adaptation to the two contrasting environments are under the control of a relatively few quantitative trait loci of large effect. This work represents an international collaboration with leading evolutionary geneticists in the US. Building on this research, a new three way collaboration in plant ecology, bacterial genomics and molecular evolution has been initiated that will probe the role of microbial communities in generating fitness tradeoffs. This new collaboration is an example of a high risk and potentially groundbreaking project that would likely not have developed in the absence of UCEG.

The bacterial genomics group in UCEG has developed a new method for genomic studies of bacteria isolated from single host individuals. Using this technique, researchers have been able to study recombination and speciation processes in *Wolbachia* strains infecting *Drosophila simulans*. These technological advances have led to the establishment of a single cell genomics platform at the Science for Life Laboratory (SciLifeLab) showing how research at UCEG creates opportunities for state-of-the-art research at national and international levels. In another breakthrough, UCEG bacterial geneticists have sequenced the genomes of ten single SAR11 cells. This should establish the SAR11 bacteria system as a major resource for studies of ecological genomics of marine micro-organisms. Roughly 30 % of marine bacteria belong to the SAR11 group, implying a prominent role in the oceanic carbon cycle and opening up possibilities for probing the genomics of carbon cycling – a truly transformative domain.

UCEG investigators have also contributed to our understanding of the evolution of a fundamental feature of higher life forms, multicellularity. Their study organism, the slime mold *Discoba* constitutes the first major evolutionary branch of eukaryotes, allowing the characterization of some of the earliest events in eukaryote evolution. Last, but by no means least, in the area of vertebrate evolution UCEG investigators have conducted very interesting work on work on bone marrow in *Eusthenopteron* and placoderm muscles and organ structure using synchrotron based tomography. This sets the stage for integration of structural phenotypes with genomics to test evolutionary hypotheses.

To sum up, in multiple research domains exceptional advances have been made, resulting in new technologies and genetic resources, setting the stage for transformative work in the future. Many of these accomplishments represent synergies among UCEG research teams that have already paid off with high impact (cover of Nature and Science) publications.

Collaboration

Postdoctoral fellows are catalysts for collaboration in UCEG. Indeed, most UCEG funds are allocated to supporting postdocs – recruited from top labs through international competitions. PhD students develop collaborations across research clusters through workshops and courses hosted by UCEG as well as interactions at the centre's annual meeting. These student collaborations regularly lead to co-authored publications. At the senior level, bibiometric data provided by the Swedish Research Council suggest that UCEG is comprised of several relatively small but strong satellites of collaboration. The analysis should be interpreted with caution because researchers were selected on the basis of "star" quality and thus postdocs who are agents of collaboration were not included. Additionally, some senior investigators encourage students to publish their dissertation research independently to establish credentials in the field – a norm in evolutionary biology. The level of collaboration of UCEG researchers appears to be quite high at all levels: within the centre, with other members at Uppsala University, with other Swedish researchers, and internationally. Numerous examples are given where the competences in different fields are combined to develop a new research line. For example, in Sweden UCEG researchers collaborate with researchers at the Uppsala RNA Research Centre (URRC) and

have been very actively engaged with SciLifeLab throughout its lifetime through shared resources and expertise. They also engage in strong collaborations with colleagues at Lund University and Karolinska Institutet. These inter-centre collaborations have extended beyond research, to bring together national communities of evolutionary biologists.

International collaborations include exceptionally productive relationships with faculty at research institutes in the USA including the Avian Phylogenomics Genome Sequencing Consortium and the Single Cell Genomics Platform at Bigelow National Laboratory. Relationships with individual "star" investigators are also notable. UCEG researchers have received nine ERC grants for collaborative research, representing a third of Uppsala University's ERC funding.

UCEG has not engaged as actively in collaboration with industry, agriculture or nonprofit (NGO) entities. They are aware of this deficit and are moving to remedy it. For example, UCEG geneticists have recently been assisting Swedish wildlife managers in quantifying the distribution and potential threat of wolverines to domesticated livestock. UCEG researchers are also very active collaborators with SciLifeLab, and with Wallenberg Foundation support they are using the WABI platform for bioinformatics support.

In total the evaluation panel found a culture promoting synergistic collaboration within UCEG. This may be the outstanding benefit of Linnaeus funding.

External communication/dissemination

UCEG researchers have also done an outstanding job in disseminating their work in high-profile journals, producing more than ten papers in Nature, Nature Genetics, and Science since 2008. Bibliometrics provided by the Swedish Research Council reflect this with a high citation rate and 17 % of papers in the top 10 % cited. The UCEG web page is up to date and publicizes seminars, new publications and links to investigator web pages. It is written primarily for professional scientists in UCEG research disciplines. Findings of research by UCEG investigators are frequently featured in the media (e.g. New York Times) but UCEG is not given credit. Researchers explained to the evaluation panel that Uppsala University limits the number of co-acknowledgment of academic units, though the vice-chancellor contested this point in her conversation with the General Expert Panel. This may be, but the panel concludes that lack of UCEG "branding" is a manifestation of a larger problem involving weak centre identity.

There is little evidence of outreach hosted specifically by UCEG or of efforts to make science achievements in the centre accessible to the public. Indeed, it would seem that when UCEG researchers involve themselves in public outreach, (e.g. popular articles in Swedish and media interviews) they give credit to their home unit (e.g., EBC) rather than the UCEG Centre. This contributes to UCEG's lack of visibility.

Participating personnel

UCEG has increased in numbers of participating personnel from 40 individuals in 2008 to 67 in 2013. In mid-2013 the numerically dominant groups comprised: 10 professors (5.5 FTE); 15 senior researchers (7.5 FTE); 15 postdocs (15FTE); and 20 PhD students (20 FTE). PhD students are counted if partial support is received from the Linnaeus grant.

The gender balance at the centre is excellent, with 34 females and 33 males. Women are well represented at all levels: (e.g., senior investigators, 8 males:7 females; PhD students 5 males:15 females). According to the vice-chancellor they have been very successful at getting fellowships for women applicants to the graduate school. The coordinator is a woman and the steering committee consists of 3 men and 2 women. UCEG actively recruits women to join as affiliated (junior) members, promoting a balanced gender distribution.

Organization and leadership of the Linnaeus Centre

UCEG at the time of the first evaluation had a scientific advisory committee, made up of four internationally prominent evolutionary geneticists. That committee was dissolved after one year and has not been reconstituted. UCEG has expanded at the senior level by encouraging exceptional postdocs to join the ranks of Associate Investigators (junior researchers). The plan is that these junior investigators form a reservoir giving

rise to senior investigators and allowing for rejuvenation of the steering committee as retirements occur. However, a mentoring plan including the rotating appointment of a junior investigator to the advisory board would make this succession smoother and more predictable. The centre is administered by a board of five, representing all research areas and currently led by a director (a rotating appointment). The board of UCEG is responsible for defining and monitoring the operational framework; managing the budget of the centre; developing strategic guidelines for UCEG activities; appointing scientific and industrial advisory boards; and reporting to the department of evolution and genetics. The dean of biology is external chair on the board. There is currently no graduate student representative on the board. Given that graduate students play key roles in organizing and hosting seminars and are actively engaged in the centre's annual retreat, inclusion on the board would seem advantageous for mentoring, communication and morale.

Organization and leadership of the university

UCEG is formally the responsibility of the vice-chancellor. The centre's director reports to the head of the Department of Evolution and Genetics and they report to the faculty board. The university's long term plan for UCEG is to strengthen the centre as a top international research hub. Specifically, the university intends to support the renewal of faculty to establish a generation of research leaders and to allocate resources in research areas that are strategic for UCEG.

Added value

UCEG has adopted several mechanisms for generating synergy: a graduate school on genomes and phenotypes that offers courses, workshops and monthly seminars, and a new national conference on Evolution in Sweden (in collaboration with the Linnaeus Centres CAnMove and CeMEB). Postdocs, strategically hired for collaborative, cross-cluster research projects are catalysts for collaboration among research clusters and serve an important role as mentors to graduate students. The primary added value is the increased level of interactions and collaborations among researchers of different expertise. This appears to primarily be in the form of integrating expertise in development, molecular evolution and bioinformatics with expertise in ecology and evolution. The Linnaeus grant has helped create a culture of open exchange of ideas and collaboration within UCEG, leading to synergistic and in many cases, truly groundbreaking research.

Recommendations

The evaluation panel concludes that the overall performance of UCEG in research and collaboration is excellent. UCEG demonstrates how Linnaeus funding has set the stage for a shift in culture from coexisting research ”silos” to a vibrant network for multidisciplinary collaboration. In light of these benefits UCEG researchers are strongly encouraged to explicitly acknowledge both Linnaeus funding and UCEG in all publications in the peer-reviewed literature: this form of acknowledgment has been weak, even non-existent in the past. UCEG continues to have a weak structural identity. This issue, dating back to the onset of the centre, is evident in the lack of identifiable UCEG outreach programs; lack of a well developed strategic plan for the next five years; and infrequent (annual) meetings of the board. The panel offers the advice that UCEG move quickly to establish a strong identity reflecting common values and capturing the emerging culture of collaboration. To guide in this process the panel strongly urges the centre to reconstitute the external scientific advisory board inviting leading scientists in world-renowned cross-disciplinary programs to serve as members and to meet at least once yearly with the UCEG board. To ensure the long-term vitality of UCEG, the panel recommends including a PhD student and an affiliate researcher as members of the board, perhaps on a rotating basis.

6.4 THE PE PANEL'S ASSESSMENT

ADOPT, Royal Institute of Technology

Short description of ADOPT

Website: http://www.kth.se/ict/forskning/centra/adopt/

The Linnaeus Centre for Advanced Optics and Photonics (ADOPT) is geographically divided between two locations, Kista and Alba Nova, and also between two schools within KTH and a department at Stockholm University. It consolidates research of 33 (27.1 FTE) senior faculty and staff, 8 (6.8 FTE) PostDocs, and 39 (37.8 FTE) Ph.D. students (as per 1 June 2013). Its total income is about 67 MSEK per year (2012). The grant awarded through the Linnaeus Centre scheme is 9 MSEK per year.

Recommendations from the first evaluation

Comment: The geographical spread of ADOPT presents challenges for collaboration and requires considerable amount of travel on a regular basis. The centre has initiated a request to KTH to gather resources and personnel at a single site.

Response: No direct overall structural/location changes have been allowed, but the internal collaborations in both research and education have improved considerably, thanks to the establishment of the centre.

Comment: Recruiting of new staff has been slow.

Response: After the first evaluation, the situation has significantly improved: 4 new positions have been opened (one of them filled by a woman) and three positions are pending. ADOPT also supported the promotions of two researchers (one of them being a woman) from an untenured to a tenured position.

Comment: ADOPT has not yet appointed an external Scientific Advisory Board (SAB).

Response: A high-profile SAB was formed in the summer of 2010 (three members: one of them a woman).

Comment: ADOPT needs to improve gender equality.

Response: The recruitment process has improved and one out of four new positions was won by a woman; one of the two Assistant Professors who became tenured was a woman. Pro-active strategies have been developed to promote the professional development and recruitment of women.

Comment: ADOPT's branding is weak.

Response: The ADOPT logo has been created and is extensively used; the web page is updated weekly; promotional material has been created and distributed. The existence of a strong scientific advisory board helps in creating a strong identity.

Overall, the panel believes that all the issues raised by the first evaluation panel have been properly addressed.

Research performed and planned: Scientific quality

The ADOPT research is focused on highly topical and important interdisciplinary areas of functional optical materials, nano-photonic devices, quantum information and communication, and near-field optics.

The volume and quality of research are high: the centre delivered 42 invited talks and a plenary talk in 2012. In the first five years, 350 papers have been published in high-impact journals including Nature Publishing Group flagship journals such as Nature Photonics, Nature Communications and Nature Physics.

Research highlights of high international standing include: the development of a sub-wavelength microdisc resonator based on hybrid plasmonic nanostructure (highlighted in "Progress in Research and Technology in Sweden 2012"); the development of structured scintillator for high resolution x-ray imaging; the discovery of plasmon-mediated magneto-optical transparency; the development of magneto-photonic projector (US patent)

and novel AlGaN deep UV light-emitting diodes and InGaN-based LEDs, and the pioneering study of the six-photon polarization-entangled state for quantum information processing.

The future research plans identified by ADOPT include cutting edge topics such as the understanding of the practicality of quantum computing; pushing for hybrid schemes of quantum information devices; the development of hybrid materials suitable for on-chip photonic integration; the development of a uniform platform for integrating the optical data processing components and light sources; the exploration of integrated quantum photonics; the development of user-friendly near field optical instruments for students that open up an "extra dimension" to photonics research; and looking for new solutions for highly efficient LED and solar cells.

Collaboration

The creation of a strong collaborative culture among the optics and photonics groups at Kista (the KTH ICT school and Acreo), AlbaNova (KTH SCI school) and Stockholm University is one of the main achievements of ADOPT.

National collaborations include academic/research photonics groups in Lund, Göteborg, Linköping, Uppsala, Hudiksvall, Ytkemiska institutet, Totalförsvarets forskningsinstitut and companies such as Ericsson, Saab Defense Systems, Syntune, Scint-X, Acreo.

Some very useful international collaborations have been established, in particular with Zhejiang University in China, the University of Toronto in Canada, and with institutions in Japan and Taiwan.

External communication/dissemination

Dissemination to the scientific community is channelled through publications in peer-reviewed journals and conferences. Bibliometrics are excellent for a centre of this size.

Dissemination outside the scientific community is mostly achieved through the university external relation groups. ADOPT has good visibility in national media, and researchers also participate in and organize events aimed at promoting science to the general public. ADOPT issues press releases and maintains a weekly-updated web page.

External communication to policy makers is achieved via the European Physical Society, the Swedish Optical Society, and PhotonicSweden.

Participating personnel

Staff dynamics are very good. ADOPT influences the university recruitment policy to its benefit. They are guided by excellence and try to improve the gender balance. They recruit on the international stage, and most of the new recruits did not study in Sweden. Of the 29 staff members, 4 are female, while out of 8 post-docs, 3 are female, and out of 32 students, 7 are female. The ratio female/male, except for post docs is low, but it is improving. Drs. Anand, Popov, Sychugov, and Gallo have successfully competed for academic positions that were supported by ADOPT. Drs. Canalias and Fokine have been promoted from non-tenured to tenured positions, again supported by ADOPT. Rotation on the executive board of ADOPT is evident and the recruitment policy is supported by the International Scientific Advisory Board.

Organization and leadership of the Linnaeus Centre

The governance scheme is simple and seems to work. An excellent high-profile International Advisory panel has been appointed. ADOPT has put together not only expertise of different groups but also their labs and facilities. Leadership is strong and well-motivated to gain a reputation as one of the world-leading centres. The financial aspects are in good shape and under control.

Organization and leadership of the university

ADOPT is considered a success by KTH and is an important asset. It adds to the international reputation of the university and within the country. ADOPT is an important cohesive force in a traditionally strong field of the university. It draws clear strategic priorities that the university is happy to endorse. KTH expresses its commitment to support the centre, even beyond the current funding period, to enable a transition into a new funding model that can enable ADOPT to establish an even more permanent character than what is has now.

Added value

The added value is in the enhanced cohesion of the research in the associated academic units, in the national and international links fostered, improved research quality and impact and the innovation achieved. The sense of belonging and brand recognition have been strongly fostered by a number of initiatives like running focus days, national conferences and workshops, Optopubs, and well organized dissemination and outreach activities.

Recommendations

The ADOPT centre has been able to consolidate a substantial critical mass of research in photonics materials, quantum photonics and nanophotonics and has established an exciting research programme that generates high impact results, raising ADOPT to the position of one of the world leaders in the field. It has fostered a strong collaborative culture among the optics and photonics groups of KTH and Stockholm University. The governance scheme is simple and effective. Some very useful international collaborations have been established.

The panel recommends ADOPT to continue its good and consistent effort in improving the gender balance.

The panel points out that photonics technology is one of the core enabling technologies identified by the EU, thus giving ADOPT a good motivation and inspiration to continue beyond the remaining 5-year period of Linnaeus funding. In the strongly competitive environment in which it exists and with the need for expensive equipment, the centre will only continue thriving if it has access to sufficient infrastructure funds.

CADICS, Linköping University

Short description of CADICS

Website: http://cadics.isy.liu.se/

CADICS is a Linnaeus Centre for Control, Autonomy, and Decision-Making in Complex Systems at Linköping University. It is composed of about 16 (4.1 FTE) senior faculty and researchers, 2 (0.5 FTE) PostDocs, and 19 (4.4 FTE) Ph.D. students (as per 1 June 2013). Its total income is about 51 MSEK per year (2012). The grant awarded through the Linnaeus Centre scheme is 5.5 MSEK per year.

