



Assessment

Graduate School of Natural Sciences

University of Aarhus

September 2021



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i. The panel

The panel was appointed in the Spring of 2021 and consisted of:

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ii. Site Visit

The panel visited the Graduate School of Natural Sciences (GSNS) at Aarhus University on 16-17 September 2021. To prepare for the site visit, the panel studied the self-evaluation report produced by GSNS in June 2021. The panel found the programme of the site visit well organised. The panel met initially with the Head of School David Lundbek Egholm, Head of Division Damian Goldberg and Head of the Administrative Department Maria Fauerby Iversen. The panel met later with the PhD Committee, the Heads of Programmes, representatives of the Admissions Committee, representative PhD students and supervisors, and with representatives of the Graduate School administrative staff.

Rikke J. Ljungmann and So-Young Ahn assisted the panel.

iii. Summary of Report

The panel finds that the Graduate School of Natural Sciences, GSNS, is a well-functioning school. PhD students receive research training at a high international level and complete their studies in a timely fashion with qualifications making them competitive on the national and the international job markets.

The panel finds that only a few topics needed particular focused attention. These are discussed in the following recommendations:

RECOMMENDATION

In order to develop greater legitimacy, enhancing wide representation is essential. We therefore suggest considering the following actions:

- Formalise appointment of membership of GSNS-committees and on limited terms.
- Develop an action plan for committees, including the local committees, to ensure a more diverse composition (gender, nationality, career stages).
- Develop an action plan for ensuring PhD student representation in more committees.
- Develop an action plan for the PhD Committee to have more responsibility.

In order to safeguard the best research talents and develop on quality and diverse recruitment, we suggest the following actions:

- Use the PhD Committee to inform on best practice for the school.
- Develop an action plan for improving the gender balance among applicants and enrolled students.
- Increase the number of screening grants for international students.
- Develop a policy for focused international announcements of PhD calls.
- Develop an action plan for enrolling students from other Danish universities.
- Develop a plan for revision of the study structure, to guarantee that the A-exam for 3+5/4+4 reflects a regular MSc exam, which will provide a safety net for students who do not complete their PhD study.

In order to enhance and widen the curriculum, we suggest the following actions:

- Develop a plan to secure the awareness of available courses at AU, in Denmark as well as internationally (including summer schools).
- Develop a plan to secure awareness that conference attendance may be accepted as course activity

In order to raise awareness about balancing time between mandatory work and research, we suggest the following actions:

- Consider the required frequency of assessment reports and seek to ensure that students and supervisors are motivated to use the report as a management tool for the PhD project.
- Develop a plan to ensure that teaching load becomes more even among students throughout the faculty.
- Develop a faculty policy on a realistic estimate of the required amount of preparation hours for student teaching and include this in the award of teaching hours.
- Acknowledge the supervision of BSc and MSc students as part of teaching duty.
- Develop a plan for PhD students and supervisors being represented in the development of the forthcoming version of PhD-Planner.

0 Introduction

The panel found the self-evaluation report and supporting materials of very good quality giving a good overview of the status of the PhD school. The report includes many relevant details and also introduces facts about the Danish PhD order. The meetings with different representatives of the graduate school clarified and complemented issues in the report, and revealed some aspects connected to what the committee perceived as a lack of transparency between various bodies in the school.

The Graduate School of Natural Sciences, GSNS, was formed formally in June 2020. The present organisation of the graduate school is, however, to large extent identical to the organisational structure prior to 2011. In the period 2011 to 2020, the graduate school combined natural and technical sciences, reflecting the mergers of Aarhus University with a number of Danish research institutions. The present evaluation reflects to some extent both the combined graduate school of natural sciences and the graduate school of technical sciences existing before 2020, and the new graduate school of natural sciences.

1 Organisation of the Graduate School

The governance and organisation of GSNS is relatively well described in the self-evaluation report. Nonetheless, it is difficult to understand the relation between the various committees and their impact. The organisation diagram in Fig. 1 is useful but incomplete. The panel would like to see a figure/table showing the various committees of the school (including the PhD committee), their structure, tasks, and interdependence.

The graduate school mirrors the structure of the faculty, thereby securing scientific professionalism. Each department (including the centre with department status) constitutes a *PhD programme*, with a *Head of Programme* and a *Departmental Programme Committee* composed of members of the permanent academic staff and PhD students. The eight Heads of Programme constitute the *Heads of Programme Committee*. GSNS has in addition an *Admissions Committee* and the mandatory *PhD Committee* consisting of three permanent academic staff members and three PhD students.

