THE NIELS BOHR PROFESSORSHIP
PROFESSOR LARS HESSELHOLT

DEPARTMENT OF MATHEMATICAL SCIENCES
UNIVERSITY OF COPENHAGEN

Final Report

The Niels Bohr Professorship (NBP)
Professor Lars Hesselholt

Department of Mathematical Sciences
University of Copenhagen
April 1, 2013 – March 31, 2018

HIGHLIGHTS 2017-2018

Much of the final year of the Niels Bohr Professorship (NBP) was focused on the continuance of its activities beyond the funding period. In coordination with the Department of Mathematical Sciences, one postdoc and two Ph.D. students were hired in addition to what was anticipated in the NBP agreement.

They are funded by different sources from 2018. Mathematically, the interplay between higher algebra and arithmetic, which was a focal point of the NBP, has risen much to prominence recently. The NBP has been a significant actor in this development, which is legacy that we are proud of.

ACTIVITIES. The Niels Bohr Professorship, in collaboration with the Department of Mathematical Sciences and the School of Science, hosted several activities: The workshop *Moduli and Traces* to celebrate the mathematical career of Ib Madsen; the sixth meeting in the series *Number Theory Days*; the workshop *Rational Points and Zariski Density*; and the master class *Stable Homotopy Theory and p-Adic Hodge Theory*, which brought together 30 participants for exquisite week-long lecture series by Matthew Morrow and Thomas Nikolaus. Again this year, NBP members served as co-organizers of a number of meetings internationally. Notably, Lars Hesselholt and Peter Scholze organized the meeting *Topological Cyclic Homology* in the traditional Arbeitsgemeinschaft series, held bi-annually at Mathematisches Forschungsinstitut Oberwolfach since 1949. Finally, the NBP hosted long-term visitor Bjørn Dundas along with a total of forty-eight short-term guests.

RESEARCH. The year saw progress in all areas. Lars Hesselholt and Ib Madsen proved that Karoubi periodicity holds for the real algebraic K-groups of any stable infinity-category equipped with a quadratic functor, a main goal of the NBP research plan. Dustin Clausen with Akhil Mathew and Matthew Morrow proved a p-adic counterpart of Gabber's rigidity theorem for ℓ-adic K-theory of henselian pairs. Their theorem is a fundamental result in p-adic geometry and will have numerous future applications. Clausen used the theorem himself in his visionary new paper *A K-theoretic approach to Artin maps*, which gives a vast generalization of the classical Artin maps of local and global class field theory and makes the reciprocity theorem an immediate consequence of the construction rather than a statement that needs proof. In total, NBP members were invited as plenary speakers at twenty-five conferences around the world.
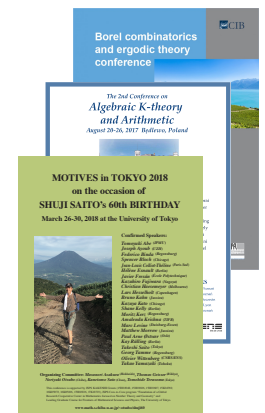
EDUCATION AND OUTREACH. This year, NBP members saw three Ph.D.s, four M.Sc.s, and seven B.Sc.s to their completion and, in addition, contributed twenty quarter-length courses of teaching at all levels. Lars Hesselholt and Nathalie Wahl also produced a second edition of their textbook *Linear Algebra*. In public outreach, Asger Törnquist spoke on *Infinity in Mathematics* at Lyngby Public Library, and Fabien Pazuki led a group of aspiring young mathematicians from Lycée Français Prins Henrik to the European Congress of MATh.en.JEANS in Berlin.