Recommendations from the first evaluation

The concerns raised in the first evaluation can be summarized as follows:

1) The CADICS centre seemed to have a weak formal identity, and even in the report the centre was presented as a funding channel for the participating departments. The lack of visibility of the centre, in the first panel's opinion, seemed to depend also on the way CADICS was connected to the top management, with many layers in between. In addition, it was mentioned that the existence of intricate connections with other groups and initiatives made it hard to evaluate the added value provided by the Linnaeus grant.
2) CADICS seemed to operate as a rigid body: no open call to collaborators, no possibility of adding an additional group, no procedures for the replacement of the coordinator in 2013 (on the contrary, the replacement person had already been chosen by the university vice-chancellor. Also the first panel remarked that mentoring was taken care of “within each group”, and this may not be sufficient in terms of developing new competences at a higher level, not to mention that it went against the spirit of the project that put together quite different expertise. Finally, the panel remarked that there was no reference in the previous report provided by the centre to organized mentoring for developing capacity at higher positions.
3) There was a significant issue regarding gender balance. Indeed the panel remarked that "definitely not enough attention is given to gender issues: no identifiable efforts for trying to integrate a female PI, even by slightly steering the focus of the research; no female member of the International Advisory Board."
4) Outreach seemed to have been inadequate. The value of the collaboration between computer scientists and electrical engineers was not promoted nor illustrated. Also, there were negative comments about the website, that seemed to be factual and surely not appealing for researchers outside the field (indeed, the panel even questioned its appeal for researchers working in that same field).

The answers provided to these recommendations, in the report and during the site visit, are as follows:

1) As far as the CADICS identity is concerned, it was mentioned that CADICS funding, although valuable, represents only a minor portion of the overall funds to the researchers participating in the program. Still, CADICS has a strong identity and visibility. Indeed, it was said that the other funding initiatives are to a large degree due to the CADICS branding. Also, this is seen by CADICS as a strength and not as a weakness. During the site visit, CADICS members remarked repeatedly on the importance of the Linnaeus funds, mostly since they provide stability and give the possibility of investing in basic research. Without this support, most of the other funds that they can count on would be very much related to a specific application. Regarding the claim that the lack of an identity may be related to the complicated connections with the top management, CADICS did not make any specific comment. In the report and during the site visit, the new organizational structure was briefly described and it seems functional. Also, the impression was substantiated that CADICS does not really have a strong identity as a centre, but rather is a group of top class scientists (a very well working one, though!). The outstanding level of the research, as carried out by this centre, however, seems not really affected by this situation.
2) To prove the fact that CADICS is, in fact, an open environment, a new group (dealing with computer vision) was invited to join CADICS, and its leader M. Felsberg has also been invited to be part of the ma-

nagement board. It was also mentioned that CADICS had been extended by creating the junior faculty (four young researchers, recently hired, with the potential to possibly become the next generation of leaders). As far as mentoring is concerned, several initiatives have been taken in this direction: the creation of the junior faculty (JF), as a "trait d'union" between PIs and PhD students. The members have been encouraged to make research visits to other groups and to act as informal mentors or supervisors for students belonging to other groups. This addresses the recommendation raised by the first panel.

3) Regarding the gender balance issue, CADICS admitted that at the time of the first evaluation no women were part of CADICS. Some measures have been undertaken in response to this situation. Two female members have been added to the International Scientific Advisory Board (SAB); an industry SAB has been created and two women are part of it; and five female PhD students have been recruited. CADICS plans to follow up on this by also hiring women at the postdoc and assistant professor level. This issue was further discussed during the site visit, and the panel thinks that this important issue still needs to be properly addressed. The measures undertaken up to now are not sufficiently effective (even though the two female PhD students, who were interviewed, did find the environment very positive and encouraging).
4) A completely new web page has been created. Section 2.2 and section 4 of the report are devoted to communication/dissemination, and they highlight that CADICS did a good job in this direction.

Research performed and planned: Scientific quality

The main research topics are:

1) Optimal vehicle behavior
2) Cooperative unmanned aircraft systems
3) Machine learning techniques in system identification
4) High quality volume rendering
5) Particle representation of information and uncertainty.

During the site visit, only results from topics 1), 2) and 4) were presented. Among the highlights, the panel particularly appreciated the look-ahead control for heavy trucks, the research on the drive cycle, unmanned aerial vehicles, medical applications and volumetric photon mapping. The results obtained in the first period of CADICS have appeared in 158 journal papers, many of them of very top quality in their field. Based on bibliometrics as provided by the SRC and based on the information provided in the CVs of CADICS researchers, these publications have a very good impact in their respective research environments. Also, the fact that some CADICS researchers were invited to give several keynote lectures, or that some of the papers published in these five years received impressive awards, supports this claim. Furthermore, five spin-offs have been created during this first period of CADICS and several patents have been issued. Also, some of the CADICS researchers received impressive personal recognitions and awards during these five first years. The research methods are appropriate and the future potential of the research is extremely high.

The graph illustrating the connectedness between CADICS members further shows that there is a good number of joint works among the members of CADICS. CADICS researchers do internationally visible high-quality ICT research. CADICS funding was also extended by substantial additional funding from other sources. Furthermore, the centre and its researchers have brought forward several research laboratories, both in Linköping and in Norrköping, which seem to have had an impact beyond the immediate boundaries of CADICS funding. Also there is impact in industry/applications, as five spin-off companies related to the CADICS environment were created.

All in all, it is this panel’s conclusion that CADICS research is excellent (and on a very competitive level on the world stage). Several of Sweden’s best researchers in ICT are collaborating in the CADICS environment.

Collaboration

In the last five years, and also thanks to several 2-day brainstorming retreats, a number of initiatives have been taken, leading to an impressive increase (at least three times) in their funding. A number of successful strategic research areas (SRA), involving researchers of CADICS, were founded. Also, a lot of emphasis is put on the SSF joint demonstrator projects: three proposals having a CADICS PI were supported. National collaborations involve some other Linnaeus Centres: LCCC in Lund (ELLIIT[3]), ACCESS at KTH, HEAD at Linköping and CANMOVE at Lund.

The ongoing collaboration with other universities and research centres in Linköping and in Sweden is excellent.

As far as international collaboration is concerned, CADICS is involved in six EU-projects:

1) ERNSI: The European Research Network on System Identification.
2) MC IMPULSE: Monte-Carlo based innovative management and processing for an unrivaled leap in sensor exploitation.
3) TRAX: TRAcking in compleX systems.
4) COFCLUO: Clearance of flight control laws using optimization.
5) Information and Communication Technologies (ICT) COST Action IC1005: The digital capture, storage, transmission and display of real-world lighting.
6) SHERPA: Smart Collaboration between Humans and Ground/Aerial Robots for Improving Rescuing Activities in Alpine Environments.

CADICS' collaboration with industry is particularly manifested in a number of spin-offs from CADICS: UAS Technologies Sweden AB (producing LinkQuad and LinkBoard); RaySpace AB (hardware and software for panoramic high dynamic range imaging and novel display solutions); SCISS AB (software Uniview licensed to Planetariums); Screenlab (tracking and calibration algorithms for Augmented Reality); Senionlab AB (indoor navigation algorithms based on sensor fusion).

Additionally, there are a number of popular science activities in the CADICS environment, including some impressive demonstrators/centres in Norrköping, which substantiate the non-academic collaboration, for example with the general public.

External communication/dissemination

The communication to the scientific community has been effectively achieved, both through standard means such as journal and conference papers, and by organizing a good number of workshops and PhD courses (taught by CADICS staff, also out of Linköping). As clarified during the site visit, however, these seminars are primarily organized by the individual groups within CADICS and there is not really a joint CADICS seminar series – something which the panel thinks would be good both for the centre's identity and to further stimulate interdisciplinary research.

The communication to the general public has been mainly achieved through demonstrations. A good part of these demonstrations is organized within the Norrköping Visualization Center, in particular it is worth mentioning the virtual autopsy table, a brush painting application, an HDR video-camera and a rotor system named LinkQuad. Remarkably, the virtual autopsy lab was installed at the British Museum to scan and present a mummy. Also, micro- and mid-sized UAVs were on display at the Linköping Aeronautics Museum. CADICS contributed to public science talks hosted in the dome theatre of the Norrköping Visualization Center. CADICS results on medical visualization and virtual autopsies were broadcast on the Discovery Channel. In addition, there are several other initiatives described in the report.

[3]Excellence Center at Linköping – Lund in Information Technology (Strategic Research Area)

The communication to research policy makers was achieved by taking affirmative action and proposing an agenda (NRIA) in Security and Simulation Technology.

Dissemination is also achieved through the CADICS project courses that pursue interdisciplinary research projects and involve both students and CADICS researchers.

To which degree the communication strategy of CADICS acts on a centre level is difficult to assess. It is however clear that CADICS researchers are active and that selected CADICS research is very visible through successful communication/dissemination activities. Overall, CADICS is doing a really great job, especially in gaining visibility and in disseminating its research results to the general public. This seems an investment that will pay off well, both to CADICS and to Linköping University. CADICS may evaluate, however, whether a more coordinated strategy with respect to questions like communication/dissemination is needed.

Participating personnel

In the report, CADICS' recruitment strategy is described as follows: "Our recruitment and research development strategy is centered around the key elements in CADICS as they are presented on our website:

- Research in integrated projects
- Integrated activities and courses in our core curriculum
- Our developed joint infrastructure

Initiatives around the above points are a living discussion in the Management Board meetings."

In the site visit, this issue was further investigated. CADICS invests in promising students, by encouraging them to pursue a PhD, and later tries to hire the best of them. This strategy has certainly brought some success, since the quality of the researchers working at CADICS is very high. However the panel got the impression that CADICS is a relatively closed environment: most of the staff is hired locally. This strategy seems to have an additional drawback: since female students seem to be particularly few, locally, the gender balance question seems to be a more difficult target to address. CADICS does not effectively pursue a strategy to attract international students and researchers, in particular female ones. Furthermore, it is certainly considered an issue that no women are present in CADICS in any position with a seniority level higher than a PhD student.

CADICS has put in place a commendable initiative to balance young and more senior researchers, in particular by introducing the junior faculty in order to bridge the gap between senior researchers and PhD students. These junior faculty members have been strongly encouraged to develop multi-disciplinary research interests and competences. The strengthening of the middle layer at CADICS is very important, especially because there are several centre researchers at the very senior level, even more than at the mid-level (PostDocs, junior researchers), and CADICS should keep pursuing it, in order to avoid an hour-glass shaped structure in the age distribution of its staff.

All in all, it is impressive to see how strongly ICT researchers collaborate with each other in CADICS. They are running a very efficient and high-quality "research machine" with high-profile output, based on prestigious funding.

Organization and leadership of the Linnaeus Centre

CADICS is organized in a simple and effective way. The council of CADICS is the place for major executive discussions and decisions. All areas of research in the centre are represented in the council. This panel perceives CADICS more as a successful group of high-profile researchers, each with his own research group, than as a highly integrated centre. The results obtained, nevertheless, are excellent, but it would be advisable to develop more synergies in the future.

As far as succession plans are concerned, the original coordinator has already been replaced, so CADICS is preparing to face its future evolution. With the newly formed junior faculty, the centre has established an instrument which is intended to help with the succession of key persons. It is unclear to this panel to which degree, at present, the junior faculty have an active role in the decision making.

Women can be only found in the external advisory board (2 out of 5 in the International SAB and 2 out of 5 in the Industry SAB).

Organization and leadership of the university

The autonomy that Linköping University (LiU) has given to CADICS is a sign of great wisdom and the capability of fully appreciating the role that CADICS has inside the university. As the vice- chancellor has written, CADICS has become one of the leading entities in ICT at LiU, and being a centre of excellence it has a major role when it comes to decisions regarding ICT, even at a university level. The university offers professional administrative service to CADICS; regular meetings take place involving CADICS researchers and the university leadership. As a main outcome of these meetings the agenda for strategic investment in the ICT area is defined at LiU.

On the other hand, CADICS has strengthened LiU's position and visibility at an international level, created synergistic effects both inside LiU and with other research centres, substantially increased the total funding and increased the possibilities to recruit leading researchers. LiU has provided important support to CADICS by supporting additional faculty positions, and CADICS had an impact on LiU's structure, agenda and priorities. CADICS is very important for national and international collaborations involving the university. Also, the university reports a significant impact by the centre on the university in the form of enabling new activities through additional funding.

LiU has university policies addressing the gender profile on different levels in the organization. The vice-chancellor recognizes that there has been a positive trend in CADICS (five female PhD students), but she also recognizes that the situation is far from satisfactory.

As far as the future of the centre is concerned, researchers at CADICS believe that the first five years have boosted an already innovative research environment and this seems to be a solid base for the future: lots of grants, lots of ongoing projects and most of all the group of JFs that will ensure the continuity as well as the innovation. The centre is optimistic with respect to its ten years perspective. The vice-chancellor confirmed that it is planned to keep CADICS as a catalyst for future efforts (in particular for the strategic research area ELLIIT).

Added value

Linköping University has always aimed at having a leading role in the ICT area, and the creation of CADICS represents a major step in this respect. In the last five years the research in this area has significantly increased in quantity and quality. This statement is supported by the large number of impressive research grants that CADICS researchers have been able to obtain, and by the number of spin-offs created from the CADICS environment. In addition, the hiring of junior faculty represents a benefit to the university.

Recommendations

The overall quality of research done at CADICS is excellent. CADICS international collaborations are mainly in the EU arena, where it is actively involved in six EU-projects. There is much contact with industry, and creation of spin-offs. CADICS is very successful in disseminating its research results to the general public, in particular through demonstrations. The organization is simple and effective, but there could be more synergies.

The following recommendations are formulated by the panel:

1) CADICS is recommended to carefully prepare a succession plan for the future (at the moment, it is noted that CADICS is substantially dependent on high-profile senior researchers; the introduction of the junior faculty is certainly observed as a very constructive step in the right direction, but careful planning of how to secure the successful succession in central positions at CADICS is advised).
2) CADICS is recommended to strengthen its character as a centre. One concrete suggestion is to establish a centre-wide (centre-organized) seminar series. It is also an opportunity to invite high-profile women to CADICS, who would serve as role models for the female graduate students.
3) CADICS is also recommended to conduct recruiting on a more international level. It would be ideal if they could, in this way, hire a high-profile female scientist (through a fast-track procedure).

4) Given the high quality of CADICS research, it is surprising that no more attempts to acquire ERC grants are made – it seems natural to the CADICS environment to strengthen their efforts in this direction, maybe in particular on the more junior level.

LCCC, Lund university

Short description of LCCC

Website: http://www.lccc.lth.se/

The Lund Centre for Control of Complex Engineering Systems (LCCC) at Lund University is mainly focused on fundamental research in: distributed control, network and embedded systems, and modeling support. It is composed of about 20 (12.7 FTE) senior faculty and researchers, 8 (5.8 FTE) postdocs, and about 36 (33.8 FTE) Ph.D. students (as per 1 June 2013). Its total income is about 36 MSEK per year (2012). The grant awarded through the Linnaeus Centre scheme is 6. 37 MSEK per year.

Recommendations from the first evaluation

The issues raised by the Evaluation Panel in the first evaluation are summarized as follows:

1) The overall organizational structure of LCCC was not clear, since there was a significant overlap in the compositions of the LCCC Board and the Steering Committee; the role distribution between the two committees was not clear; the LCCC Board seldom met. In addition there was a potential conflict of interest since the LCCC coordinator was at the same time the Head of the Department of Automatic Control. Finally, the role of the International Advisory Board (IAB) was not clear and it was noted that the IAB never met in person.
2) There appeared to be no plans for leadership succession nor gender policies, since both the LCCC Board and the Scientific Advisory Board were composed only of men.
3) Outreach appeared to be insufficient and there was no formal interface with industry.

The changes introduced by LCCC to address these concerns were:

1) The Steering Committee has been eliminated and the LCCC Board consists now of 5 LCCC faculties, including two women. In addition, they are the youngest faculty members. The role of the LCCC Board is now clarified and it meets every 2-3 weeks. The International Advisory Board consists of 6 persons, two of them are women. Its role is now clear and it meets (in person) once a year. The IAB members are appointed for a 3-year term. The LCCC and the Dept. of Automatic Control are now formally independent, and the LCCC coordinator is no longer the Head of the Dept.
2) The leadership succession problem has been addressed by recruiting young researchers. Also, the new LCCC Board consists of the youngest faculty members. LCCC now considers gender when selecting the members of the LCCC Board and of the IAB. The gender balance of the staff working at the LCCC from 2008 to 2013 has slightly improved. The situation is reasonably good, especially compared to other centres and keeping in mind the boundary conditions.
3) New policies aimed at outreach, communication and dissemination to students, industry, policy makers and the general public have been put in place. In particular, LCCC supported the creation of a professional network for industrial automation, named Sesam-Sverige. The formal interface with industry is handled by the industrial reference groups. Also, industrial workshops have been organized as an outreach activity. They take place sufficiently often, and they are able to attract a good number of people working in the industry.

Research performed and planned: Scientific quality

The theoretical research themes strategically chosen by the centre are: distributed control, network and embedded systems, and modelling support. All these methodological research topics find application in the six areas indicated in the report: Process Control, Tele-communications, Automotive, Robotics, Medicine and Energy. The fact that research at LCCC is organized into working groups, each of them concentrating on a

specific application problem, guarantees that theoretical research is both given appropriate attention and is immediately judged for its effectiveness and meaningfulness in the associated application areas. There are interesting applications to transportation, energy, biology, cloud computing, etc.