The impact of the various committees and the relationship between the committees is not transparent. The appointment of members of some committees is not formalised, and there are no given terms of reference for committee membership. A substantial number of committee members have been serving for a particularly long period of time. Moreover, the panel noted a surprising male dominance; this was particularly noticeable for the Admissions Committee. The members of this committee are respected among the staff members; however, it was unclear to the panel (and to the committee members themselves) when and how they had been appointed. This committee of eight persons includes only one female representative. The panel recommends a formalised appointment of membership of committees, with limited terms and with general diversity. A rotation scheme may be useful for bringing in new perspectives and for involving more staff members in the organisation of the school. Such rotation also provides good career progression opportunities for staff.

The PhD Committee is the only elected body of the GSNS. Officially, the PhD Committee has the task of approving and discussing matters related to the PhD studies and to advise the Head of the Graduate School on these matters. The committee expressed, however, that in practice it has very little influence. Most items to be approved by the committee were already decided upon by other bodies of GSNS. Therefore, the committee views it as its main task to discuss matters brought up by

PhD students or supervisors and to advise the school on them. It is, however, often unclear whether and how this advice is followed up. The panel recommends that the PhD Committee is given true responsibility, and that PhD students are represented in other faculty-level committees as well, to secure important input and real influence.

In the meeting with representative PhD students it turned out that few students know about the existence and tasks of the PhD Committee (and other bodies of GSNS). The PhD students feel stronger ties to their local PhD community at the programme level, and they were much better informed about local rules and decision processes than about processes at the overarching GSNS level. The panel appreciates that the school intends to organise an annual PhD day, in order to facilitate the exchange of information and to create a GSNS-level PhD community. In a school as diverse as GSNS it makes a lot of sense to give the programmes some autonomy in the design of their local organisation and their mode of operation. The panel felt, however, that sometimes the local rules have drifted apart to such an extent that fairness at the GSNS level is at stake (e.g. in assigning teaching credits to the supervision of MSc and BSc students). The panel recommends that the local rules of each programme are made transparent to the other programmes and that GSNS stimulates the exchange of “best practices” regularly.

It is the panel’s impression that the online PhD administrative system PhD Planner is an effective tool for the administrative personnel. It provides a good overview of the state of each individual PhD project and easily accessible statistical material for the school as a whole. Students and supervisors expressed less enthusiasm with the system: the students complained about the intricate interface, and some supervisors stated that they enter only a minimal amount of information in the PhD Planner. The panel recommends that PhD students and supervisors are involved in the development of the forthcoming version of PhD Planner and are then strongly encouraged to use it properly.

2 Admission / Enrolment

GSNS has four application calls per year. It is appreciated that calls are announced internationally although the ratio of international to national students is relatively low. The panel notes that the majority of PhD students is from the Aarhus area, and the international group is dominated by few nationalities. It is recommended that GSNS makes an action plan for attracting students from other Danish universities.

Each programme has a local programme committee composed of academic staff members and PhD students. The PhD students are, however, not involved in the important decisions on PhD applications.

The procedure for the admission of PhD students is not very transparent, neither to the panel nor to staff members. The self-assessment report does not reflect the importance of the Admissions Committee, which makes decisions on admission based on rather limited information on the candidates and it was articulated that this was mainly based on grades. The panel had the impression that there were discrepancies in the Admissions Committee on matters such as weighing grades against other skill sets conveyed in motivation letters. This was also reflected in the interview with staff members who expressed that motivation letters should be used in the admission process. The panel recommends that in all cases where an applicant has already been evaluated and interviewed, the supervisor’s motivated evaluation is included in the application file and used by the Admissions Committee in its decision.

The panel was pleased to note the availability of screening grants for international students. These grants are appreciated by the staff members (and undoubtedly by the students), and secure GSNS the best students. There seems to be demand for even more screening grants.

GSNS collaborates in various double or joint degree programmes. Such options are appreciated by supervisors and students, and they secure flexibility for international funding. However, participation in such programmes creates a substantial administrative burden, partly because double or joint degree PhD students cannot easily be fit into the relatively rigid Danish system of PhD education. GSNS should therefore consider if the gain associated with such grants outweighs their costs, especially in case of joint degree arrangements.

The uptake of students at the eight GSNS PhD programmes has been relative stable during the assessment period, except 2015, which generally had significant larger uptake. The panel notes an apparent decrease in uptakes on the mathematics program, but this is in turn replaced by larger uptake in computer sciences. The self-evaluation report does not indicate that this reflects a planned strategy, and it does not mention any actions taken to change the situation.