Picture: Lycée Français Prins Henrik

HØJDEPUNKTER 2017-2018

I Niels Bohr Professoratets (NBP's) sidste år har der været fokus på at sikre en fortsættelse af professoratets aktiviteter efter bevillingsperiodens udløb. I samråd med Institut for Matematiske Fag blev der ansat yderligere to ph.d.-studerende udover de, der var indregnet i NBP-kontrakten. De finansieres fra 2018 via forskellige andre kilder. Forskningsmæssigt er samspillet mellem højere algebra og aritmetik, som var et fokuspunkt for NBP, steget væsenligt i anseelse i de senere år. NBP har spillet en central rolle i denne udvikling, hvilket vi har grund til at være stolte af.

AKTIVITETER. Niels Bohr Professoratet var sammen med Institut for Matematiske Fag og ph.d.-skolen vært for adskillige aktiviteter: Workshoppen *Moduli and Traces*, der fejre-de Ib Madsens matematiske karriere; det sjette møde i rækken *Number Theory Days*; workshoppen *Rational Points and Zariski Density*; samt master-classen *Stable Homotopy Theory and p-Adic Hodge Theory*, som tiltrak 30 deltagere til to fremragende foredrags-rækker ved Matthew Morrow og Thomas Nikolaus. Som i tidligere år var NBP-personale medarrangører af en række møder internationalt. Især skal nævnes, at Lars Hesselholt og Peter Scholze sammen organiserede mødet *Topological Cyclic Homology* i den traditionelle Arbeitsgemeinschaft-serie, som siden 1949 har været afholdt hvert halve år ved Mathema-tisches Forschungsinstitut Oberwolfach. Sluttelig var NBP vært for ialt 48 korttidsgæster samt en enkelt langtidsgæst, Bjørn Dundas, der besøgte NBP i tre måneder.

FORSKNING. Året bragte fremskridt på alle områder. Lars Hesselholt og Ib Madsen beviste, at de reelle algebraiske K-grupper af en stabil uendelig-kategori med en kvadratisk funktor opfylder Karoubi periodicitet, hvilket var et af hovedmålene i NBP's forskningsplan. Dustin Clausen beviste i samarbejde med Akhil Mathew og Matthew Morrow et p-adisk modstykke til Gabbers rigiditetssætning for ℓ-adisk K-teori af henselske par. Denne sætning er et nyt grundlæggende resultat inden for p-adisk geometri, og den vil utvivlsomt finde udbredt fremtidig anvendelse. Clausen anvendte således selv sætningen i sin visionære nye artikel *A K-theoretic approach to Artin maps*, som giver en vidtrækkende generalisering af de klassiske Artin symboler fra lokal og global klasselegemesteori og gør Artin reciprocitet til en umiddelbar konsekvens af konstruktionen i stedet for en påstand, der kræver bevis. NBP-personale var igen i år efterspurgte foredragsholdere på konferencer verden over og var inviteret til i alt 26 plenarfordrag.
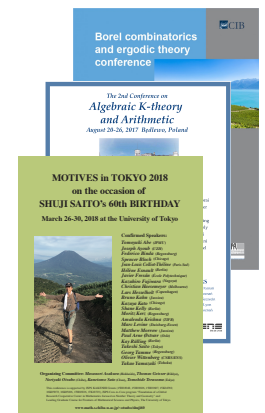
UDDANNELSE OG FORMIDLING. Tre ph.d.-studerende, fire specialestuderende og syv bachelorstuderende færdiggjorde deres afhandlinger vejledt af NBP-personale, der endvidere bidrog med 20 blok-kurser på alle niveauer. Lars Hesselholt og Nathalie Wahl producerede tillige en anden udgave af deres bog *Lineær Algebra*. Asger Törnquist talte om *Uendelighed i matematikken* på Lyngby Bibliotek, og Fabien Pazuki anførte en gruppe af unge aspirerende matematikere fra Prins Henriks Skole til den europæiske MATh.en.JEANS kongres i Berlin.

Picture: Lycée Français Prins Henrik

Supported by:

2 Organization 2017–2018

2.1 Scientific staff and visitors

The composition of the scienfitic staff follows the outline mentioned in the contract. In particular:

- As of March 31, 2018, the number of postdocs/Assistant Professors was 2.
- As of March 31, 2018, the number of Ph.D. students was 6.