In terms of scientific results of international impact, the area of distributed control is the strongest; the other areas emphasize their impact on applications, both in terms of related research and innovation, and seem more concentrated on the local/national environment of LCCC.

From the presentations delivered, the panel was particularly impressed with the study on the control of wind power farms, the control of dynamical traffic networks, the work on dynamic resource management and control for a wide range of applications, such as smartphones and cloud infrastructures.

In the last 2 years (2012 and 2013) 7 papers produced by LCCC researchers received awards at the major conferences of the field. This shows that some of the results of the research obtained at LCCC have had a strong impact at an international level. Also the level of the scientific journals (among the top in the field), where some of these results have been published, supports this observation. In addition, due to the Linnaeus program and to the increased visibility of LCCC, it has been possible to attract a very high number of researchers (about 400 of them have stayed at LCCC for at least 2-3 days since the creation of the centre) to Lund - which is a big success. The number of publications (referring to the participants' curricula, since the bibliometric data provided by SRC was not complete) and the number of citations are very good (most individuals checked had recent papers, in the last 10 years, with several hundred citations, according to Google Scholar). Also, there is a clear positive trend that, for some researchers, shows a clear step up since the beginning of the Linnaeus program (source: Google Scholar). In some areas of LCCC, presentations of pristine results at conferences are more important than paper publications in journals.

The methods adopted for pursuing the research interests on which LCCC is focusing seem to be the appropriate ones. They try to pose and solve each problem in a multi-disciplinary frame, thus involving experts from other areas, in particular mathematicians, computer scientists, telecommunication engineers, physicians and biologists. Clearly the research centre has a synergistic effect. The selection of research interests is broadly differentiated and very balanced. The centre is to be commended for the rich list of seminars that have taken place in the last five years (source: LCCC web page). This supports the perception that LCCC is well recognized at the international level and that it is an exciting place to work.

Most of the researchers belonging to LCCC had received some sort of international recognition even before the creation of LCCC. The Linnaeus Centre has provided the funding necessary to bring the research quality and the international visibility to a higher level, in order to recruit high quality researchers to support the future of the centre.

Collaboration

Collaboration inside LCCC is organized through 6 working groups, each of them involving 5-15 researchers and meeting every 2-4 weeks. During the interview the panel observed the strong collaborations and the strong sense of community inside the centre. The fact that PhD students typically have two supervisors from different areas encourages collaboration inside the centre. Also, PhD students receive a lot of attention and interact with each other on a daily basis.

There are several joint projects across the university. Specifically: 1) a collaboration with the Department of Electro-and Information Technology (EIT) that led to the successful creation of the strategic research area ELLIIT; 2) a collaboration with the power systems group in the Division for Industrial Electrical Engineering and Automation (IEA); 3) a collaboration with the Department of Industrial Management and Logistics (IML) and the Department of Economics; 4) a collaboration with the Centre for Mathematical Sciences (MatCent), mainly expressed at the level of PhD supervision; 5) a collaboration with the Linnaeus Centre NeuroNano; 6) a recently started collaboration with the Linnaeus Centre CanMove; 7) a collaboration with the Department of Computer Science that led to the creation of a new Robotics Lab; 8) a collaboration with the SSF-funded centre PiCLU, coordinated by the Department of Chemical Engineering. Collaborations with other centres in Sweden are:

1) The new strategic research area ELLIIT, with Linköping University and Lund University as main partners, stemming from the collaboration between CADICS in Linköping and LCCC in Lund.
2) The recent collaboration with Umeå University (cloud computing).

International collaborations are on a personal level with researchers at the University of Illinois, Cambridge University, Technion, University of Michigan, Caltech, MIT, Tsinghua and UC Berkeley. Every year two students are sent to Caltech under the U.S. Summer Undergraduate Research Fellowship (SURF) program. Other international collaborations are with The European Network of Excellence HYCON2 and the Institute for Mathematics and its Applications (IMA) in Minneapolis.

These collaborations have also been triggered by the focus periods organized to encourage international researchers to visit the centre. These visits have also had a great impact on PhD students and Post-docs.

Collaboration with the industry is mainly achieved in two ways: industrial reference groups and industrial workshops - but it is also enhanced by the open software and open standards produced by LCCC researchers, which create a strong link with the industrial environment. There are ongoing collaborations with ABB, Ericsson, NovoNordisk, Novozymes, Scania, Sony Mobile, Volvo and other companies.

Collaboration with research policy makers is quite active, as witnessed by the active participation of some LCCC faculty members in relevant meetings aimed at finalizing the details of the Horizon 2020 framework program.

These collaborations are very effective and the increased visibility and funding of LCCC researchers have significantly contributed to creating new ones and to strengthening existing ones, merging different expertise from various areas of engineering, but also from outside of engineering. Seed projects (6 up to now: two years initial support for selected initiatives), as well as the scientific and industrial workshops, played a significant role in this. In addition, several other collaborations are in formation (MAPCI, SKÅNE, SONY...).

External communication/dissemination

There is a strong communication strategy in place with most of the natural targets:

1) dissemination to students through new courses, text books and tutorial books based on the research developed at LCCC.
2) dissemination to industry through open standards (LCCC is active in standardization organizations: ISO, IEC, ISA, SEK and SIS) and open software (with particular emphasis on Modelica and TrueTime), as well as through industrial workshops and the aforementioned network for industrial automation (Sesam-Sverige). Also, industrial reference groups create a strong link with industry and help dissemination in a very effective way.
3) dissemination to research policy makers is achieved thanks to the participation of LCCC faculty members in meetings aimed at generating policy documents and EU projects (e.g. the EU/NSF workshop on the Impact of Technology and the meetings in preparation for the EU framework program Horizon 2020).
4) dissemination to general public through press releases, the LCCC web page, and through open days to elementary and high school students.

In addition, the technical results of the scientific research are disseminated through journals, conferences and workshops, as well as through the Focus Periods, to the other members of the international scientific community.

The effects of this dissemination, outside the centre, can be seen in the increasing number of international visitors, the increased international reputation of LCCC, the increased number of applicants for PhD or Post-doc positions and the increased number of interactions with industry.

Participating personnel

LCCC has set two main targets, with respect to recruitment: 1) to create optimal conditions for students, post-docs and visiting faculty, since they are typically attracted by the reputation of the specific research environment. 2) to accentuate the role of junior faculty.
These actions are expected to have a positive effect on recruitment at higher levels. Indeed, as they revealed during the interview, after having hired Post-docs and young researchers for some years, now they are ready to hire one or two people at a senior level. Faculty recruitment depends on the university (unlike the hiring of PhDs and Post-docs that has been possible with the centre funds), thus the university will have to decide whether to follow up on this initiative of LCCC.

Women faculty members have gained a more active role within LCCC. Both the LCCC Board and the IAB now encompass a higher percentage of women. The two recent recruitments are younger women faculty members. The 5 members of the LCCC Board are the youngest of the faculty members and there is a slight improvement in the proportion of women/men in the research groups in the last five years. The panel would like to encourage the LCCC board to continue promoting gender balance inside the centre. Lund University offers a program for coaching the career of female researchers (AKKA) and women of the LCCC seem to have benefitted from that program.

A number of programs are in place (LeKa, Future Faculty and Academic Traineeship) at Lund University aiming at coaching and mentoring young researchers, thus investing in the future generation of faculty members. LCCC is investing in future generations in a very effective way.

Organization and leadership of the Linnaeus Centre

The work at the centre is organized with the aim of achieving synergistic effects. This is supported by the creation of working groups, supervision policies for PhD students, collaborations inside and outside Lund University. The leadership of the centre is very strong and works extremely well. In response to the criticisms raised by the first evaluation panel, LCCC has been better organized and the roles and duties of the various boards better defined. There are succession plans for key-persons (the vice-coordinator is actively involved and can surely replace the coordinator, if needed) and plans for succession of generations (young faculty members have been chosen for the LCCC board, seed projects have led to hiring young people). PhD students receive a lot of attention, are connected with the international community and have developed a strong sense of belonging to the centre. The proportion of women/men in the leading positions is very high: two members out of five in the LCCC Board and two out of six in the IAB are women.

The priorities of the centre to take advantage of the funds brought by the Linnaeus grant are clear and very well chosen: post-docs and students, seed projects, focus periods, new recruitments, and their effects are already visible. The planned actions are to pursue these initiatives and to fine-tune them depending on the results and the evolution of the international research environment.

The centre seems to be a very lively place, with an excellent leader, a very good organization and a strong sense of belonging. Also LCCC has been able to obtain a very good number of grants that support its smooth functioning and the possibility to pursue rewarding initiatives.

Organization and leadership of the university

The panel did not perceive that there is any aspect of the way the University of Lund governs the Linnaeus Centre that should be highlighted.

Lund University has provided support to the centre in terms of development opportunities and synergies. All the initiatives taken by LCCC have been supported at the university level. Recruitment and personnel issues have been handled in close interaction with the departments involved. LCCC contributes to the budget discussions and to decisions regarding the profile needed for the role when deciding a new appointment. Leadership training has been offered by the university, and all members of LCCC leadership have participated. Also, female researchers at LCCC have participated in a two-year training program for future leaders offered by Lund University.

The main impact that LCCC has had on Lund University has been that of significantly increasing cross-disciplinary connections and collaborations, with the target of remaining at the top levels of research. In the vice-chancellor report a project named "Fronesis" is mentioned, which started in Autumn 2010 and is aimed at proposing a new organization of Lund University. Also, a new institute for advanced studies (Pufendorf) has been established, with the purpose of generating and coaching new research themes.

Finally, the centre certainly had a great impact in terms of national and international collaborations involving the university.

University policies addressing the gender profile on different levels in the organization are in place at Lund University, and these policies have had positive effects on the centre (female researchers at LCCC participated in the two-year training program for future research leaders).

The university strategies for maintaining Linnaeus Centres as strong research centres after the grant period, as described by the vice-chancellor, are clear at a general level, but not for this specific centre. Based on the internal evaluations (provided by the university) and the external evaluations (provided by the evaluation panels recruited by the Swedish Research Council), Lund University will decide on the future of each centre on an individual basis.

Added value

The added value consists of: new collaborations with other centres in Lund, in Sweden, and abroad; new collaborations with the industry; increased visibility both at an international level and with industry, visitor programs and industrial workshops; improved quality of the research; new initiatives (seed projects); new recruitments and new international visitors; an improved organization; and new funding, as LCCC has been able to attract a significant number of grants.

Recommendations

The research centre has a synergistic effect. The selection of research interests is multi-disciplinary and balanced. Very effective collaborations have been set up at the national and international level. A robust communication strategy is in place. A serious effort has been made towards improving gender balance. The leadership of the centre is very strong and works extremely well. The centre leadership has created succession plans for key personnel.

The panel recommends that LCCC:

- proactively engage with the university about its long-term future, after the Linnaeus funding
- actively recruit and hire high quality senior level women researchers
- promote its brand name, by making more frequent use of the LCCC logo and by explicitly referring to LCCC when they give their affiliations.

OKC, Stockholm University

Short description of OKC

Website: http://okc.albanova.se/about/

The Oskar Klein Centre for Cosmoparticle Physics is composed of about 43 (31.7 FTE) senior faculty and researchers, 21 (20 FTE) PostDocs, and 38 (30.4 FTE) Ph.D. students (as per 1 June 2013) from the Departments of Physics and Astronomy of Stockholm University (SU) and The Department of Physics at the Royal Institute of Technology (KTH). Its total income is about 80 MSEK per year (2012). The grant awarded through the Linnaeus Centre scheme is 7.7 MSEK per year.

Recommendations from the first evaluation

OKC's first evaluation was excellent. OKC was one of only four Linnaeus Centres that received increased funding after the first evaluation -- still a few recommendations were made.

1) Little information was available about the existence of succession plans for key persons and the generational succession. Indeed, it was remarked upon that the age pyramid of the professors in OKC may require a strategy for the recruitment of young talent who can eventually take leadership positions. It was also underlined that, at that time, most of the efforts were focusing on hiring PostDocs, but it was advisable to open competition for a junior or associate professor.
2) There seemed to be little outreach and communication activities. However, during the interview, the first evaluation panel became convinced that OKC had already started working on this issue.

The centre has responded to the recommendations with concrete actions.

1) OKC has co-financed an openly announced permanent lectureship position. This initiative led to the recruitment of an internationally known high energy astrophysicist, S. Rosswog. A similar initiative has now been undertaken, to create another partly OKC-financed position. In cooperation with the faculties of SU and KTH, several new OKC-related permanent or tenure track positions have been created (C. Finley in astroparticle physics, J. Sjölin and S. Strandberg in particle physics, T. Schwetz in particle phenomenology, all at SU; M. Jackson astroparticle physics and J. Strandberg in particle physics at KTH).
2) A part-time Communications Manager (female) has been hired on the OKC budget. The OKC website is now fully functional, administered by her. This has significantly helped to increase OKC visibility.

Research performed and planned: Scientific quality

OKC research activity has led to about 800 publications since its creation. It stands out in the bibliometric analysis made by the Swedish Research Council, with a high mean citation rate and a large proportion of highly cited papers. The research is of excellent quality, as can be seen from publications and citations, but even more by looking at the published papers.

OKC is actively involved in several very high-profile international experiments or facilities (see also the section on collaboration). The most prominent is ATLAS, one of the two experiments which led to the discovery of the Higgs boson on the CERN LHC. There are also gamma ray astronomy facilities in space: Fermi, Pamela, and in the future GAMMA 400, or the ground facility: HESS, and in the future CTA; finally, the Antarctica neutrino facility Ice Cube. In all cases, OKC has had hardware participation in, and is leading the search for, indirect detection of dark matter.

OKC researchers have access to, and make good use of, leading telescope facilities such as HST and the ESO VLT, and in the future JWST and the E-ELT.

There are two main themes of research in OKC. The first one revolves around the nature of dark matter. The centre has a three pronged approach to the problem of the nature of dark matter:

a) Production in accelerators: the search for supersymmetry and for dark matter signatures in events continues, with the data acquired with ATLAS in 2011 and 2012, and will become more effective when the LHC resumes its operations in 2015.
b) Indirect detection: dark matter annihilation or decay can give rise to emission of gamma ray lines, positrons and/or neutrinos. With Lars Bergstrom, the centre plays a major role in the work done, or to be done, with the gamma ray and the neutrino facilities on this topic. So far only upper limits have been established, although we should mention the very interesting observation with PAMELA (Payload for Anitmatter Matter Exploration and Light-nuclei Astrophysics) of a rising positron fraction and its interpretation in terms of dark matter signal. A group of researchers at OKC participated in the design and construction of PAMELA, as well as in analysing the positron excess. This work received more than 1,100 citations and triggered a flurry of theoretical papers aimed at explaining the phenomenon, often in terms of detection of products of dark matter annihilation. However, some recent work by OKC on the galactic halo goes against this interpretation, and most astrophysicists tend to support the idea that the positrons are emitted by pulsar nebulae, but today no definitive proof of the origin of the PAMELA positrons has been obtained.
c) Direct detection: This is new for OKC, which is in the process of engaging in the DARWIN experiment.

It is also possible that dark matter does not exist, and that it is the theory of gravity, which requires modifications. A 2011 OKC paper provided a consistent formulation of the "bimetric theory", as an alternative to Einstein's theory of gravitation, with the potential to account for dark matter and dark energy. This work has already received 600 citations, and researchers at OKC are confronting this theory to observations.

The second main theme of research at OKC, led by C. Fransson, is centred on the structure of the universe and on extreme objects, in particular supernovae and neutron stars. One member of the centre (A. Goobar) played an important role, from the start, in the Nobel Prize-winning discovery paper by Perlmutter et al. in 1999 of the acceleration of the expansion of the universe, derived from observations of Type 1 Supernovae, while J. Sollerman was a member of the competing team. The group remains very active in Supernova cosmology, e.g.: the Union2 Supernovae 2010 paper reporting results on this topic has an OKC member as first author and received 600 citations.

Much theoretical and observational work is done on supernovae, including a new determination of the present 3-dimensional structure of Supernova (SN) 1987A. Gamma ray bursts are another research topic, related to the previous one; recent observations led to a change of paradigm in the modeling and interpretation of prompt emission spectra. Other promising work is on modeling neutron star mergers, whose emission of gravitational waves may soon be directly measured. Also, IceCube appears to be detecting intriguing neutrino signals at very high energy which may be related to some of the strange objects studied.

There is present and future involvement in radio observatories (LOFAR, and, in the future, SKA), to seek information on the dark ages of the universe and the reionization process.

A new initiative, which seems interesting and timely, is to join Caltech and other groups to continually monitor optical transients, progenitors of neutron stars and black holes, with IPTF (Intermediate Palomar Transient Factory), thanks to a grant from the Wallenberg Foundation, to be followed by the more ambitious Zwicky Transient Facility.

Several OKC researchers have received awards and distinctions since the creation of the Centre. The network of collaborations at OKC is solid and well connected. The methods are appropriate and the selections are balanced; in the most important subjects, it is high risk high gain research.