The panel appreciates the flexible uptake of PhD students based on different entrance levels. The PhD study may start after completion of the 5-year BSc/MSc study (5+3 variant), or it may start after completion of the BSc degree, with the aim to make an integrated MSc/PhD project. A limited number of talented students are allowed to enrol directly after the 3-year BSc study (3+5 variant), while other students start their PhD study after their first MSc year (4+4 variant). In the latter two variants, the “qualifying examination” that has to be passed half way the PhD study constitutes the MSc graduation. During the 2015-2020 period, there has been a tendency that more students start after MSc graduation (increase from 50% to 60% in the period).

Supervisors expressed that generally it is difficult to terminate a PhD study if a student does not fulfil expectations. Even more importantly: it is difficult to terminate a 3+5/4+4 trajectory after the qualifying examination, since this exam, apparently, is not equivalent to a regular MSc exam. The panel recommends that GSNS establishes rules for terminating those 3+5/4+4 trajectories where students do not fulfil expectations after the qualifying examination; in these cases, GSNS should ensure that the qualifying examination reflects a regular MSc exam, to provide those students who do not complete their PhD study with a recognized Degree.

The panel is particularly concerned about the trend in uptake of female students. The enrolment has been less than 40% women throughout the period with a worrying downward trend in recent years. The GSNS should develop an action plan to recruit more women both among qualified applicants and among enrolled students.

3 Progress Management and Quality Assurance

The panel is impressed by the quality of the students, despite the limited time for research and high demand for additional activities during the PhD study period. The GSNS quality assurance seems effective throughout the PhD study, as proven by the average study length and the fact that only few students fail to complete their PhD study. The student satisfaction survey gives the impression of a

very well-run graduate school, where the students are highly integrated into the scientific environment. However, a significant fraction of the students expresses work related stress.

The panel appreciates the mandatory introduction day, giving students information on the importance of mutual alignment of expectations. The panel appreciates the planned annual PhD day at the faculty level. The faculty and the departments may also consider facilitating networks among students, give more realistic and transparent plans for teaching demand and research, potentially alleviating stress among the students.

The panel further acknowledges the GSNS policy on the mandatory change of environment in terms of extended international visits, which is an important part of becoming an independent researcher. The panel appreciates the GSNS-approach for looking after PhD students during the Covid-19 pandemic time, concerning progress in their research programmes and access to laboratories, but also concerning social aspects of the related limits and the possibility for exemptions (e.g. change of environment) and extension of study time.

The half-year assessments are valuable for reflecting regularly on the state of the PhD study. However, students complained about the administrative burden and the high frequency of reporting in light of the tight schedule for Danish PhD education. Some students also complained about a lack of feedback in the planner from their supervisors. Not all supervisors seemed aware of the possibility to use the half-year report positively to get the PhD student back on track. The panel noticed that only one student received a negative half-year evaluation within the assessment period. It is recommended that GSNS consider the required frequency of assessment reports and seeks to ensure that the students and their supervisors are motivated to use the report as a management tool for their project.

GSNS has an appreciated policy on the required course activities. The PhD student's course portfolio must be dominated by scientific courses and have a maximum of 10 ECTS for "transferable skills" courses. Credits are also given for scientifically relevant activities like participation in summer schools, conferences etc. Nonetheless, it appears that the students are not satisfied with the number and content of PhD courses offered. The panel recommends increasing awareness of available courses at AU (also outside the faculty), in Denmark as well as internationally (e.g. summer schools), both among students and among supervisors, and awareness that attending conferences and workshops may be accepted as course activity.

Annual Staff Development Dialogues (SDS – MUS in Danish) are offered to all employed PhD students (and many non-employed students). The MUS is organised differently in different departments. Many students have their MUS with their supervisor, others with the Head of Programme, and again others with a "PhD Student Support Group". It is recommended that the departments participating in GSNS exchange their best practices on organising the MUS. To deal with potential conflicts with a supervisor, all students should be offered the option of having their MUS with a second staff member or a "support group".

All PhD students have to spend a substantial amount of time on teaching. The panel appreciates that, in preparation for this, they have to follow a mandatory course on scientific teaching. The past course did not, however, satisfy the students' needs and wishes. The panel hopes that this situation will change with the advent of a new version of the course that is better tailored to the students' needs. During the interview, several PhD students said that they had to teach before having the opportunity of following the course. The panel recommends that the course is offered several times per year, allowing PhD students to attend the course early in their PhD period. Several PhD students pointed

out a lack of feedback on their teaching activities (in particular in large practicals, where the teaching assistants are not individually mentioned on the student evaluations). The panel recommends ensuring that all PhD students receive individual feedback on their teaching.