Among the two postdocs, Dustin Clausen, will continue his position through July 2018, funded by the Department of Mathematical Sciences, whereafter he will relocate to Universität Bonn as Assistant of German superstar Peter Scholze, a likely 2018 Fields medalist. It is a testament to the strong impact of Clausen's mathematical contributions that Scholze will take him under his wing, and, in my view, the Department of Mathematical Sciences would be foolish not to offer Clausen a permanent position as soon as possible. Postdoc Daniel Bergh was hired from January 2017, and his position will continue until the end of June 2019, also funded by the Department of Mathematical Sciences. We are happy to report that since January 2018, Sho Tanimoto, who was an NBP postdoc from July 2015 through December 2017, has been a tenured Associate Professor at Kumamoto University, Japan. In fall 2017, the NBP and the Department of Mathematical Sciences hired two additional Ph.D. students, Malte Leip and Ricardo Pengo, to work with Lars Hesselholt and with Ian Kiming and Fabien Pazuki, respectively. Among the remaining Ph.D. students, Vibeke Quorning and Karen Bakke Haga continued working with Asger Törnquist, while Martin Speirs continued working with Lars Hesselholt. Ryo Horiuchi completed his Ph.D. supervised by Lars Hesselholt in January 2018 and began a postdoc position at Nagoya University, while Dino Destefano completed his Ph.D. supervised by Ian Kiming in December 2017 and began a postdoc position at Universität Göttingen. Finally, Annelies Jaspers, who was co-supervised by Lars Halvard Halle and Johannes Nicaise (Imperial College London) also completed her Ph.D. in October 2017, but decided to leave academia for a job in management consulting. The total number of postdocs and Ph.D. students was in step with or slightly exceeded the level set forth in the contract.

The NBP was the host of a total of forty-eight shorter-term visitors including professors Wu-chung Hsiang (Princeton), Michael J. Hopkins (Harvard), Anna Cadoret (Jussieu), and Tim Browning (Bristol), along with rising stars Thomas Nikolaus (Münster) and Akhil Mathew (Chicago). In addition, the NBP had a single long-term visitor, Bjørn Dundas from University of Bergen, who visited for three months, funded partly by the NBP and partly by Bergen. While Dundas did not teach during his visit, he interacted to a great extent with NBP members, including postdocs and Ph.D. students.

2.2 Administration

There were no administrative changes in 2017-2018. The NBP administrator Mette Fulling continued to handle the many practical aspects concerning staff and visitors in a very professional and friendly manner. We also again benefitted greatly from the administrative support structure in the department and university administrations, as far as budgetary and accounting assistance is concerned.

2.3 Recruitment and gender strategy

At the senior level, recruitment is done by the Department of Mathematical Sciences, in coordination with the NBP, where appropriate. The NBP has been fortunate to have had Dustin Clausen on its roster since 2013. As described below, Clausen's work is at the forefront of current research in p-adic geometry, and as a consequence, he has been offered a position as Assistant of Peter Scholze at Universität Bonn, who is

arguably the most influential mathematician in the world today and the leading contender for a 2018 Fields medal. Clausen, however, would prefer to return to Copenhagen after two years in Bonn, and it is past high time that the Department of Mathematical Sciences retain him with an offer of a tenured position. Indeed, with the high impact of his work and his network of contacts to the absolute top people his generation, Clausen's presence in Copenhagen would cement the future of arithmetic geometry here. Clausen has been slow to publish, which has made him difficult to hire. However, this is now a moot issue with his papers appearing in top journals, and he is likely to soon receive attractive offers from elsewhere.