Collaboration

Collaborations, both at a local level and at an international level, are numerous, strategically chosen and provide important benefits to all concerned.

Collaboration among OKC members has significantly increased, and the present situation is illustrated in the graph provided in the bibliometric analysis of the Swedish Research Council. In particular, the Astronomy and Physics Departments have become much closer. The collaboration among some of the researchers of OKC had

already led in 2005 to the creation of the AlbaNova Centre for High-Energy Astrophysics and Cosmology (HEAC).
It is worth noting that the members of all 5 working groups at OKC meet at least twice per month. The OKC Colloquia is another weekly activity, with coffee and informal discussions after the talks, which further stimulate collaboration.

National Collaborations: recently, there have been important contacts with the Mathematical Statistics group of the Department of Mathematics. There is an ongoing collaboration with the KTH space and plasma physics group. In general, OKC has created close ties between SU and KTH in its field. Also, there are ongoing collaborations with the universities in Lund, Gothenburg, Kalmar, Karlstad, and, in particular, Uppsala, and with the Nordic theory institution NORDITA, that moved to the AlbaNova building in Stockholm almost at the same time as OKC was created.

International collaborations: Most of the OKC projects (see section on research) are international. To quote a few projects/collaborations for the future: (1) OKC foresees playing a leading role in the development of a gamma-ray space observatory, 'GAMMA-400', with participation of Russian, Ukrainian, Italian and US groups. (2) OKC has also recently joined the European DARWIN noble liquid multi-ton dark matter detector initiative. (3) CTA is the next generation air Cherenkov telescope with an envisaged threshold down to around 10 GeV and increased sensitivity by an order of magnitude. CTA is a global project comprising over 100 institutes from 26 countries, and the PI for Sweden is an OKC member. (4) OKC was also involved in the construction of one of the instruments of the HST successor, the 6m James Webb Space Telescope (JWST), to be launched in 2018. (5) OKC is involved in the design phase of the low frequency part of the future Square Kilometer Array radio telescope (SKA Low). (6) PoGOLite is an X ray polarimeter flown on a balloon, in collaboration with groups in Japan and USA. (7) OKC scientists received a grant (2008-2010) from STINT (the Swedish Foundation for Internationalization of Research) for cosmology and astroparticle physics collaborating through joint workshops and a visitor exchange program with Stanford and MIT.

Collaborations with industry: There has been a collaboration with DST Control (Linköping) and SSC (Solna and Esrange) for PoGOLite.

Collaborations with research policy makers: many OKC members are involved in national or international committees and consortia, deciding about future projects and funding in astrophysics. Bergström is Scientific Secretary of The Nobel Committee for Physics of The Royal Swedish Academy of Sciences (KVA). J. Sollerman is chairing the Swedish Astronomical Society.

External communication/dissemination

OKC researchers are very often invited to give invited talks at conferences. In addition, OKC has taken part in the organization of workshops and conferences in Stockholm, for example: Identification of Dark Matter, 2008; The Hector Rubinstein Memorial Symposium, 2010; Cosmic Ray Backgrounds in Dark Matter Searches, 2010; Lyman alpha physics of galaxies and reionisation, 2010; TeV Particle Astrophysics, 2011; Explosive Ideas about Massive Stars, 2011; Marcel Grossman 2012; TOOLS 2012; EPS-HEP 2013. In the summer of 2013, OKC hosted the yearly International School of AstroParticle Physics (ISAPP), with some 50 graduate students and dozens of well-known international lecturers.

Dissemination to the general public is achieved through a number of successful initiatives. Members of the OKC have appeared in about 80 interviews (press, radio and TV). OKC also participates in the bi-annual outreach event "Fysik i Kungsan", targeting the general public. Information brochures and items with the OKC logo have been produced for distribution at this kind of occasion. Members of OKC have taken part in a large number of public lectures; in particular lectures specially designed for high-school and college teachers. Frequent press releases from SU and KTH divulge the new research results.

Participating personnel

The total number of personnel has been rising fast since OKC creation: 73 (19 female) in 2009, 98 (27 female) in 2011, 104 (26 female) in 2013.

The recruiting is done through international calls. An important criterion apart from excellence is that of achieving a critical mass in crucial areas of research related to the OKC goals. As remarked also by the first evaluation panel, the primary target of the recruitment strategies is PostDocs (OKC Fellows). Indeed, OKC has made a dedicated effort to increase the number of young OKC Fellows and invests a large part of the Linnaeus funding received for that purpose. The first call for 10 OKC Fellows received 300 applications. At present, a large fraction of the personnel was not trained in Sweden. As mentioned, following a recommendation from the first evaluation panel, a permanent position in high-energy astrophysics has been filled in the Astronomy Department. There is a serious effort to attract women, particularly successful with students (25 males, 13 females), for PostDocs the ratio is 16/5. There are only 7 women in the research staff (from professors to researchers), none in astronomy. There is currently an attempt to attract a very high-profile senior female scientist to the Centre.

Organization and leadership of the Linnaeus Centre

The OKC Steering Group meets on a monthly basis and discusses all the main issues regarding the centre. There is a clear succession strategy in place: all the Steering Committee members are appointed for 3 years and up to now there has been a good turnover. The current project leader has indicated that he will then step down (possibly in the next two years) in favour of a younger colleague. The leadership seems to be very committed to the success of the centre.

The total budget in 2013 is 35 % above that of 2009; in fact, it fluctuates above the 2009 value depending on grants and awards received. The Linnaeus grant accounts for less than 10 %, but allows the hiring of PostDocs and of a new professor, the invitation of distinguished foreign scientists, the organization of seminars, conferences and outreach actions - all measures of paramount importance for the scientific life and the visibility of the centre.

Organization and leadership of the university

Stockholm University has a decentralized organization with independent departments. It is the policy of the university that most of the strategic planning should be done at the departmental level and almost all of the university funding goes directly to the departments which are free to use this funding, within general rules, as they see best. OKC is a centre under the Department of Physics with parts of the Department of Astronomy, Stockholm University, and the Physics Department, KTH, as members.

From the vice-chancellor's report, we can see that the centre is very important for national and international collaborations involving the university. According to the vice-chancellor OKC has a strong impact at the departmental level, where the scientific strength of the OKC has influenced the directions of the departments and the selections made for the recruitments.

SU has policies for increasing the number of women in the university staff. An interesting policy is that when a woman is ranked second for a position, then it is seriously considered whether the position should be doubled. A handful of women have been hired in this way, one of them being S. Strandberg, who is now a member of the OKC Steering Group.

As far as the future of the centre is concerned, with the new recruitments to the OKC environment and the future programs, OKC should succeed in maintaining its high scientific standards for the foreseeable future. At the expiration of the Linnaeus grant, it will be the task of the Steering Group of OKC to make sure that a sustainable solution is found, in collaboration with, and active support from, the university departments and Faculties, and if possible help from the Swedish Research Council. The International Advisory Board and the vice-chancellor fully confirm this perspective and seem to have no concerns about the future of the centre. The project leader and the Steering Group are confident that OKC will survive after the next five years and keep flourishing.

Added value

The OKC centre uses Linnaeus funds in a targeted fashion to bring in new young people as PostDocs, to make new hires and to enhance scientific life and visibility. As a consequence, it attracts considerable external funding, most often directed to specific efforts, such as hardware for new projects. This has allowed research directions to change in a coherent way and in accordance with the goals of the OKC. The creation of OKC has been fundamental for the development of its areas of research in Stockholm. Several permanent positions in those areas have been created. Even more, as supporting evidence of the international visibility gained by OKC, the number and the quality of the applicants for each open position have become extremely high.

In summary, the Linnaeus Centre has increased the visibility of OKC at the international level. The number of publications and citations are quite high and continue to increase. OKC is involved in new international projects that are mostly focused on observational activities coupled with theory. PostDocs are essential for the scientific productivity, the participation in projects, and for guiding PhD students.

Recommendations

OKC is a highly visible Linnaeus Centre, which combines in a synergistic way the tools and concepts of particle physicists and astrophysicists to tackle some of the most exciting and mysterious problems of the universe: the nature of dark matter, the structure of the universe, the behaviour and properties of extreme objects, in particular supernovae and neutron stars. It is very actively involved in several world leading international experiments or facilities, such as ATLAS in CERN and ground or space gamma ray telescopes. The quality of the publications is remarkable, as is their number and the number of citations. OKC excels at disseminating its results to the public. Thanks to the Linnaeus grant, the number of post-docs, many of them females, has considerably increased. The organization is simple and effective.

The following recommendations are formulated by the panel:

OKC should continue to recruit female PostDocs and PhD students, continuing the current trajectory.

It may become soon necessary for the centre to evaluate its dependency on long-established senior personnel and to tackle the corresponding challenge to come up with a promising succession plan. As a second challenge, the centre should take concrete steps to also achieve significant effects in terms of gender balance on a more senior level in the centre. Both challenges should be addressed together.

It is essential that the Centre keeps the possibility of hosting PhD students, PostDocs and external visitors in numbers comparable to the present ones.

Researchers in the centre should consider applying for ERC grants.

The centre should continue to promote interdisciplinary research concerning astrophysics and particle physics, and ensure that students and PostDocs are exposed to both disciplines.

UPMARC, Uppsala University

Short description of UPMARC

Website: http://www.it.uu.se/research/upmarc

The Uppsala Programming for Multicore Architectures Research Centre (UPMARC) at Uppsala University is composed of about 20 (5.3 FTE) senior faculty and researchers, 4 (1.7 FTE) PostDocs, and 40 (14.6 FTE) Ph.D. students from the department of Information Technology (as per 1 June 2013). Its total income is about 30 MSEK per year (2012).The grant awarded through the Linnaeus Centre scheme is 6. 2 MSEK per year.

Recommendations from the first evaluation

The first evaluation report was very good. The following three suggestions were made:

1) Participate in more, larger-scale international collaborations;
2) Increase the number of women on the Science Advisory Board (SAB); and
3) Improve the UPMARC website, to reflect the marketing and outreach concepts that the centre has put in place.

The centre has made the following changes:

1) Established a number of new European collaboration projects and several new international collaborations have been set up;
2) Increased the number of women on the SAB from one to two out of 5 members (see also Section 6b of the report as well as the vice-chancellor's report); and
3) Improved their website (see also Section 4.2).

All recommendations have been addressed satisfactorily.

Research performed and planned: Scientific quality

One can divide the hardware of the globe-spanning computer systems that are rapidly transforming the modern world into three parts: networking, storage, and processors. The UPMARC project has taken on the very ambitious goal of applying its many talents to the third of these parts: computer processors. Key to understanding computer processing is to examine their architectures and memory hierarchy as well as their resource needs: power, cooling, timing, etc. A great deal of what this centre studies is technology dependent and rapidly changing: new processors are constantly appearing and they are being placed into new environments (e.g., mobile phones, cars) and are applied to new tasks (e.g., simulations, visualization). A fundamental change to the nature and application of computer processors revolves around the introduction of multi-core processors and the associated notion of weak memory model.

UPMARC has addressed challenges resulting from this change through a broad program that focuses on 4 main directions: 1) Programming Language Technology, 2) Resource Management, 3) Verification, and 4) Application Performance.

Regarding direction 1), researchers at UPMARC have focused on efficiently implementing the Erlang language on massively parallel multicores. They have extended their static defect detection tool, Dialyzer, to detect concurrency errors. They are also developing Concuerror (a stateless model checker) and Joelle (a new object-oriented language that overcomes a number of problems due to shared memory). On a more foundational level, a general framework for concurrent computation, the psi-calculus, has been developed and formalized. A notable impact of this work is the identification of several errors in existing formalisms, e.g., applied pi-calculus, as well as the demonstration of alternate and correct formulations.

Regarding direction 2), techniques for measuring and analysing the memory and cache systems used for long-running applications, with low overhead and high accuracy, have been developed: StatStack, Cache Pirate,

Bandwith Bandit and ScarPhase. Based on the previous tools, models have been developed to predict how resources will be shared among different applications on a multicore platform. One of them is StatCC. This has allowed the creation of routines that optimize memory usage. Several of these techniques have been incorporated in the commercial optimization tool ThreadSpotter (see also EU-project ADEPT). UPMARC researchers are also doing pioneering research into power-efficiency. For example, analytic models for Dynamic Voltage-Frequency Scaling (DVFS) have been developed and tools, such as PowerSleuth, have been built to analyse the power behaviour of programs and show how changes in software can lead to power optimizations. The researchers in this area are getting their work recognized at the highest, international levels. For example, the work on the verification of real-time guarantees for timed systems has been recognized with the CAV 2013 award; a result on response time analysis of multiprocessor systems was awarded with the RTSS 2009 Best Paper Award; and other results led to the DATE 2013 Best Paper Award and the ECRTS 2012 Outstanding Paper.

Regarding direction 3), the UPMARC group also conducts world-leading research on algorithmic program verification and model checking. Since the start of UPMARC, fundamental results on this subject have been obtained, largely thanks to the contribution of one senior and one junior researcher, recently recruited. Some results on this subject earned the group the TACAS 2013 Best Paper Award.

Regarding direction 4), the Linnaeus funds have allowed the centre to introduce a novel group that focuses on applications of multicore systems in real world system. As a result, a new adaptive and fast multipole method has been developed, implemented, and successfully used to optimize vertical axis wind turbines. URDME is an open source software tool created to simulate spatial reaction-diffusion systems: it has been used in molecular system biology for simulating cells at a molecular level.

The variety of the research developed at UPMARC is also matched with a high level of quality. The number of Best Paper Awards that researchers of the group have obtained at the major conferences of the area is surely noteworthy and a sign of exceptional quality. UPMARC researchers' international visibility is also highlighted by their participation in Program Committees of the flagship conferences of their area (UPMARC researchers also acted as program chairs), and by the high number of international and European research projects in which they are involved.

The number of new ideas and the breadth of their aims for the future are impressive. The specific research plans of the various teams and lead scientists are exciting and, based on the centre's grounding in applications and industrial collaborations, important to pursue.

Collaboration

The collaboration among researchers within UPMARC is dynamic and flexible, changing as their various projects require. The fact that often the 2 supervisors of PhD students at UPMARC are from different research groups is an example of how they value internal collaboration. Seminars, summers schools, working lunches and collaboration meetings have been created for the purpose of encouraging collaboration. Such collaboration meetings have led to the formation of several projects, funded either by the Swedish Foundation for Strategic Research (SSF) or by the European Union. The centre is also collaborating in meaningful ways with other parts of Uppsala University (UU): with the Division of Systems and Control (CoDeR-MP project, funded by SSF); with the Department of Engineering Science (and several Swedish companies), with the WISENET centre for wireless sensor networks (funded by Vinnova); and with involvement in the strategic research area eSSENCE.

Regarding collaborations within Sweden: UPMARC has taken a leading role in promoting multicore and parallel programming, via, for example, workshops and summer schools on these topics. Active collaborations also take place with universities in Linköping and Chalmers as well as with the National Veterinary Institute (SVA).

There are also numerous collaborations with international partners. UPMARC is represented on the strategic management board of the Special Interest Group on Embedded Systems (EMSIG), and is very active in the Network of Excellence on High Performance and Embedded Architecture and Compilation (HiPEAC). There are collaborations with universities in the USA (e.g., UC Berkeley and CMU), in India, (e.g., Chennai

Mathematical Institute), and in China (e.g., Northeastern Univ., the Chinese Academy). A good number of European collaborative projects are now in place, a fact that reflects very well on the centre.
Collaborations with industry are also healthy: there is a long standing collaboration with Ericsson's OTP team (Erlang language and Dialyzer); with Ericsson's base station group (CachePirate and BandwitBandit); with the start-up company Acumen AB (ThreadSpotter); with ABB and SAAB; with ARM, a leading hardware design company; with Microsoft Research; with Bangalore Labs (verification of concurrent programs); with EDF-France; etc.

External communication/dissemination

The centre disseminates its work in various ways. They publish their research in flagship conferences and top-ranked journals. They produce a range of software systems and tools that are picked up and used by a number of people in academics and industry. The centre strongly supports the educational mission of the university and contributes significantly to the education of undergraduates, masters, and PhD students: research results from the centre are fed into the classes that these students take. The centre has put in place very effective dissemination strategies and it receives very good feedback both from the scientific community and from industry.

Participating personnel

There has been a large expansion of this centre since 2008. The largest growth has been in the number of PhD students but there was also growth in the junior faculty and the cadre of postdocs. Young researchers are a predominant part of UPMARC: a very healthy sign for the future of the centre. There are few women in the centre, reflecting, in part, the low percentage of women across the field of computer and information science and technology. The centre has taken actions to help address the gender imbalance which has mostly benefited the most junior levels of researchers (more efforts in this direction are necessary, however).

Organization and leadership of the Linnaeus Centre

Leadership is strong and it seems that all the senior researchers support the organization with enthusiasm. The role of the coordinator as a facilitator takes a great deal of administrative burden away from the researchers. The panel did not fully understand how the management structure of the centre functions, with the existence of both a Board and an Executive Committee: in any case, it seems to function well.