Most students expressed views that the teaching load is very high and that, in particular, the time needed for preparation is underestimated. Moreover, there seem to be considerable differences between departments, both regarding the overall teaching load and as to whether the supervision of BSc and MSc students is counted as teaching. It is recommended that the teaching load of PhD students is equalized across the faculty. It is further recommended to develop a faculty policy on a more realistic estimate of the required preparation hours, and to acknowledge the supervision of BSc and MSc students as part of the teaching duty throughout the faculty.

4 International Students and Internationalization

GSNS has a variety of actions with goal to internationalize the graduate school. This includes international students, international exchange of the GSNS students and visiting grants for external students. It is appreciated that GSNS is involved in the project on Excellence in European Doctoral Training, which includes a joint PhD degree with Edinburgh University. Some students find it difficult to fulfil the required change of research environment, some due to their family situations. The self-evaluation report does not present plans to accommodate this.

GSNS is good at attracting applications from international students. The committee notes that the ratio between admissions and applications is far better for Danish applicants than international applicants, independent of whether they are from Europe, Asia or America. There seems to be a big discrepancy between the number of international applicants and the number of qualified applicants. The GSNS may consider whether the open and widespread announcements of PhD calls is still the right policy, or whether the announcements should be more focused. In the assessment period the international students constitute about one third of the enrolments. The committee accepts this as satisfactory, but notes that this is somewhat low when compared to many European universities.

The enrolment of international students on the 3+5/4+4 system is low. This may be expected, since international BSc-students have limited CVs that are difficult to access. On the other hand, many students (UK, USA, Asia) graduate with a four-year BSc, and would nicely fit into the 4+4 program at GSNS.

5 Thesis

GSNS has a very high percentage of positively evaluated theses. Very few students failed during the assessment period and those that did were offered the opportunity to re-submit their theses. The panel further appreciated that all GSNS theses are scanned by iThenticate to accommodate the internationally recognized problem of plagiarism.

The panel appreciated that the PhD-assessment committees have high international representation. This guarantee that the PhD studies and thesis are on an international competitive level.



6 Outreach

It is appreciated that the GSNS programmes generally has very good contact and collaboration with industry. It is further acknowledged that GSNS follows its alumni closely for some years after graduation, to learn about their career pathway after their PhD. GSNS students have a high employment rate.

APPENDIX

International evaluation of the Graduate School of Natural Sciences, Aarhus University
Programme for site visit
Thursday, 16 September 2021 to Friday, 17 September 2021

Accommodation during the stay:

Hotel Scandic Aarhus City, Østergade 10, 8000 Aarhus C.

Location for meetings:

Ny Munkegade 120, 8000 Aarhus C, building 1520, rooms 732 and 737. Furthermore, room 731 will be available just for the panel during the entire visit.

Contact persons:

So-Young Ahn, e-mail: bsa@au.dk, mob. +45 2057 0955

Rikke J. Ljungmann, e-mail: rjl@au.dk, mob. +45 6020 2605

Thursday, 16 September 2021		
Time and place	Event	Participants
		<p>Panel:</p> <ul style="list-style-type: none"> • Professor Kell Mortensen (chair) • Professor Gunn Mangerud • Professor F. J. (Franjo) Weissing • Professor Helen Fielding (participating remotely) <p>So-Young Ahn and Rikke J. Ljungmann will assist the panel all through the meetings (incl. note taking)</p>
8.30	Taxi from hotel to university. Destination address: Ny Munkegade 118, 8000 Aarhus C. (Department of Mathematics)	
9.00-10.00 1520-732	Short introduction and discussion with the Graduate School Management	<ul style="list-style-type: none"> • Panel • David Lundbek Egholm, Head of school • Damian Goldberg, Head of division • Maria Fauerby Iversen, Head of administrative department
10.00-10.30	Break	