The department is highly mindful of the under-representation of women and minorities, as was discussed in last year's report. That said, our graduates are immensely employable and have very attractive employment opportunities elsewhere, which makes an academic career less appealing, in particular for underrepresented groups. To wit, this year Annelies Jaspers, who completed her double-degree Ph.D. under co-supervised by Lars Halvard Halle and Johannes Nicaise (Imperial College London), decided to forego an academic career for a high-paying management consulting job in London.

An even more dire situation prevails among M.Sc. graduates, who do not pursue a Ph.D., where all but none of the eighty graduates produced by the department annually elect to pursue an education career. The reason is plain for all to see: the relatively favorable working conditions that high school teachers in science and mathematics have enjoyed for decades have been eliminated, whereas additional requirements for M.Sc. graduates to be eligible for teaching positions have remained in place.

3 Achievements

In the following, I will attempt to answer the questions posed by the DNRF for the final report.

3.1 Research achievements

In my view, the main research achievement of the NBP has been to help bring higher algebra into the mainstream of research in arithmetic geometry. My research lies at the intersection of two fields, homotopy theory and arithmetic geometry, both of which are major fields of research internationally and represented at top universities worldwide. I was educated in homotopy theory, which has long been very strongly represented in Danish mathematics, but over the course of my career, my research has naturally led me to contemplate and contribute to questions in arithmetic geometry. My research in this direction has built on the pioneering work by Waldhausen in the late seventies. My journey into arithmetic geometry has been that of an outsider and it has not been easy. In the last few years, however, the ideas that I have helped to bring into the field have been embraced by a new generation of arithmetic geometers and have received enormous attention. This year, for example, I was invited to speak in the colloquium at MIT, and one of the graduate students, who came out for dinner afterwards, told me that "Every number theory student from Harvard and MIT came to your talk." Notably, the German superstar, Peter Scholze, who, at thirty, is one of the most influential mathematicians in the world and whom I expect to win a Fields medal at this year's International Congress of Mathematicians, has taken these ideas to heart and have applied them in spectacular new ways. This new development is still in its infancy and I believe that we are only scratching the surface as far as applications are concerned. I am not alone in this belief: the Hopkins-Lurie seminar at Harvard, the Drinfeld seminar at Chicago, and prominent research seminars at Paris and Moscow have all focused on this development, recently. In addition, Scholze and myself were invited to organize the Arbeitsgemeinschaft at Mathematisches Forschungsinstitut Oberwolfach, where, bi-annually since 1949, a small group of experts have been invited to outline a series of talks on a timely topic that applicants can apply to present in order to learn the subject by doing. We had 111 applicants for 50 spots.

It was my paper *On the topological cyclic homology of the algebraic closure of a local field* published in 2006 that was the key to unlocking this development. However, until Bhargav Bhatt visited the NBP in its first year of operation, this paper had gone unnoticed in the arithmetic geometry community. Soon thereafter, however, Scholze announced the resolution with Bhatt and Morrow of a conjecture of mine from 2012, which set off an avalanche of results. A common feature of the mathematical results and objects to emerge from this development is that the denominators necessary in earlier work have been eliminated, which is precisely what Waldhausen foresaw long ago. It has been enormously satisfying to witness and contribute to this development. My paper *Topological Hochschild homology and the Hasse-Weil zeta function* published this year introduces the denominator-free analogue of de Rham cohomology in this setting and shows that it precisely gives rise to the cohomological interpretation of the Hasse-Weil zeta function by regularized determinants that had been envisioned by Deninger, at least for schemes smooth and proper over a finite field. This was the main goal of part (C) of the research plan.