Organization and leadership of the university

This centre is clearly of high strategic value for the university and it has been receiving growing support from it in every respect. The Linnaeus grant has strongly contributed to making ICT one of the university's key priority areas in its strategies for the period 2013-16. The university is supporting UPMARC with additional resources and has a strategy to consolidate UPMARC as an important centre, even after the Linnaeus funding period.

Added value

The Linnaeus Grant has stimulated the establishment of an interdisciplinary environment for research and education. Indeed, UPMARC acted as a catalyst for scientific interaction across the IT department as well as beyond the already broad borders of the IT area and department. The establishment and growth of this centre has benefited Uppsala University, raising its visibility in ICT which is known to be one of the university's strong points.

Recommendations

UPMARC supports rich collaborations among excellent researchers. They are among the world leaders in research on multicore computer architecture and contribute greatly to the educational goals of Uppsala

University. The research developed at UPMARC is varied and of high quality. The number of new ideas and the breadth of their aims for the future are impressive. Research plans are exciting and important to pursue. The leadership is strong. The dissemination strategies are effective.

The centre has taken actions to help address the gender imbalance which has mostly benefited the most junior levels of researchers (more efforts in this direction are necessary, however).

The following recommendations are formulated by the panel:

1) UPMARC and the university should continue to work on improving the gender balance within the centre, by combining a number of strategies that the centre is already deploying or planning to deploy. Direct involvement from the university regarding the appointment of senior woman should also be explored.
2) Applications for ERC grants at the senior and junior level are encouraged.
3) While applications and industrial ties are extremely important, the centre needs to keep its focus on the core, basic scientific questions that underlie the IT discipline. In the rapidly changing, technologically-based subject on which this centre is founded, this core focus must also be maintained and highlighted.

7. CONCLUSIONS AND RECOMMENDATIONS ON FUNDING

The General Expert Panel (GE Panel) is impressed by the overall quality, commitment and productivity of the Linnaeus Centres that we reviewed. The GE Panel can justify an increase, decrease, or no change in funding based on discussion of the conclusions and recommendations of the Subject Oriented Expert Panels, but we make no attempt to normalise the language across the panels. Since the total available funding is fixed, increases are only recommended for exemplary Linnaeus Centres *and* where the GE Panel believes that there are specific opportunities that can be realised through additional funding for the remaining period of the grant. Similarly, for the small number of Linnaeus Centres that have demonstrated some weaknesses, the Panel recommends reductions in support.

Humanities, Social Sciences, and Educational Sciences

CCL: Thinking in Time: Cognition, Communication and Learning - Lund University

The CCL Linnaeus Centre conducts cutting edge research in some of its focus areas. The centre attracts good doctoral students and with advisors from different disciplines, thereby developing new expertise in cognition communication and learning. The GE Panel recommends continued funding at the existing level.

HEAD: Linnaeus Centre for Research on Hearing and Deafness - Linköping University

The HEAD Linnaeus Centre is an excellent and highly productive multi-disciplinary research centre. HEAD communicates and disseminates results to successfully brand itself in the international arena and is considered the world-class leader in Cognitive Hearing Science. The GE Panel recommends continued funding at the existing level.

IMPACT: The Impact of Religion: Challenges for Society, Law and Democracy - Uppsala University

IMPACT is an excellent, vibrant and well-functioning centre that has put religion back on the agenda of social sciences. IMPACT involves multidisciplinary faculty and doctoral students providing true interdisciplinary and trans-disciplinary interactions across a very wide spectrum of expertise. There are specific opportunities for strengthening research in key areas for this centres. The GE Panel recommends a ten per cent increase in funding.

LUCID: Lund University Centre of Excellence for Integration of Social and Natural Dimensions of Sustainability - Lund University

During the first five years, the LUCID Linnaeus Centre has emerged as one of the world's leaders in scholarship on Sustainability Science. The centre has gained increased recognition for their work, yet should do more to integrate the Natural Sciences into the core research program. The GE Panel recommends continued funding at the existing level.

SPaDE: Linnaeus Centre on Social Policy and Family Dynamics in Europe - Stockholm University

SPaDE is an excellent research centre with specific opportunities for future research. SPaDE is an established, dynamic and productive research centre and one of the world leading centres in population studies. The GE Panel recommends continued funding at the existing level.

Medicine

Bagadilico: The Basal Ganglia Disorders Linnaeus Consortium – Lund University

BAGADILICO mainly works on Parkinson's disease, for which Lund University has a long-standing international reputation, with some interesting scientific developments. They have been very successful in restructuring this area of research in Lund, with the recruitment of a young group of leaders following the retirement of major scientists/clinicians. They have an excellent policy of using the Linnaeus Centre grant for priming exciting new projects. The GE Panel recommends continued funding at the existing level.

CERIC: Centre for Research on Inflammation and Cardiovascular Disease – Karolinska Institutet

CERIC successfully bridges basic and clinical research and is an excellent example of a successful translational centre. The centre is well structured and has organised scientific activities that bring together the groups working in diverse areas. The GE Panel recommends continued funding at the existing level.

CRisP: The Cancer Risk Prediction Centre – Karolinska Institutet

CRisP aims to reduce the incidence and mortality of breast and prostate cancer through individualised prevention programmes. PIs play an important role in public outreach with patient groups and policy makers. The contacts between the two areas of biomedical research generated by the centre are clearly beneficial, although there are not many centre-based activities. Given this latter concern, the GE Panel recommends a ten per cent decrease in funding.

THRM: The Human Regenerative Map – Karolinska Institutet

The original aim of THRM was to use the carbon14 method to date and analyse the turnover of cells in different human tissues. They have made major breakthroughs with this approach. This centre is outstanding scientifically with many very high-profile publications. It is relatively small so that an informal organisation works well, with regular scientific meetings on the campus. The GE Panel recommends continued funding at the existing level.

UCMR: Umeå Centre for Microbial Research – Umeå University

UCMR is a leading centre nationally and internationally for chemical microbiology. This interdisciplinary centre brings together chemists, physicists and biologists. It is very well structured and has a remarkably successful training programme for young scientists. Their integration with the associated EMBL/MIMS structure has produced an impressive international centre. The GE Panel recommends continued funding at the existing level.

Natural Sciences

CAnMove: Centre for Animal Movement Research – Lund University

CAnMove has done innovative research, making use of modern technological developments to fundamentally advance the field. The GE Panel recommends continued funding at the existing level.

CeMEB: The Linnaeus Centre for Marine Evolutionary Biology – University of Gothenburg

CeMEB is an excellent, well-functioning centre involving multi-disciplinary faculty and trainees providing true interdisciplinary interactions across a very wide spectrum of expertise. The GE Panel recommends a ten per cent increase in funding.

LUCCI: Lund Centre for Studies of Carbon Cycle and Climate Interaction – Lund University

The LUCCI centre is the premier group in the world that addresses the question of understanding and quantifying the carbon cycle in the context of the climate system. The LUCCI centre is well functioning and producing important outputs and collaborations. The GE Panel recommends continued funding at the existing level.

SUPRA: Linnaeus Centre for Bio-inspired Supramolecular Function and Design – Chalmers University of Technology

The SUPRA centre is academically excellent and forms a bridge between different disciplines. However, there is a lack of Linnaeus branding, and an uncertainty about the future governance. The GE Panel recommends a ten per cent decrease in funding.

UCEG: Uppsala Centre of Evolution and Genomics – Uppsala University

UCEG is academically excellent, but lacks Linnaeus branding and several key elements, specifically outreach, an external scientific advisory board, and a strategic plan for the next five years. Based on these concerns, the GE Panel recommends a ten per cent decrease in funding.

Physical Sciences and Engineering

ADOPT: Advanced Optics and Photonics – The Royal Institute of Technology

ADOPT centre has been able to consolidate a substantial critical mass of research in photonics materials, quantum photonics and nanophotonics and has established an exciting research programme that generates high impact results, raising ADOPT to the position of one of the world leaders in the field. The GE Panel recommends continued funding at the existing level.

CADICS: Control, Autonomy, and Decision-making in Complex Systems – Linköping University

CADICS performs excellent research in autonomy, control, planning, supervision, and visualisation. With respect to some of their work, CADICS is placed amongst the world-leaders in their respective fields. The GE Panel recommends continued funding at the existing level.

LCCC: Lund Centre for Control of Complex Engineering Systems – Lund University

LCCC is a centre working with control of complex systems, which is excellent in selected research areas. The centre is very active and has broad international visibility, thanks to a number of successful initiatives it has promoted. The GE Panel recommends continued funding at the existing level.

OKC: The Oskar Klein Centre for Cosmoparticle Physics – Stockholm University

Research on some of the most profound mysteries of the universe, such as the nature of dark matter, is being conducted in OKC at the highest international levels. The GE Panel recommends continued funding at the existing level.

UPMARC: Uppsala Programming for Multicore Architectures Research Centre – Uppsala University

UPMARC supports rich collaborations among excellent researchers. They are among the world leaders in research on multicore computer architecture and contribute greatly to the educational goals of Uppsala University. The GE Panel recommends continued funding at the existing level.

APPENDIX 1. LINNAEUS GRANT CALL

LINNAEUS GRANT

Final date for application is 2007-11-06 16:00

1. Type of grant

The purpose of the Linnaeus Grant is to create environments for basic research which afford synergic effects and are characterised by excellent scientific quality and potential for scientific renewal. This objective is to be attained by means of national competition among individual higher education institutions (HEIs) or collaborating HEIs. The Linnaeus Grant is a supplement to the HEIs' own basic resources and the research councils' support for researcher-initiated projects. Linnaeus Grants may be expected to influence strategic priorities of the HEIs and exert a structural impact on the research system.

The nature of research tasks varies among and within different subject areas and faculties. Since research is variously organised, the most effective and dynamic research environments are presumably of varying sizes and differ from the academic disciplines of one faculty to those of another. Environments in new, rapidly expanding areas of knowledge with high potential, where qualifications are not yet very extensive, may be difficult to assess. These environments may initially be given small-scale support that is then allowed to increase if this is prompted by the outcome of the evaluations. In certain fields of basic research, collaboration in connection with, and/or the use of, national and international infrastructure may create a critical mass of researchers and pave the way for interdisciplinary advances. This type of collaboration may have a particular strategic bearing on Swedish research.

The Swedish Research Council and the Swedish Research Council for Environment, Agricultural Sciences and Spatial Planning (Formas) issue joint calls for applications for Linnaeus Grants. This form of support is aimed at strong environments for basic research in all academic disciplines. In this second call for applications, a minimum of SEK 120 million is to be distributed. 1-2 environments covering areas of research pertaining to the responsibility of Formas will be granted. The grant period will start on 1 July 2008.

Special conditions for this form of grant

In addition to the Swedish Research Council´s and Formas´ general conditions for Linnaeus Grant http://www.vr.se/huvudmeny/sokabidrag/dokumenttilllinneutlysningen.4.61663a1611210085753800013 14.html the following special conditions apply:

- Applicants are the heads of HEIs.
- The maximum duration of the grant is 10 years.
- A single research environment can obtain SEK 5-10 million a year. The grant can cover all types of costs at the HEI, but may not be used for fellowships. The total annual sum for which each HEI may apply is specified in the Linnaeus Grant Memo http://www.vr.se/huvudmeny/sokabidrag/dokumenttilllinneutlysningen.4.61663a161121008575 380001314.html. Overall, the HEI's cofunding must total at least 50% of the amount applied for, but may vary over time.
- Each application applies to a specific environment. Two or more HEIs can jointly apply for support for a shared environment. The total sum of a shared environment that is applied for may not exceed SEK 10 million a year. Each HEI's share in this kind of collaboration must be accommodated within its total annual sum.

1(8)

- It must be stated how the environment for which the HEI is applying for support tallies with the HEI's strategic priorities, and how the HEI supports the environment concerned.
- Individual researchers included in an application, or who receive part of a Linnaeus Grant, can receive, apply for and/or obtain other forms of grant from the Swedish Research Council and/or Formas. An existing Linnaeus environment may not apply for an additional Linnaeus Grant. People included in a Linnaeus environment that has already been funded may take part in a new application. If this is the case it must be clearly stated in the application so that the panel will be able to assess whether it is realistic that this person can honour his/her undertakings in both the new and old environment.

2. Who can apply?

Only heads of HEIs can apply for Linnaeus Grants. An application must relate to a single research environment only. Two or more HEIs can jointly apply for support for a shared environment.

Administration

The Linnaeus Grant is normally administered by a Swedish HEI.

A signature on the application (Appendix S) by the head of the HEI is required.

3. Form of application

A complete application consist of a filled-in online form and appendices, submitted electronically, for the research environment(s) to which the grant application relates and, of a summary on paper signed by the head of the HEI of all the environments concerned, in addition to the signed confirmation appendix (Appendix S) for each of the environments.

Overview of application content

An application must contain sufficient information to enable the following to be assessed:

- Scientific quality.
- Scientific renewal and synergic effects of the support for the proposed environment.
- Gender equality in the environment concerned (as an additional criterion).

Language

The application, including appendices, should be written in English, except for the compulsory popular-scientific description and the applicant's address, which should be in Swedish. The project title should be written in both Swedish and English.

Instructions for boxes in the online form

The following instructions apply to some of the headings found in the online form. When filling out the form, you can obtain further information and assistance at every point by clicking on the text marked in blue for the point concerned.

Applicant

The applicant must be the head of the HEI.

Coordinator

The contact person for the environment, here denoted coordinator, should be one of the co-workers in the application.

Summary

The summary in the online form should contain a description of:

- What is to be done.
- How the research is to be carried out, which scientific methods will be used.
- What has been done previously.
- What is important about the planned research.

The summary is intended mainly as a brief introduction to the purpose and implementation of the planned research. It should be written in such a way as to be intelligible to people whose research specialisation differs from the applicant's.

Propose an evaluation panel and the experts' specialist fields

An applicant HEI can, in its application, propose which evaluation panel that it considers should deal with the application. This is done in the application form. If the applicant HEI considers that two or more academic disciplines or subject areas are involved, more than one panel should be proposed. To guide decisions as to which reviewers should evaluate the application, the HEI should state on the application form the classification codes of the areas in which the external reviewers should have expert knowledge (see the list in the application form). Three external experts will be appointed for each application, and three different codes can therefore be given. Those applications that concern gender research and research with gender perspective should be indicated in the summary of the applications from the HEI.

Co-workers

State in the online form the people who, according to plans, will be most actively involved in the implementation of the proposed research.

Popular-scientific description

Every application must include a popular-scientific description in Swedish.

The popular-scientific description in the online form should be written in such a way that even someone who is unfamiliar with the subject can understand what the research is about. Describe what will be done and why, with an emphasis on the basic research involved. Explain how the new knowledge may be important.

The Swedish Research Council may use the popular-scientific description for information purposes.

General conditions for the application

Applications to the Swedish Research Council must be made entirely electronically, by means of an online form reached by the link "Ansök här/apply here (VR-Direct)" http://vrdirect.vr.se/default2.asp on the Swedish Research Council's website http://www.vr.se/

Detailed technical instructions are provided with the online form. The form automatically requests the appendices required for the form of grant selected. Applicants should then enclose the appendices, preferably as PDF files, or convert them into PDF files according to the instructions accompanying the form. It is the applicant's responsibility to ensure that the application, converted into a PDF file by the application system, is complete and that all the required appendices are enclosed.

- Applications should be submitted electronically.
- Incomplete applications are not processed.
- No additions to applications after the last application date, except for additions explicitly specified in the instructions, are approved. If funding from another funding agency is obtained for the same purpose as, or a similar purpose to, the funding applied for in this application, the Swedish Research Council should be notified as soon as possible.
- Materials not explicitly requested should not be enclosed and are not included in the assessment of the application. An example of such material is a letter of recommendation.

Participation in and association with international collaboration

Project Research Grants from the Swedish Research Council are available to cofund similarly oriented EU projects within the Sixth and Seventh Framework Programmes. If such coordination is planned, it should be reported in the research programme.

Indirect costs (overheads etc)

In its application, the applicant HEI should give an account of the use of the funds applied for. In the Swedish Research Council's decision, indirect costs are not added to the amount applied for in the application. Indirect costs are included either in the amount of funding applied for by the HEI or in the portion covered by its cofunding.

VAT

Funds that will be administered by a state-owned HEI or other public agency, municipality or county council, or company or organisation with activities liable for value-added tax are estimated in the application without VAT.

Public access

An application to the Swedish Research Council is a public document. Applicants who intend to apply for patents should note that the Swedish Research Council is unable to treat applications for research support as secret. Material that is also to be included in a patent application should therefore not be included in an application submitted to the Swedish Research Council before the patent application has been submitted. Information on grants awarded will be posted on the Swedish Research Council's website http://www.vr.se/

Ethical considerations

The Swedish Research Council only supports research characterized by the highest ethics.