10.30-12.00 1520-732	Meeting with PhD committee	<ul style="list-style-type: none"> • Panel • Ernst-Martin Füchtbauer, Head of PhD committee • Henrik Stapelfeldt, Professor • Anders Møller, Professor • Louise Marie Dalskov Kjerulff, Vice-Chair of PhD committee • Ragnhild Ørbæk Laursen, PhD student • Mads Blichfeldt Amdisen, PhD student • Irfansha Shaik, PhD student
12.00-13.00 Canteen: Kemisk Kantine	Lunch	<ul style="list-style-type: none"> • Kell Mortensen, Head of panel • Gunn Mangerud, Panel member • F. J. (Franjo) Wiessing, Panel member • David Lundbek Egholm, Head of school • Ernst-Martin Füchtbauer, Chair of PhD committee • Louise Marie Dalskov Kjerulff, Vice-Chair of PhD committee • So-Young Ahn • Rikke J. Ljungmann
13.00-13.30	Tour on campus	<ul style="list-style-type: none"> • Panel • David Lundbek Egholm, Head of school
13.30-15.00 1520-732	Meeting with Heads of programme	<ul style="list-style-type: none"> • Panel • Ernst-Martin Füchtbauer, Molecular Biology and Genetics • Henrik Stapelfeldt, Chemistry • Anders Møller, Computer Science • Kurt Thomas Jensen, Biology • Christian Tegner, Geoscience • Andreas Basse-O'Connor, Mathematics • Duncan Sutherland, Nanoscience • Karsten Riisager, Physics and Astronomy
15.00-15.30	Break	
15.30-16.30 1520-732	Meeting with representatives of the Admissions committee	<ul style="list-style-type: none"> • Panel • Brigitte Maria Stadler, Nanoscience • Thorsten Nagel, Geoscience • Jesper Buus Nielsen, Computer Science

		<ul style="list-style-type: none"> • Gregers Rom Andersen, Molecular Biology and Genetics
16.30-17.30 1520-732	Panel meeting - preliminary drafts for report	<ul style="list-style-type: none"> • Panel
17.30	Transport to hotel	
18.40-19.00	Pick up at hotel (walk to restaurant)	
19.00-21.00	Dinner - at Restaurant Pihlkjær Web: https://pihlkjaer-restaurant.dk/ (only in Danish)	<ul style="list-style-type: none"> • Kell Mortensen, Head of panel • Gunn Mangerud, Panel member • F. J. (Franjo) Wiessing, Panel member • David Lundbek Egholm, Head of school • Kristian Pedersen, Dean • Ernst-Martin Füchtbauer, Chair of PhD committee • Louise Marie Dalskov Kjerulff, Vice-Chair of PhD committee • Rikke J. Ljungmann
Friday, 17 September 2021		
9.00-10.30 1520-737	Meeting with PhD students	<ul style="list-style-type: none"> • Panel • Julie Lund Petersen, Molecular Biology and Genetics • Johanna Luige, Molecular Biology and Genetics • Mette Heidemann Rasmussen, Chemistry • Gustav Julius Wørner, Chemistry • Fatemeh Zardbani, Computer Science • Clemence Krystel Marie Rose, Biology • Michael Bjerre Pedersen, Biology • Torsten Hundebøl Hansen, Geoscience • Hafsa Mahmood, Geoscience • Jonathan Ditlevsen, Mathematics • Toni Vitasovic, Nanoscience • Yaqing Chen, Nanoscience • Simon Vendelbo Bylling Jensen, Physics and Astronomy • Stig Elkjær Rasmussen, Physics and Astronomy



10.30-10.45	Break	
10.45-12.15 1520-737	Meeting with supervisors	<ul style="list-style-type: none">• Panel• Ditlev Egeskov Brodersen, Molecular Biology and Genetics• Sadegh Nabavi, Molecular Biology and Genetics• Victoria Birkedal, Chemistry and Nanoscience• Tobias Weidner, Chemistry• Eve Hoggan, Computer Science• Andreas Schramm, Biology• Vivi K. Pedersen, Geoscience• Claudia Strauch, Mathematics• Søren Fournais, Mathematics• Troels Skrydstrup, Nanoscience• Peter Balling, Physics and Astronomy• Jill Miwa, Physics and Astronomy
12.15-12.30	Break	
12.30-13.30 1520-737	Meeting with representatives of the Graduate School administrative staff	<ul style="list-style-type: none">• Panel• Mie Meulengracht Christensen, PhD Partner• Karen Konradi, PhD Partner• Mette Nielsen, PhD Partner
13.30-14.15 1520-737	Lunch	<ul style="list-style-type: none">• Panel
14.15-17.30 1520-737	Report writing - breaks according to needs	<ul style="list-style-type: none">• Panel
17.30-18.00 1520-737	Debriefing with Head of school	<ul style="list-style-type: none">• Panel• David Lundbek Egholm, Head of school
18.00	Departure	