Dustin Clausen, who was hired as an NBP postdoc in 2013, has also contributed greatly to this development. His main achievement, in my view, is his visionary new paper *A K-theoretic approach to Artin maps*, which shows that the classical Artin maps of local and global class field theory have a common origin in higher algebra. The Artin reciprocity law now becomes an immediate consequence of the construction rather than a theorem in need of proof. In this way, Clausen's approach exemplifies Grothendieck's dictum that if a statement requires proof, then it has not been properly understood. The paper builds on two earlier papers by Clausen and collaborators, which provide the key technical results necessary for the construction. The first of these papers is accepted for publication in *Journal of the European Mathematical Journal*, which is in the top 10 among journals in mathematics, and I expect the second paper to be accepted for publication in *Journal of the American Mathematical Journal*, which is a top 5 journal. Indeed, the latter paper, which is entitled *K-theory and topological cyclic homology of henselian pairs*, proves the p-adic counterpart of the celebrated Gabber rigidity theorem for ℓ-adic K-theory of henselian pairs. It is a fundamental new theorem in p-adic geometry, which undoubtedly will have numerous future applications.

Finally, my joint work with Ib Madsen has completely achieved the main goal set out in part (A) of the research plan and has achieved the main goal of part (B), as far as homotopy theory is concerned. The latter part of our work constructs a functor that assigns bi-graded real algebraic K-groups $KR_{i,j}(\mathscr{C}, Q)$ to every pair of a stable ∞-category $\mathscr{C}$ and a non-degenerate quadratic functor $Q\colon \mathscr{C}^{\mathrm{op}} \to \mathsf{Sp}$, and the first part of our work shows that if $\mathscr{C}$ is defined over $\mathbb{Z}$, then these groups satisfy Karoubi perodicity: If $i-j \geq 0$, then there is a canonical isomorphism

$$KR_{i,j}(\mathscr{C}, Q) \xrightarrow{\ \sim\ } KR_{i,j-2}(\mathscr{C}, -Q).$$

This result had been proved by Karoubi in the eighties under the stronger assumption that $\mathscr{C}$ be defined over $\mathbb{Z}[1/2]$, but, for applications in geometric topology, it was important that his assumption that 2 be invertible be removed. This has been accomplished with our work, which will be published as a monograph in the series *Ergebnisse der Mathematik und ihrer Grenzgebiete* published by Springer Nature.

The NBP members not mentioned here have also made significant research contributions, many of which have been discussed in earlier reports.

3.2 Lasting effects at host institution

In terms of its impact on Danish mathematics, in general, and the Department of Mathematical Sciences, in particular, the primary goal of the NBP was to build a strong presence in arithmetic geometry, which

had hitherto been absent in Denmark despite being a major research field internationally. A secondary goal was to contribute to the long-term the stability of the Department of Mathematical Sciences.

As stipulated in the NBP agreement, the Department of Mathematical Sciences has offered me a regular professor position, which I have accepted. In addition, the University of Copenhagen and Nagoya University, where I am also a professor, have signed an agreement to the effect that, going forward, I will spend the half-year October–March in Copenhagen and the half-year April–September in Nagoya. From the Nagoya side, the agreement must be renewed every three years, which I anticipate to be a formality. Also in line with the NBP agreement, the Department of Mathematical Sciences, in coordination with the NBP, made three permanent hires at the Associate Professor level, namely, Fabien Pazuki and Lars Halvard Halle, both of whom specialize in arithmetic geometry, and Asger Törnquist, who specializes in the budding area of descriptive set theory. Accordingly, the department now has a strong representation in these areas, both of which were completely absent before.

The NBP has certainly raised the international profile of the Department of Mathematical Science, which was already very strong in other areas of mathematics. The extent to which this internationally competitive center and department is a lasting effect, in the end, depends on the commitment of university leadership at all levels to appreciate and protect it. In this context, the fact that few in a leadership position within the university have international experience remains a great concern, as does the lack of tenure at Danish universities. That the department did not succumb to a misguided merger experiment in 2014 was to no small extent thanks to the efforts and pondus of NBP members, notably, Ib Madsen and myself. That being said, I am happy to report that the department and the NBP now enjoys good and fruitful relations with university leadership.