As of January 1 2004 there is a law concerning ethical review on research carried out on people. It encompasses research on people dead or alive, biological material derived from humans and research including processing of personal particulars. If the scope of the research applied for falls under the law for ethical consideration then ethical review or a guiding assessment should be sought. The application is to be made by the head of the HEI. The head of the HEI is responsible for the research carried out and should, thus, be the one to submit the application for ethical review. More information and the application form can be found on http://www.epn.se/

Further information on professional ethics as well as ethical considerations can be found on the URL of Codex, http://www.codex.vr.se/

Research including animal experimentation

For research that includes animal experiments, approval must be obtained from an ethical committee on animal experiments. Such approval shall be obtained as soon as possible, and in accordance with the Animal Protection Act, before experimentation is commenced. Notification of this approval need not be sent to the Swedish Research Council.

Commercial interests

One basic requirement in the Swedish Research Council's general conditions for awarding research grants is that the knowledge generated by the research must be made publicly available in an objective manner. This requirement rests on the general premises on which good research practice has long been based. The Swedish Research Council's interest is prompted partly by a wish to ensure that findings from research funded by the Swedish Research Council itself can always be published freely, but also that findings should be disseminated among research groups and HEIs.

The responsibility for ensuring that researchers comply with the requirements, generally accepted within the research community, of objectivity, independence and openness rests primarily on the researchers themselves. Their employers, i.e. individual HEIs, bear secondary responsibility.

4. Appendices

The appendices, on which the Swedish Research Council's evaluation of the application is based, are attached to the online form. The form automatically requests the appendices required for the form of grant selected. On each appendix page, at the top, the applicants name and Swedish personal identity number, and the alphabetical code of the appendix, should be stated. Please note that the reviewers will have access to the applications in the form of PDF files or on paper. Paper copies will be black-and-white, which should be kept in mind when writing the application. The following appendices must be enclosed with the application:

A Research programme.

B Curriculum vitae/scientific qualifications.

C List of publications.

U Requirements for implementation.

V Other information.

S Appendix with confirmation of the application (contains a reference code provided by the Swedish Research Council for the corresponding electronic application).

Appendix A - Research programme

This appendix should comprise a concise description of the research, not more than 20 pages long, evenly divided between research carried out and research proposed.

The description should include an account of research to date, illustrating key findings obtained, breakthroughs in the research and international contacts and impact. Where new environments are being created, the account should cover the research carried out by the various constituent groups.

Future research plans should cover the development potential for renewal of research, the development of international collaboration and the skills and equipment required by the research.

The account should include the following information about the research:

- An account of the challenges, objectives and vision of the proposed research throughout the period, with clear milestones for the short (two-year), medium and long term, and the strategy for attaining the objectives.
- Significance: a brief account of the importance of the research environment to the research field concerned.
- Estimated synergic effects resulting from support to the environment.
- Overview of the field: a summary of the environment´s and other people's research in the field concerned, with key references.
- International and national collaboration: a brief account of current and planned collaboration with foreign and Swedish researchers and/or research groups.
- Skills and special equipment required for the research, classified as existing and as yet non-existent.

Appendix B - Curriculum vitae/scientific qualifications

This Appendix should contain CVs for the researchers taking part (a maximum of 10 researchers), and they may not exceed two A4 pages per person. For each researcher the following headings, where applicable, should be used:

- Doctoral degree (year).
- Postdoctoral periods (year and position).
- Qualification as Associate Professor (year).
- Current position, appointment period and time for research in the position.
- Previous positions and periods of appointment.
- Parental leave, service in the Armed Forces or similar periods, and research time deductible for such purposes.
- Distinctions.

- Number of people awarded doctorates for whom the participating researcher has been a supervisor (state the periods concerned).
- Number of postdoctoral researchers who are or have been collaborating with the researcher in the research group (state the periods concerned).
- National and international assignments of importance.
- Qualifications with respect to collaboration and/or communication of research findings. These may, for example, relate to cooperation with businesses, organisations or public agencies; commercialisation of results; popular-scientific activities or documentation for decision-making at various levels.

Appendix C - List of publications

This Appendix should contain publications by the participating researchers (a maximum of 10 researchers) over the past five years (2003-2007). Each researcher's publications should be listed separately, with the ten most important publications marked with an asterisk (here, articles more than five years old may also be included) and the publications classified under the following headings:

- Peer-reviewed articles.
- Overviews and conference contributions.
- Books and book chapters.
- Popular-scientific articles and activities.
- Other relevant material, such as patents and publicly available computer programs, databases, etc developed by the researcher(s) concerned.

Appendix U - Requirements for implementation

This Appendix should contain an account of requirements, classified under the following headings:

1. A financial plan for the entire period. For the first three years, there must be detailed accounts of income, including new funds for growth, and also costs. For the remainder of the period, an overview is adequate. HEIs' cofunding (in SEK and 'in kind', the latter being stated in terms of its value in SEK) should be specified clearly.
2. The size of the research environment in its first year of activity: the planned total financial cost of the research and the number of people working in the environment, classified among four categories: researchers/teachers; junior/postdoctoral researchers; PhD students; and other staff.
3. Investment requirements for new equipment or the cost of maintaining and/or upgrading existing equipment.
4. Organisational plan: how work in the environment is organised to attain the intended objectives and synergic effects.
5. Leadership in the environment: an account of the leadership experience and training of the proposed leader; the order of succession for key people in the environment; and foreseeable generation shift during the grant period.
6. The HEI's strategy for fostering the development of the research environment.
7. The HEI's processes for supporting and monitoring the leadership of the initiative.
8. An account of the relationship between the HEI's strategic priorities and the various environments included in the application.

Cofunding should amount to 50% of the total amount applied for during the funding period but may vary over time. The cofunding may consist of e.g. premises, researchers, other staff, financial contributions to research, infrastructure or communication. It should come from the HEI's own resources, i.e. government grants, in-house foundations or in-house funds. The source should be specified in the financial plan.

Appendix V - Other information

This Appendix should contain a gender equality plan for the environment. Totalling not more than three pages both the current situation and the objective for Year 5 for all postdoctoral staff in the environment should be described as well as a description of the intended ways to attain the objective.

Appendix S - Confirmation of the application

Appendix S must be signed by the head of the HEI, conforming that the application with the reference code assigned to it by the Swedish Research Council is complete and is a final application. The head of the HEI should also sign a summary, according to the Swedish Research Council's model found at

http://www.vr.se/huvudmeny/sokabidrag/dokumenttilllinneutlysningen.4.61663a1611210085753800013 14.html

of all the research environments for which funds are applied for. This summary must be sent by regular post to the Swedish Research Council together with Appendices S for all the environments funds are applied for. For joint applications by two or more HEIs, the application must be sent from the HEI where the coordinator of the environment works. Copies of Appendix S should be sent to the heads of the participating HEIs. These environments should be listed under the heading "Samverkande miljöer" in the summaries.

The Swedish Research Council must receive the signed summary and every Appendix S required within five working days after the closing date for applications, i.e. by 4.00 pm on Tuesday 13 November 2007.

The address is:

The Swedish Research Council

SE-103 78 Stockholm

Sweden

Mark the envelope 'Linnaeus Grant'.

5. Evaluation and decision

For assessment criteria and a description of the review process we refer you to the document "Guidelines for panels and reviewers" found on
http://www.vr.se/huvudmeny/sokabidrag/dokumenttilllinneutlysningen.4.61663a1611210085753800013 14.html

The council presents this text in English only as to avoid any problems with the translation.

Decision

The Swedish Research Council and Formas (in the following called the council) will decide on the award of Linnaeus Grants within the set limits not later than June 2008.

Communication of the decision and evaluations from the panels concerned will be sent to the heads of the respective HEIs as soon as possible after the decisions are made. Confirmation of the grant conditions signed by the head of the HEI must be returned to the appropriate funding agency not later than three months after they have been received by the HEI.

An environment granted support must submit its communication strategy in accordance with subsequent instructions.

Evaluations of Linnaeus Grants awarded

Evaluation shall take place on three occasions: after one and a half to two years; after five years; and after the end of the entire grant period.

Both the council and the HEI can request that an evaluation take place at an earlier date.

First evaluation occasion

After one and a half to two years, the organisation, collaboration and leadership of the research environment is evaluated in relation to the HEI's commitment. The recommendations of this evaluation may result in a change in, or development of, the organisation or leadership of the environment. They may also prompt the council to impose conditions on or alter its support, and possibly to increase or reduce it by up to 20%. One option is for the parties to reach a new agreement on a higher or lower level, with or without new conditions.

Second evaluation occasion

The evaluation after five years focuses on scientific results, the added value afforded and dynamism created, and the potential for successful research during the concluding part of the Linnaeus Grant

period. On this occasion, aspects of gender equality, communication, etc should also be clarified. In a plan for this evaluation, the HEI should report on how the research can be developed during the concluding part of the period and in the subsequent years. The evaluation is carried out by international experts. Their recommendations may result in a change in, or development of, the organisation or leadership of the environment, or prompt the council to attach conditions to, or effect changes in, its support. Normally, the maximum possible increase or decrease in funding during the year after the evaluation is 20%. If support for a research environment is discontinued entirely, a phase-out plan covering two years must be drawn up by the parties.

Third evaluation occasion

After the end of the grant period an overall evaluation, including an impact analysis, of the Linnaeus Grant is carried out. This evaluation is intended to provide documentation for further work of developing the councils´ forms of support, and for the HEIs' development work.

6. Contact

Questions about application content may be addressed to Maria Starborg, telephone 08-546 44 237, email maria.starborg@vr.se

7. How and when to apply

The closing date for the electronic application is Tuesday 6 November 2007 (at 4.00 pm). Every Appendix S required and the summary of all research environments for which funds are applied for, signed by the head of the HEI concerned, must be received by the Swedish Research Council within **five working days after the closing application date**, i.e. by 4.00 pm on Tuesday 13 November 2007.

Appendix S should be sent to the following address:

Swedish Research Council

SE-103 78 Stockholm

Sweden

Mark the envelope 'Linnaeus Grant'.

Link to the electronic application form

The online form may be found in the Swedish Research Council's application system VR-Direct.

APPENDIX 2. EXPERTS AND PANEL MEMBERS

General Expert Panel (GE Panel)

Director/Research Professor Stephanie Shipp (Chair)

Deputy Director and Research Professor at the Social and Decision Analytics Laboratory (SDAL) at the Virginia Bioinformatics Laboratory at Virginia Tech,USA. Expertise: Economic and statistical methodology and tools for using big data to address social science policy questions quantitatively. Prior positions: 2007-2013, Senior Researcher at the Science and Technology Policy Institute; 2000-2007: Director of the Economic Assessment Office in the Advanced Technology Program at the National Institute of Standards and Technology. Member of the international advisory board for VINNOVA.
Research area/field: Statistical analysis, innovation, competitiveness, smart cities, advanced manufacturing, federal laboratories, and funding of high risk/high reward research.
Website: http://stephanieshipp.weebly.com/cv.html

Professor Dr. Neil Geddes

Director Technology, STFC Rutherford Appleton Laboratory, Harwell, Oxford, United Kingdom.
Former Director of the e-science programme at Science and Technology Facilities Council, STFC, and participated in setting up the LHC Grid computing project. First Chairman of the worldwide LHC Computing Grid Collaboration. 2005-2012 leader at the e-Science Department at the UK (STFC), 2012 Director of Technology at STFC. UK delegate to the EU e-Infrastructure Reflection Group (eIRG).
Research area/field: High energy particle physics.
Website: http://www.stfc.ac.uk/e-Science/Contact+us/22381.aspx

Professor Stig Arild Slørdahl

Dean at the Faculty of Medicine, Norwegian University of Science and Technology (NTNU) Trondheim, Norway. Professor of Medicine (cardiovascular physiology) specialist in internal medicine and cardiology. Attending physician at St Olavs Hospital. 2009 member of The Royal Norwegian Society of Sciences and Letters. 2012 Chair of the Scientific Review Group for the Biomedical Sciences in European Science Foundation.2007 member of the board of Division for Science at The Research Council of Norway. Member of the board of SINTEF and The Cancer Registry of Norway. 2010-2012 Chair of The Joint Committee of the Nordic Medical Research Councils (NOS-M).
Research area/field: Echocardiography, exercise physiology and heart-brain vascular interactions.
Website: http://www.ntnu.edu/employees/stig.slordahl

Chairs and General Expert Panel (GE Panel)

Professor Gunn Elisabeth Birkelund (Chair HSE Panel)

Professor of Sociology, Department of Sociology and Human Geography, University of Oslo, Norway.
Research area/field: Analytical sociology, social stratification and labour market research with a specific focus on gender and ethnic inequalities.
Website: http://www.sv.uio.no/iss/english/people/aca/gunnb/index.html

Professor Margaret Buckingham (Chair M Panel)

Department of Developmental Biology, Pasteur Institute, Paris, France.

Research area/field: Developmental biology, molecular genetics of development.
Website: http://www.pasteur.fr/ip/easysite/pasteur/en/research/scientific-departments/developmental-e-stem-cells-biology/units-and-groups/molecular-genetics-of-development

Dr. Catherine Cesarsky (Chair PE Panel)

Service d'Astrophysique, IRFU, Paris-Saclay, France.
Research area/field: High-energy and infrared astrophysics.
Website: http://www.academie-sciences.fr/academie/membre/Cesarsky_Catherine.htm

Professor.Dr.Dr.h.c. Helmuth Möhwald (Chair N Panel)

Director, Department Interfaces, Max-Planck-Institute of Colloids and Interfaces, Potsdam, Germany.
Research area/field: Molecular interfaces, organised films and capsules, membrane biophysics and nanoparticles.
Website: http://www.mpikg.mpg.de/interfaces/director/helmuth-moehwald

Humanities, Social Sciences and Educational Sciences Expert Panel (HSE Panel)

Associate Professor Krister Andersson

Associate Professor, Departments of Political Science and Environmental Studies, University of Colorado at Boulder, USA.
Research area/field: Governmental reforms to address social and environmental problems in developing countries.
Website: http://sobek.colorado.edu/~anderssk/

Professor Theresa H Chisolm

Professor and Chair, Department of Communication Sciences & Disorders, University of South Florida, Tampa, Florida, USA.
Research area/field: Rehabilitative audiology.
Website: http://csd.cbcs.usf.edu/people/bio.cfm?ID=53

Professor Celia Evangeline Deane-Drummond

Department of Theology, University of Notre Dame, USA.
Research area/field: Systematic theology the biological sciences, practical and ethical discussions in bioethics and environmental ethics.
Website: http://theology.nd.edu/people/faculty/celia-deane-drummond/

Professor Jukka Hyönä

Head of Psychology, Department of Behavioral Sciences and Philosophy, University of Turku, Finland.
Research area/field: Cognitive psychology and psychology of language.
Website: http://users.utu.fi/hyona/

Medicine Expert Panel (M Panel)

Professor Rolf K. Reed

Department of Biomedicine, University of Bergen, Norway.
Research area/field: Matrix biology.
Website: http://www.uib.no/persons/Rolf.Reed

Professor George Salmond

Department of Biochemistry, University of Cambridge, United Kingdom.
Research area/field: Molecular microbiology.
Website: http://www.bioc.cam.ac.uk/people/uto/salmond

Professor Tapio Visakorpi

Prostate Cancer Research Centre, University of Tampere, Finland.
Research area/field: Molecular biology of prostate cancer.
Website: http://www.uta.fi/pcrc/

Professor Su-Chun Zhang

Department of Neuroscience, University of Wisconsin, Madison, USA.
Research area/field: Human stem cells and neural regeneration.
Website: http://neuro.wisc.edu/faculty/zhang.asp

Natural Sciences Expert Panel (N Panel)

Professor John M. Fryxell

Department of Integrative Biology, University of Guelph, Guelph, Ontario, Canada.
Research area/field: Behavioral ecology and population ecology.
Website: http://www.uoguelph.ca/ib/people/faculty/fryxell.shtml

Professor Candace Galen

Division of Biological Sciences, University of Missouri, Columbia, USA.
Research area/field: Global change impacts on species interactions.
Website: http://biology.missouri.edu/people/?person=76

Dr. Kathy A. Hibbard

Manager, Atmospheric Sciences and Global Change Division, Pacific Northwest National Laboratory, Fundamental and Computational Sciences Directorate, Richland, USA.
Research area/field: Biogeosciences, carbon cycle, terrestrial ecology and modeling.
Website: http://www.pnnl.gov/science/staff/staff_info.asp?staff_num=7439

Professor Jeffrey A. Hutchings

Department of Biology, Dalhousie University, Halifax, Nova Scotia, Canada.
Research area/field: Ecology, evolution, population dynamics, genetics, and conservation biology of fishes.
Website: http://myweb.dal.ca/jhutch

Physical Sciences and Engineering Expert Panel (PE Panel)

Professor Helwig Hauser

Department of Informatics, University of Bergen, Norway.
Research area/field: Visualization, interactive visual analysis and computer graphics.
Website: http://www.ii.uib.no/vis/team/hauser/

Professor Dale Miller

INRIA Saclay, Île-de-France and the Laboratoire d'Informatique, France.
Research area/field: Computational logic, proof theory, formalized meta-theory, automated reasoning and logic programming.
Website: http://www.lix.polytechnique.fr/~dale/

Professor Maria Elena Valcher

Department of Information Engineering, University of Padova, Padova, Italy.
Research area/field: Switched positive systems, Boolean control networks, multi-agent systems, behavioral approach and multi-dimensional systems.
Website: http://www.dei.unipd.it/~meme/MEV/Main.html

Professor Nikolay Zheludev

Optoelectronics Research Centre, University of Southampton, United Kingdom and Centre for Disruptive Photonic Technologies, NTU, Singapore.
Research area/field: Nanophotonics and metamaterials.
Website: http://www.nanophotonics.org.uk/

APPENDIX 3. GUIDELINES TO CENTRES

Vetenskapsrådet

Datum
2013-10-07

Diarienummer
353-2012-5860

Handläggare
John Tumpane, Janet Eltebo

To the Linnaeus centres for the midterm evaluation of the 2008 Linnaeus grants.