3.3 The NBP as training ground

At the postdoc level, the NBP has been a fabulous training ground for our young researchers. Two of our postdocs, Christopher Davis and Sho Tanimoto, are now in tenured associate professor positions at UC Irvine and Kumamoto University, respectively. Two more postdocs, Dustin Clausen and David Schrittesser, have accepted temporary positions at the absolute centers of their respective areas of specialization, Clausen with Peter Scholze at Universität Bonn and Schrittesser with Sy Friedman at the Kurt Gödel Research Center for Mathematical Logic at Universität Wien. The quality of our postdocs has been absolute fantastic and they have contributed greatly to the research and teaching activities of the NBP and of the department as a whole.

The success at the Ph.D. level is not as unqualified as at the postdoc level, and I believe that there are two main reasons for this. One is that, in terms of career opportunities, it is highly beneficial for Ph.D. students to graduate from a renowned institution such as Harvard, MIT, or Oxford. Even Göttingen still attracts very good students on its pre-war reputation, albeit mainly at the undergraduate level. It will take time and persistence to overcome this disadvantage. Another more important and structural reason, however, is that, in mathematics, completing a Ph.D. within three years is very difficult, and most of our international peers, including Harvard and MIT, regularly allow their Ph.D. students five years to do so. Since academic careers are largely made in the ten years following graduation, it is of the utmost importance that students have time to produce significant results during before they graduate, and three years is often too little time to do so. The $4+4$ option is a good step in the right direction, leaving four years of Ph.D. studies, and we do all that we can to encourage our undergraduate students to choose this option. However, for underrepresented groups, in particular, a longer period of five years to complete a Ph.D. would undoubtedly be helpful.

3.4 Continuance of activities

The positions of permanent NBP faculty are funded through income from internal sources such as teaching, as are all permanent positions in the Department of Mathematical Sciences. By contrast, unlike the situation at international peer institutions, funding for Ph.D. students and postdocs comes almost exclusively from external sources, and therefore, is largely subject to the successful outcome of grant applications.

4 Internationalization

By internationalization, I understand the bringing in of outside expertice through the hiring of international faculty and postdocs. Educating foreign Ph.D. students here, however, can hardly be considered an instant of internationalization in this sense, although it does help to build an international network of contacts.

4.1 Effects on research field

This has largely been described already. The NBP has had a very significant impact on its central research field of arithmetic geometry, which did not exists in Denmark before. During my long international career, where I spent fifteen years at MIT and ten years at Nagoya University, my research shifted from my initial focus of homotopy theory to a broader focus that includes both homotopy theory and arithmetic geometry. The interplay between these areas has much risen to prominence during the funding period, and the NBP is a leading center for these activities worldwide. To maintain this position, it is of eminent importance that Dustin Clausen be hired in a permanent position in Copenhagen. The additional NBP activities have all much helped to put Copenhagen on the map in aritmetic geometry. The *Number Theorem Days* meetings inaugurated by Fabien Pazuki that are held bi-annually have become the focal point of the Nordic aritmetic geometry and number theory community.

4.2 Internal and external collaboration

The NBP funds have helped start numerous new collaborations. Associate professors Lars Halvard Halle and Fabien Pazuki and postdoc Sho Tanimoto initiated a collaboration with Fedor Bogomolov of Courant Institute, NYU, and Higher School of Economics, Moscow, to produce the first examples of Calabi-Yau varieties over number fields in which the rational points are Zariski dense, and Lars Hesselholt collaborated with long-term visitors Michael Larsen and Ayelet Lindenstrauss of Indiana University to produce a norm residue isomorphism for the p-adic K-theory of division algebras over local fields. Postdoc Dustin Clausen began his very fruitful collaboration with NBP visitor Akhil Mathew during a weeklong visit by the latter. Lars Hesselholt co-advised Ph.D. student Ryo Horiuchi from his home institution, who earned a double-degree from Copenhagen and Nagoya earlier this year. Shigeyuki Kondo from Nagoya visited NBP for one week and spoke at a *Number Theory Days* meeting, as did Takeshi Saito from University of Tokyo, who is the leading arithmetic geometer in Japan.