Midterm evaluation of the 2008 Linnaeus grants

Instructions for the Linnaeus centres

This document gives an overview of the evaluation process and describes what the Swedish Research Council and the Swedish Research Council for Environment, Agricultural Sciences and Spatial Planning (Formas) expect of the Linnaeus centres during the evaluation.

Background

The Swedish Research Council and Formas are responsible for organizing the evaluation of the Linnaeus grants. Twenty research centres received the Linnaeus grant in 2008.

The Evaluation

The mid-term evaluation of the Linnaeus centres will focus on scientific quality, added value and the dynamics created. High scientific quality can be evidenced by key findings, breakthroughs in research and/or international impact. In addition, the potential for successful research during the next five years should be considered. Aspects of organization and leadership, such as how key persons in Linnaeus centre are replaced, should be commented on. International and national collaboration and gender aspects should also be evaluated. The latter issues include the composition of research groups, and the integration of gender aspects when applicable in the research. The methods used by the research group in disseminating research results, and the success of the communication strategy used should also be taken into account.

The evaluation will be performed by international expert panels. There are four subject-oriented expert panels, one for each subject area and one general expert panel. The subject-oriented panels consist of five members (including the chair). The general expert panel includes the chairs of the subject-oriented panels plus four international experts with extensive research and/or organization management experience.The task of the generalists is calibration and quality assurance across the subject-oriented panels.

In their reports, the international expert panels may recommend changes in the level of support to individual Linnaeus centres. Normally, 20 % is

Vetenskapsrådet

the maximum possible increase or decrease in funding during the fin
years of the grant period, after the evaluation. If support for a researc
centre is discontinued entirely, a phase-out plan over two years will l
drawn up. It should be noted that the total budget of the Linnaeus
programme cannot be increased. Consequently, any increases in
financial support for some Linnaeus centres must be offset by
corresponding decreases in other Linnaeus centres.

Site visits

Each Linnaeus centre will be visited by a subject-oriented expert pan
during the period 26 January -1 February 2014. Each member of the
subject-oriented panel will be responsible for guiding the pace and
direction of the interview at one of the Linnaeus centres. A
representative of the general expert panel will also participate and wi
contribute to the general expert panel's overview of the Linnaeus
centres. Representatives of the Swedish Research Council and Forma
will participate in site visits, but will not take active part in the
evaluation.
The expert panels will use the self-evaluations provided by the Linna
centres as a starting point for the site visits. Other documentation tha
will serve as input for the panels includes the evaluation report of 20
(Linné 2008+2), the announcement and call for applications (2008
Linnaeus grants) and the applications from the Linnaeus centres
approved for 2008.
The subject-oriented panels will hold sessions with the coordinator o
each Linnaeus centre and researchers. The coordinator and some of t
researchers will give short presentations, followed by questions from
panel. The subject-oriented panels will summarize their impressions
report.
The schedule for the site visits is illustrated in the table below. Pleas
note that although the order of the sessions may be changed, **the actu
content or length of each session must remain unchanged.**

Interviews with vice-chancellors

Interviews with vice-chancellors will be carried out on Saturda
February 2014 by link from Stockholm. The interviews will be
carried out by the general expert panel including the four subje
oriented panel chairs. Members of the other panels may also
participate if they are evaluating a centre at that university. A
number of vice-chancellors have several centres at their univer
and will be given extra time accordingly. The vice-chancellors
self-evaluation will be the basis for this interview. Aspects of t
self-evaluation that are unclear or relevant questions that have
arisen during the site-visits may be discussed. See separate
information sheet for the timetable for these interviews.

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Table I: Schedule for site visits to Linnaeus centres

Time	Activity	Participants	Comments
9.00-10.00	Presentation and interview.	Linnaeus centre coordinator and representatives for the Linnaeus centre.	Introduction 15 min. Coordinator 20 min presentation. 25 min for question from the panel.
10.00-10.45	Presentation of the Linnaeus centre's main research and research themes	Representatives for the Linnaeus centre including Linnaeus centre coordinator.	
10.45-11.00	Coffee break		
11.00-11.45	Interviews after research presentations.	Representatives for the Linnaeus centre including Linnaeus centre coordinator.	
12.00-13.00	LUNCH		
13.00-13.45	Interview with PhD-students.	PhD-students.	
13.45-14.15	Coffee and discussion	Panel members only	
14.15-14.45	Summary discussion	Linnaeus centre coordinator and representatives for the Linnaeus centre.	Any remaining questions will be dealt with here.

Practical arrangements for site visits

The Linnaeus centres are requested to do the following in preparation for the site visits:

1. Invite representatives for the university and the Linnaeus centre for relevant interview sessions and communicate the schedule for the site visit including premises with the Swedish Research Council no later than 10th January 2014.
2. Provide name cards for all participants during the interview sessions.
3. Provide paper copies of presentations.
4. Provide appropriate premises for the interview sessions and the room should be available for panel until 17:00.
5. Provide lunch in a separate location for the expert panel and administrative personnel from the Swedish Research Council and Formas. (Bedömargruppen och den administrativa personalen önskar enskild lunch så att en intern diskussion kan föras).

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6. Arrange coffee and tea for the morning and afternoon sessions.
7. Be prepared to provide a location with internet and phone conference facilities on the day of the evaluation and on the following day (This is in case the panel is not able to make a site-visit due to weather conditions or other unforeseen problems). This location should be available until 17:00.

We would be thankful if you could assign a contact person for the visit. The cost for coffee and lunch will be reimbursed by the Swedish Research Council.

Report

The work of the evaluation panels should result in a report on the Linnae us centres evaluated. Each subject-oriented panel will report on five Linnaeus centres. When the site visits have been completed, each subject-oriented panel will meet and finalize its report. They will summarize their general impressions of the five Linnaeus centres and agree on recommendations of the level of support to be forwarded to the general expert panel by the chairs. The general expert panel will then meet and summarize their overall views of the 20 Linnaeus centres. They will give recommendations and will also comment and may recommend changes in the level of financial support.

Handling and distribution of the report

Each Linnaeus centre will receive a draft of the evaluation report concerning their centre from the subject-oriented panels. The draft will be distributed by the Swedish Research Council to the vice chancellor and the coordinator of the respective Linnaeus centres. The Linnaeus centre should review the draft for possible factual errors and reply within a week.

The final evaluation report will be presented to the Swedish Research Council and Formas. The boards of the councils will then decide on the level of support for the remaining period. When the decision has been taken in June 2014, the report will be released. Immediately prior to its official release, the report will also be distributed to all the Linnaeus centres.

APPENDIX 4. GUIDELINES TO PANELS

Vetenskapsrådet

Datum
2013-10-24

Diarienummer
353-2012-5860

Handläggare
John Tumpane, Janet Eltebo

To members of the evaluation panels conducting the midterm evaluation of the 2008 Linnaeus grants.

Midterm evaluation of the 2008 Linnaeus grants

- Guidelines for panel members

This document gives an overview of the process used to evaluate the Linnaeus grants

The evaluation process will start with a joint meeting of all expert panels in Lund on Sunday 26th January 2014, followed by site visits from 27th - 31st January 2014 to the universities holding Linnaeus grants. The evaluation process will end with subject-oriented panel meetings in Stockholm on 1st February, and the general expert panel meeting in Stockholm on 2-3rd February 2014.

Background

The Linnaeus grants are intended for research centres that have already achieved international excellence in their research fields, or centres that could attain a leading international position if provided with extra support. The most important criterion used in choosing the recipients of the Linnaueus grants was the ability of the centres to perform internationally competitive research.

The Linnaeus grant is a complement to the basic resources of the universities and are intended to influence the strategic prioritizations at the university. The 2008 announcement of Linnaeus grants centres stated that these grants were open to applications from vice-chancellors of Higher Education Institutions (HEIs) in Sweden, but not from research groups or individual researchers. The announcement was issued jointly by the Swedish Research Council and the Swedish Research Council for Environment, Agricultural Sciences and Spatial Planning (Formas). Each HEI had a maximum total amount that they could apply for based on the size of that HEI. This amount could be divided into applications of SEK 5-10 million per year per centre. Approved applications received the amount applied for. The grants were awarded for a period of ten years. The HEI's co-funding to the centres should amount to 50 per cent of the amount granted, but may vary over time.

1

Vetenskapsrådet

Guidelines for panel members conducting the midterm evaluation of Linnaeus centres granted 2008

Linnaeus grants

Scientific quality and potential for scientific renewal were two aspects the HEIs were asked to account for in their applications. The aim was to create attractive research centres performing top quality research with high international visibility. A third aspect mentioned in the announcement was the level of commitment of the HEI. Gender equality was also an aspect to be taken into consideration in application.

The Evaluation

The Swedish Research Council and Formas are responsible for organizing the evaluation of the Linnaeus grants.

The mid-term evaluation of the Linnaeus centres will focus on scientific quality, added value and the dynamics created. High scientific quality can be evidenced by key findings, breakthroughs in research and/or international impact. In addition, the potential for successful research during the next five years and beyond the grant period should be considered. Aspects of organization and leadership, such as how key persons in the Linnaeus centre are replaced, should be commented on. International and national collaboration and gender aspects should also be evaluated. The latter issues include the composition of research groups, and when applicable the integration of gender aspects in the research. The methods used by the research group in disseminating research results, and the success of the communication strategy used should also be taken into account.

The evaluation will be performed by international expert panels. There are four subject-oriented expert panels, one for each subject area and one general expert panel. The subject-oriented panels consist of five members (including the chair). The general expert panel includes the chairs of the subject-oriented panels plus four international experts with extensive research and/or organization management experience.

Normally, 20 % is the maximum possible increase or decrease in funding during the final years of the grant period, after the evaluation. If support for a research centre is discontinued entirely, a phase-out plan over two years will be drawn up. The total budget for the Linnaues programme must, however, remain unchanged.

Prior to the site visits the general expert panel should have discussed and agreed upon evaluation indicators. There will be a telephone meeting to dicuss this and other issues in December 2013. The task of the generalists is calibration and quality assurance across the subject-oriented panels.

Members of the subject-oriented expert panels are required to assess the universities self-evaluation reports, make site visits to universities holding Linnaeus grants, and contribute to authoring the report. Each

expert panel should write about the Linnaeus centres visited. The chairs should also contribute to the report of the general expert panel. The report should include general recommendations and recommendations concerning changes in the level of financial support. The report forms the basis for decisions on further financing by the Swedish Research Council and Formas.

Site visits

Each Linnaeus centre will be visited by a subject-oriented expert panel. Each member of the subject-oriented panel will be responsible for guiding the pace and direction of the interview at one of the Linnaeus centres. A representative of the general expert panel will also participate and will be responsible for contributing to give the general expert panel an overview of the Linnaeus centres. Representatives of the Swedish Research Council and Formas will participate in site visits, but will not take active part in the evaluation.

The expert panels will use the self-evaluations provided by the Linnaeus centres as a starting point for the site visits. Other documentation that will serve as input for the panels includes the evaluation report of 2010 (Linné 2008+2), the announcement and call for applications (2008 Linnaeus grants) and the applications from the 20 Linnaeus centres approved in 2008.

The subject-oriented panels will hold sessions with the coordinator of each Linnaeus centre. The coordinator and some of the researchers will give presentations, followed by questions from the expert panel. The subject-oriented panels will summarize their impressions in a report (see *Reports*, below).

The schedule for the site visits is illustrated in the tables below. Please note that although the order of the sessions may be changed, the actual content or length of each session will remain unchanged.

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Table I: Schedule for site visits to Linnaeus centres

Time	Activity	Participants	Comments
9.00-10.00	Presentation and interview.	Linnaeus centre coordinator and representatives for the Linnaeus centre.	Introduction 15 min. Coordinator 20 min presentation. 25 min for question from the panel.
10.00-10.45	Presentation of the Linnaeus centre's main research and research themes	Representatives for the Linnaeus centre including Linnaeus centre coordinator.	
10.45-11.00	Coffee break		
11.00-11.45	Interviews after research presentations.	Representatives for the Linnaeus centre including Linnaeus centre coordinator.	
12.00-13.00	LUNCH		
13.00-13.45	Interview with PhD-students.	PhD-students.	
13.45-14.15	Coffee and discussion	Panel members only	
14.15-14.45	Summary discussion	Linnaeus centre coordinator and representatives for the Linnaeus centre.	Any remaining questions will be dealt with here.

Interviews with Vice-chancellors

Interviews with vice-chancellors will be carried out on Saturday 1st February by link from Stockholm. The interviews will be carried out by the general expert panel including the four subject-oriented panel chairs. Members of the other panels may also participate if they are evaluating a centre at that particular university. A number of vice-chancellors have several centres at their university and will be given extra time accordingly. The vice-chancellors self-evaluation will be the basis for this interview. Aspects of the self-evaluation that are unclear or relevant questions that have arisen during the site-visits may be discussed.

Report

The work of the evaluation panels will result in a public report on the Linnaeus centres evaluated. Each subject-oriented panel will report on five Linnaeus centres. When the site visits have been completed, each subject-oriented panel will meet and finalize its report. They will summarize their general impressions of the five Linnaeus centres and recommendations of the level of support and recommended changes (if any), to be forwarded to the general expert panel by the chairs.

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The general expert panel will then meet and summarize their overall views of the 20 Linnaeus centres. They will consider the recommendations of the subject-oriented panels and agree on a recommendation on the level of support and they may recommend changes.

Structure and content of the report

The report template below outlines the report and indicates the person or entity with the primary responsibility for each part.

1. **Sammanfattning [the executive summary translated to Swedish]** (Swedish Research Council and Formas) *(1 page)*
2. **Executive Summary** (general expert panel chair) *(1 page)*
3. **Introduction (Swedish Research Council and Formas)**
4. **The general expert panel's overall view of the 20 centres** (2–4 pages) (general expert panel)
5. **The subject-oriented panels' assessments of each centre.** Each Linnaeus research centre assessment should be approximately five pages. (each subject-oriented panel)

   I) ***Short* description of the Linnaeus centre**
   This section should include the name of the Linnaeus centre, university, research area, size (number of researchers and PhD students), awarded amount and total budget.

   II) **Recommendations from the first evaluation**

   III) **Research performed and planned, (Scientific quality)**

   IV) **Collaboration**

   V) **External communication/dissemination**

   VI) **Participating Personnel**

   VII) **Organization and leadership of the Linnaeus centre**

   VIII) **Organization and leadership of the university**

   IX) **Added value**

   X) **Recommendations**

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6. **The general expert panels' conclusions and recommendations on the level of support (maximum 0.5 page per Linnaeus centre)**

   The general expert panel will comment on the level of support and may recommend increases or decreases of up to 20 per cent. However, the *total* budget of the Linnaeus programme may not be increased. Thus, a recommendation to increase a grant to one centre is possible only if there is a recommendation to decrease the budget of some other centre.

Finalization, handling and distribution of the report

A full draft of the evaluation report should be finalized before the general expert panel members leave on Monday 3rd February 2014. The panels are jointly responsible for the content of the final report.

Each Linnaeus centre will receive a draft of the evaluation report concerning their centre from the subject-oriented panels. The draft will be distributed by the Swedish Research Council to the vice-chancellor and the coordinator of the respective Linnaeus centre. The Linnaeus centre should review the draft for possible factual errors and reply within a week.

The final evaluation report will be submitted to the boards of the Swedish Research Council and Formas. The boards will then decide on the level of support for the remaining period. When the decision has been taken in June 2014, the report will be released. Immediately prior to its official release, the report will also be distributed to all the Linnaeus centres.

APPENDIX 5. INSTRUCTIONS TO COORDINATORS/SELF EVALUATION REPORT

Vetenskapsrådet

Datum
2013-04-10

Diarienummer
353-2012-5860

Handläggare
Andreas Augustsson, Lisbeth Söderqvist

To the Coordinators of the Linnaeus centres granted in 2008

Instructions for reports from universities that received a Linnaeus Grant in 2008

According to the terms and conditions for Linnaeus Grants, evaluations will take place on three occasions: after 1.5 to 2 years; after 5 years; and after the conclusion of the grant period. It is now time for the second evaluation of the 2008 Linnaeus Grants.

International experts will conduct the evaluation. The evaluation will focus on scientific results, the added value afforded, the dynamism created, and the potential for successful research during the final phase of the Linnaeus Grant period. The evaluation also concerns aspects relating to gender equality and communication strategies. The university is also asked to report on how the research is expected to advance during the final phase of the period and in subsequent years.

In addition to scientific recommendations the experts may give recommendations related to the organisation and management of the research centre, or changes in the level of support. Normally, 20 per cent is the maximum possible increase or decrease in funding. In the event that support for a research centre is withdrawn entirely, the parties must prepare a two-year phase-out plan. The total budget of the Linnaeus programme cannot be increased. Hence, any possible increases in financial support for some Linnaeus centres must be offset by corresponding decreases in others.

Five panels of international scientific experts will be selected. Panel members will have scientific expertise relevant to the research performed by the Linnaeus centres granted in 2008. The panels will evaluate the self-evaluation reports from the Linnaeus centres and will perform site visits. They will present their findings in a report. In June 2014, the Swedish Research Council and Formas will render their final decision on budget allocation.

The following instructions outline the contents of the self-evaluation report required from each of the Linnaeus centres.

1 (7)

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The report is to be written in English and must not exceed 16 A4 pages, excluding attachments. Use Times New Roman typeface, 12 points. Write the *name of the Linnaeus centre* and *university* at the top of all pages. Page the document. The report should be submitted by e-mail in both PDF and Word format no later than 2013-09-01 to Andreas Augustsson and Lisbeth Söderqvist. Name the file: "*Name of the centre*" and "*University*". Attachments 1-4 should also be enclosed in the appropriate file format as specified below. Name the attachments: *Name of the centre, University* plus *attachment x*.

Please provide the website address of the Linnaeus centre and indicate how often the information on the website is updated.

Questions regarding these instructions can be directed to Lisbeth.Soderqvist@vr.se and Andreas.Augustsson@vr.se.

Attachments

Attachment 1: Curricula Vitae (CV) (maximum 2 pages) and complete lists of publications (since the Linnaeus centre started in 2008) for a maximum of 20 participating researchers active in the centre. File format: PDF.

Attachment 2: Basic publication data from Web of Science (please see enclosed *Publication data instructions*) for each researcher as given in attachment one. File format: txt (one file per researcher). Please send this data in a separate e-mail to john.tumpane@vr.se.

Attachment 3: The completed template regarding staff participating in the Linnaeus centre and the economic report of the Linnaeus centre (the attached Excel template must be used).

Attachment 4: Organisational chart illustrating how the Linnaeus centre is organised (no template) File format: PDF

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Questions to the Coordinator of the Linnaeus centre (questions 1-7) (maximum 16 A4-pages, attachments excluded)

The evaluation panels will have access to the original call for applications, your application, the subsequent decision and conditions for your Linnaeus Grant, your report after 1.5 years, and the report *First Evaluation of the 2008 Linnaeus Grants (Vetenskapsrådet 2010)*.

1. Recommendations from the first evaluation

Please comment on how the recommendations (if any) from the evaluation panel conducting the first evaluation have been taken into consideration.

2. Research performed and planned

a) Describe the research being performed and its most significant results since the start of the Linnaeus Grant, including development of new methods. Describe briefly the development and standing of the research compared to research performed internationally.

b) Describe how the results from the Linnaeus centre have been disseminated, and describe the impact these results have had in the research community.

c) Describe the added value of the Linnaeus Grant.

d) Describe the collaboration between the researchers active in the Linnaeus centre.

e) Describe briefly the research planned for the remaining period. What changes have been made compared to the original plan (if any)?

f) What is your prognosis regarding the standing of the research from the Linnaeus centre 10 years from now?

g) In *Attachment 1* enclose Curricula Vitae (CV) (maximum 2 pages) and complete lists of publications (since the Linnaeus centre started in 2008) for a maximum of 20 participating researchers active in the centre. Mark with an asterisk (*) the publications that can be attributed to new collaboration resulting from the Linnaeus Grant, and mark publications

that are results of research performed at the Linnaeus centre, using two asterisks (**).

h) Enclose basic data from Web of Science (follow the instruction).

3. Collaboration

Can any *new* collaborative initiatives be attributed *wholly or partly* to research funded by the Linnaeus Grant? Please list only new collaborations involving the Linnaeus centre:

a) between the Linnaeus centre and other parts of your university

b) national collaboration with researchers or research groups at other universities in Sweden

c) international collaboration

d) collaboration with industry, the public sector, policy makers, and/or other segments of society

Include, for example, both bilateral cooperation and agreements to participate in networks, consortiums, multicentre studies, and other initiatives. For each type of collaboration describe, to the extent possible, the actual or potential synergy effects

4. External communication/dissemination

Describe your communication strategy. What efforts have been made to communicate/disseminate information about the activities and results of research funded by the Linnaeus Grant? Please note that this question does **not** seek to capture details of scientific presentations made to your peers in academia.

Describe how the results have been, and will be, communicated/disseminated to the public, policy makers, research agencies, et cetera. Please list the method of communication for example textbooks, popular science presentations, or other media.

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5. Participating personnel

a) Describe strategies for recruiting researchers and research groups. Describe any strategy you might have for appointing new groups or dissolving groups, if needed.

b) Describe and comment on strategies for recruiting researchers and research groups from a gender perspective. Have the strategies been successful? Describe any planned or needed actions.

c) Please present the staff numbers in *Attachment 3*.

6. Organisation and leadership of the Linnaeus centre

a) Describe any changes in the organisation, leadership, and management of the Linnaeus centre since the previous evaluation (after 1.5 years). Comment on the effect(s) of these changes. Describe any foreseen, planned, or needed changes. In *Attachment 4* please provide an organisational chart to illustrate how the Linnaeus centre is organised.

b) Describe and comment on the current leadership structure in the Linnaeus centre from a gender perspective. Describe any planned or needed actions.

c) What is your strategy for maintaining a strong research centre after the grant period?

d) Describe and comment how internal communication is organized.

7. Financial aspects

a) Please present a financial report in *Attachment 3*.

b) Please present a financial outline covering the remaining period (1 July 2013 through 30 June 2018) in *Attachment 3*.

Attachment 1 – Curricula Vitae and publication lists

Curricula Vitae (CV) (maximum 2 pages) and complete lists of publications (since the Linnaeus centre started in 2008) for a maximum of 20 participating researchers active in the centre.

Each **CV** must not exceed two A4 pages. The following headings should be used, where applicable:

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- Doctoral degree (research field, year, and university)
- Qualification as associate professor/docent (research field, year)
- Current position, period of appointment, share of time spent in research
- Previous positions and periods of appointment (specify type of position).
- Interruptions in research. Indicate if active research time has been interrupted to the extent that it affected the opportunity to acquire qualifications, for example by parental leave, illness, clinical internship/residency, governmental assignments, or other similar reasons. Specify the reason(s) for and the dates and total time of the interruption(s)
- Distinctions
- PhD students awarded doctorates for whom the researcher has been the main supervisor
- Postdoctoral researchers who are or have been engaged in collaboration with the researcher in the research group
- National and international assignments of importance.

Publication list

Attach a list of publications to the CV of each researcher. List only the publications since the start of the Linnaeus centre (2008).

Mark with an asterisk (*) the publications that can be attributed to new collaboration resulting from the Linnaeus Grant, and mark publications that are results of research performed at the Linnaeus centre, using two asterisks (**).

Categorise the publications under the headings a – f, in the following order:

a) Peer-reviewed articles
b) Peer-reviewed conference contributions (the results of which are not presented in other publications)
c) Review articles, book chapters, books
d) Patents
e) Open access computer programs or databases developed by the researcher
f) Popular science articles/presentations

Note! Include only articles (or equivalent) that have been published or accepted for publication.

Vetenskapsrådet

Attachment 2: Basic publication data from Web of Science (please see enclosed Publication data instructions for each researcher as given in attachment one. File format: txt (one file per researcher). Please send this data in a separate e-mail to john.tumpane@vr.se.

Attachment 3: The completed template regarding staff participating in the Linnaeus centre and the economic report of the Linnaeus centre (the attached Excel template must be used).

Attachment 4: Organisational chart illustrating how the Linnaeus centre is organised (no template) File format: PDF

APPENDIX 6. INSTRUCTIONS TO VICE-CHANCELLORS/SELF EVALUATION REPORT

Vetenskapsrådet

Datum
2013-02-28

Diarienummer
353-2012-5860

Handläggare
Andreas Augustsson, Lisbeth Söderqvist

To Vice-Chancellors of the universities that received a Linnaeus Grant in 2008

Instructions for reports from universities that received a Linnaeus Grant in 2008

According to the terms and conditions for Linnaeus Grants, evaluations will take place on three occasions: after 1.5 to 2 years; after 5 years; and after the conclusion of the grant period. It is now time for the second evaluation of the 2008 Linnaeus Grants.

International experts will conduct the evaluation. The evaluation will focus on scientific results, the added value afforded, the dynamism created, and the potential for successful research during the final phase of the Linnaeus Grant period. The evaluation also concerns aspects relating to gender equality and communication strategies. The university is also asked to report on how the research is expected to advance during the final phase of the period and in subsequent years.

In addition to scientific recommendations the experts may give recommendations related to the organisation and management of the research centre, or changes in the level of support. Normally, 20 per cent is the maximum possible increase or decrease in funding. In the event that support for a research centre is withdrawn entirely, the parties must prepare a two-year phase-out plan. The total budget of the Linnaeus programme cannot be increased. Hence, any possible increases in financial support for some Linnaeus centres must be offset by corresponding decreases in others.

Five panels of international scientific experts will be selected. Panel members will have scientific expertise relevant to the research performed by the Linnaeus centres granted in 2008. The panels will evaluate the self-evaluation reports from the Linnaeus centres and will perform site visits. They will present their findings in a report. In June 2014, the Swedish Research Council and Formas will render their final decision on budget allocation.

The following instructions outline the contents of the self-evaluation report required from each of the Linnaeus centres.

The report is to be written in English and must not exceed 4 A4 pages, excluding appendices. Use Times New Roman typeface, 12 points. Write the *name of the Linnaeus centre* and *university* at the top of all pages. Page the document. The report should be submitted by e-mail in both PDF and Word format no later than first of September 2013 to Andreas Augustsson and Lisbeth Söderqvist. Name the file: "*Name of the centre*", "*University*" and "*vc*".

Questions regarding these instructions can be directed to Lisbeth.Soderqvist@vr.se and Andreas.Augustsson@vr.se.

1 (2)

Vetenskapsrådet

Instructions for the report

Questions to the Vice-Chancellor of the University (questions 1 – 7) (maximum four A4-pages)

The evaluation panels will have access to the original call for applications, your application, the subsequent decision and conditions regarding your Linnaeus Grant, your report after 1.5 years, and the report *First Evaluation of the 2008 Linnaeus Grants* (Vetenskapsrådet 2010).

1) How does the university governs the Linnaeus centre? Describe and comment.

2) How important is the Linnaeus centre for national and international collaboration involving the university?

3) What university policies address the gender profile of the group involved in the Linnaeus centre – particularly policies related to leadership? How and when have these policies been implemented?

4) Has the Linnaeus Grant influenced the strategic priorities of the university? If so, in what way?

5) Has the Linnaeus Grant had any structural impact on the university-wide level? If so, in what way?

6) What is your strategy for maintaining a strong research centre after the grant period?

7) Other relevant information

Schedule midterm evalutation Linnaeus grants (2008+5) panel weeks.

PE = Phyisical Sciences and Engineering Expert Panel, HSE = Humanities, Social Sciences and Educational Sciences Expert Panel, M = Medicine Expert Panel, N = Natural Sciences Expert Panel, GE = General Expert Panel.

Generalist 1 Stig Slördahl; Generalist 2 Neil Geddes; Generalist 3 Stephanie Shipp

Sth = Stockholm, Ua = Uppsala, Li = Linköping, Um = Umeå, Gbg = Göteborg, Lu = Lund

2014

Week 4																Saturday 25 Jan		Sunday 26 jan	City
																		introduction joint panel meeting in Lund	Lu
Week 5	Monday 27 Jan	City	Generalist	Tuesday 28 Jan	City	Generalist	Wednesday 29 Jan	City	Generalist	Thursday 30 Jan	City	Generalist	Friday 31 Jan	City	Generalist	Saturday 1 feb	City	Sunday 2 feb	City
	PE *LCCC*	Lu	1	PE *CADICS*	Li	3	PE *Advanced optics*	Sth, KTH	2	PE *CPC*	Sth, SU	1	PE *UPMARC*	Ua		**PE final meeting**	Sth	**GE meeting**	Sth
	M *Bagadilico*	Lu		M *CrisP*	Sth, KI	2	M *THRM*	Sth, KI	3	M *CERIC*	Sth, KI	2	M *UCMR*	Um	1	**M final meeting**	Sth		
	HSE *CCL*	Lu	2	HSE *LUCID*	Lu		HSE *HEAD*	Li	1	HSE *SPaDE*	SU, Sth	3	HSE *IMPACT*	Ua	3	**HSE final meeting**	Sth		
	N *LUCCI*	Lu	3	N *CAnMove*	Lu	1	N *CeMEB*	Gbg, GU		N *SUPRA*	Gbg, CTH		N *UCEG*	Ua	2	**N final meeting**	Sth		
Week 6	Monday 3 feb	City		Tuesday 4 feb															
	GE meeting	Sth																	

APPENDIX 8. SCHEDULE FOR INTERVIEWS WITH VICE-CHANCELLORS

Vetenskapsrådet

Datum
2013-09-23

Diarienummer
353-2012-5860

Handläggare
Lisbeth Söderqvist

Halvtidsutvärdering av Linnébidrag beviljade 2008: Preliminärt schema för intervju med rektor den första februari 2014.

Intervjun genomförs av den så kallade generalistpanelen vilken består av åtta granskare varav fyra dessutom är ordförande för en expertpanel. Granskare från expertpanelerna kan också komma att delta.

Rektors självvärdering utgör underlag för intervjun. Exakt vilka frågor som kommer att ställas är inte möjligt att ange men sannolikt kan frågor om sådant som panelerna uppfattar som oklart i rektors svar, eller i miljöernas dito, komma att tas upp. Ju fler miljöer rektor har, desto längre tid för intervju. Rektor avgör själv om eventuella bisittare.

Vi använder i första hand Adobe Connect. Fungerar inte detta kan intervjun göras via telefon. Skicka uppgifter (telefonnummer och mailadress) så att vi kan nå den som hanterar de tekniska arrangemangen den aktuella dagen.

9.00-9.45. (6 miljöer). Lunds universitet

10.00-10.30. (3 miljöer) Uppsala universitet

10.45-11.10. (2 miljöer) Stockholms universitet

11.20-11.45. (2 miljöer) Linköpings universitet

12.00-12.20. (1 miljö) Kungl. tekniska högskolan

12.30-13.00 (3 miljöer) Karolinska institutet

13.50-14.10. (1 miljö) Umeå universitet

14.20-14.40. (1 miljö) Chalmers tekniska högskola

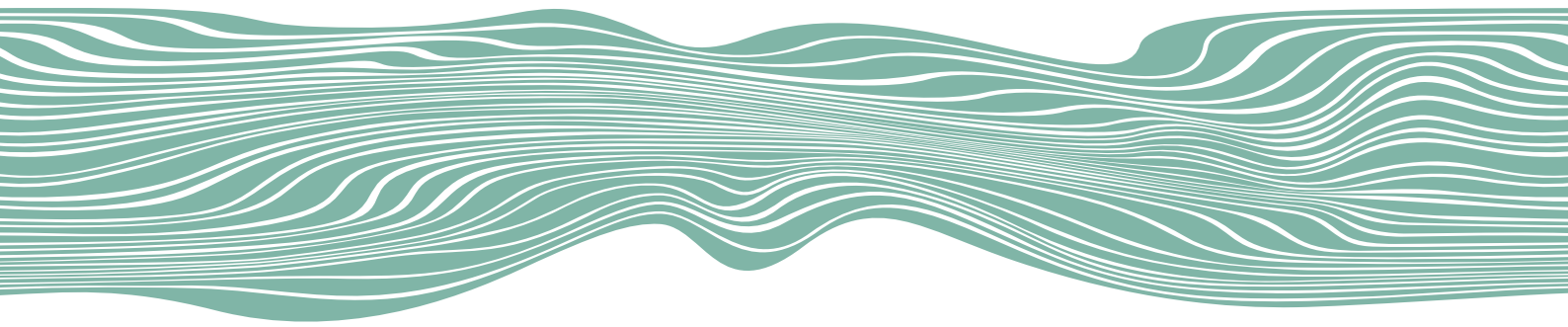
14.50-15.10. (1 miljö) Göteborgs universitet

Lisbeth Söderqvist
Projektledare/Analytiker
Vetenskapsrådet

1 (1)

With the Linnaeus grants the Swedish Research Council and the Swedish Research Council Formas, provide support for 40 research centres in different research areas. The aim of the Linnaeus grants is to enhance support for research of the highest quality that can compete internationally. The amount of the Linnaeus grants is 5–10 MSEK annually for a maximum of ten years.

This report presents the result of the mid-term evaluation for those Linnaeus centres funded in 2008. The main focus is scientific quality, potential for scientific renewal and synergic effects of the support, the added value of the grant, the commitment of the university, and gender equality in the centre concerned.



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