5 Personal issues

As far as I know, the Danish National Research Foundation has not required host institutions to maintain the level of compensation to its Niels Bohr Professors after the termination of the professorship, as does for example the Alexander von Humboldt Stiftung with its Humboldt Professors. In my case, however, the host institution, the Department of Mathematical Sciences at the University of Copenhagen, has nevertheless offered me a regular professorship, effective April 1, 2018, at the same salary level. I have accepted the position and I am grateful that my host institution has made this possible.

6 The funding mechanism

The Niels Bohr Professorship is a great vehicle for change. It is extraordinarily well-funded and gives the Bohr professor ample means to have a large impact on the host department. It is important that this impact be a positive and lasting one, and I think that it would be a good if applicants for the Bohr professorship were specifically asked to enumerate, in the contract, how this will be accomplished.

I was much pleased by the site visit by the DNRF after Søren-Peter Olesen became its director. It was very helpful, I think, to have this meeting with the board to communicate mutual experiences and concerns in a free and direct manner.

The Niels Bohr Professorship is certainly a wonderful opportunity and one that I actively encourage select international scientists to apply for. Europe has been able to attract and retain absolute top researchers recently for reasons that are all too obvious, so now is a great opportunity to bring people here.

7 Comments to the appendix

Appendix—B: Conferences. (Ba) The NBP in collaboration with the Department of Mathematical Sciences and the School of Science hosted hosted five conferences: The two-day workshop *Moduli and Traces* with Fields medalist celebrating Ib Madsen's mathematical career; the weeklong master class *Stable Homotopy Theory and p-Adic Hodge Theory*, which brought thirty mainly young participants to Copenhagen for two exquisite lecture series by Matthew Morrow (Jussieu) and Thomas Nikolaus (Münster); the sixth meeting in the series *Number Theory Days*; the three-day conference *Rational Points and Zariski Density*; and the one-day meeting *Denmark Australia Diophantine Approximation Day* held at Aarhus University. In addition, NBP members helped coorganize seven additional conferences.
(Bb) lists 54 invited talks, 25 of which were plenary addresses at international conferences.

Appendix—C: Educational activities. The table lists 13 graduate courses and 9 undergraduate courses and states that, in 2017–2018, NBP members produced three Ph.D. graduates, four M.S. graduates, and seven B.S. graduates. We also mention that Lars Hesselholt and Nathalie Wahl wrote a second edition of their textbook *Linear Algebra*.

Appendix—F: Public outreach. Again this year, Fabien Pazuki organized a workshop in the *Math en Jeans* program at Lycée Français Prins Henrik and led a group of students to its European Congress in Berlin. Asger Törnquist gave a lecture *Uendelighed i matematikken* at Lyngby Public Library.
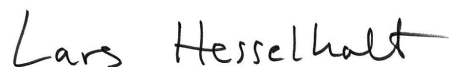
Appendix–H: Publications. The final publication list includes a total of 19 journal publications and 4 articles published in peer-reviewed conference proceedings, all of which are available on www.arxiv.org. The list also includes 1 monograph.

Appendix–I: Presence in Denmark. In 2017, Lars Hesselholt spent the two-month period February-March at Institut Mittag-Leffler in Djursholm, Sweden, where he co-organized the program *Algebro-Geometric and Homotopical Methods* with Eric M. Friedlander (USC) and Paul Arne Østvær (Oslo). He also spent the full month of July at the Hausdorff Research Institute for Mathematics in Bonn as a participant in the trimester program *K-Theory and Related Fields*.

8 Signature

I hereby confirm the correctness of the information concerning annual accounts, including itemizations. Also, I confirm that the compiled annual reporting, including the appendices, is correct, i.e. it is free of material misstatement or omissions, and that the administration of the funds has been secure and sound, and in accordance with the conditions of the Niels Bohr Professor agreement.

29 June, 2018

Lars Hesselholt
Niels Bohr Professor