

The interplay of various Scandinavian mathematical journals (1859–1953) and the road towards internationalization

Reinhard Siegmund-Schultze

University of Agder, Faculty of Engineering and Science, Gimlemoen 25a, Postboks 422, 4604 Kristiansand S, Norway

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Abstract

The merger of various Nordic mathematical journals in 1953 into *Mathematica Scandinavica* (for research) and into *Nordisk Matematisk Tidsskrift* (for the more elementary topics, from 1979 NORMAT) confirmed increasing cooperation between matured Scandinavian mathematical communities. The merger originated from practical considerations including the wish to have a critical mass for economically viable publications.

The present paper presents the basic steps in the development of several Scandinavian mathematical journals from 1859, the year of the foundation of the first general mathematical journal in a Scandinavian language, the Danish *Mathematisk Tidsskrift*, through various converging and diverging tendencies, towards the events of the year 1953.

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Zusammenfassung

Der im Jahre 1953 stattfindende Zusammenschluss mehrerer skandinavischer mathematischer Zeitschriften zu *Mathematica Scandinavica* (für Forschung) und *Nordisk Matematisk Tidsskrift* (für eher elementare Themen, ab 1979 als NORMAT) bestätigte die zunehmende Kooperation zwischen gereiften skandinavischen mathematischen Milieus. Der Zusammenschluss erfolgte aus praktischen Erwägungen, darunter dem Wunsch, eine kritische Basis für ökonomisches Publizieren zu erreichen.

Die vorliegende Arbeit beschreibt grundlegende Schritte in der Entwicklung mehrerer skandinavischer mathematischer Zeitschriften seit 1859, dem Gründungsjahr der ersten auf die Mathematik in ihrer Gesamtheit zielenden Zeitschrift in einer skandinavischen Sprache, der dänischen *Mathematisk Tidsskrift*. Es wird dann die weitere Entwicklung durch konvergierende und divergierende Tendenzen hin zu den Ereignissen des Jahres 1953 verfolgt.

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E-mail address: Reinhard.siegmund-schultze@uia.no.

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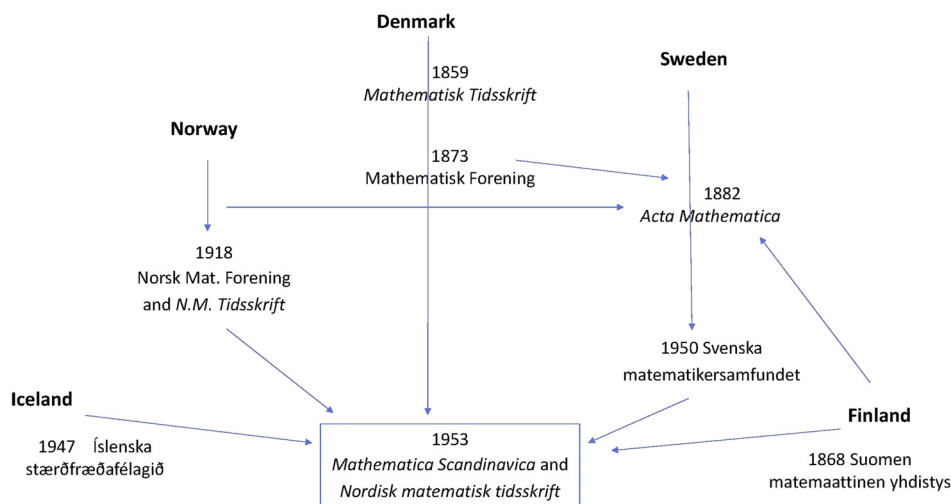


Figure 1. A diagram for the most important dates in the development of Scandinavian mathematical journals (italics) and societies. The five Nordic countries are grouped approximately in geographic arrangement, as far as the West–East axis is concerned. Important specialized journals such as *Skandinavisk aktuarietidsskrift* do not appear here.

1. Introduction to the historical Scandinavian environment and the sources used in this study

In order to understand the conditions for collaboration between various Scandinavian (or Nordic) mathematicians and their journals in the past 150 years or so one has to look at the specifics of the political, social and scientific situation in the five countries at the Northern periphery of Europe.

The five countries we are talking about are Norway, Sweden, Denmark, Finland, and Iceland (Figure 1). While only the first two and parts of Finland are located on the “Scandinavian peninsula”, the first three are “Scandinavian” in the sense of being united by mutual intelligibility among their languages. In particular, there are but small differences between the written (not, however, spoken) languages of Danish and Norwegian (at least as far as the dominating Norwegian language *Bokmål* is concerned), which is due to the roughly four centuries of Danish dominance in Norway until 1814.¹ Icelandic is historically related to the old Norwegian language. While Finnish is not related to the Scandinavian languages, close historical bonds particularly to Sweden, which are palpable even today in a certain presence of the Swedish language among the Finns, allow for the inclusion of Finland among the Scandinavian or, rather more broadly, “Nordic” countries.

As we will see, mathematics, and in particular journals, provide another reason for including Finland among the Nordic countries. Iceland, however, will be barely mentioned in the following due to its small population and peripheral mathematical importance.²

For the period to be considered here (about 1859 to 1953), two specific historical circumstances are relevant, in addition to the global ones, such as the two World Wars. These specific developments are Nor-

¹ Until the spelling reform of 1948 Danish nouns were capitalized.

² As Branner (2003, 13) reports, in 1953 the economic support from the various Nordic mathematical societies for the new journal *Mathematica Scandinavica* was expected to be proportional to the number of inhabitants in each country, hence it was set to 1% for Iceland. The only contribution of an Icelandic mathematician I could find in the Danish mathematical journal to be discussed below was a short geometrical paper by Ólafur Daníelsson (1877–1957) in *Nyt tidsskrift for matematik*, vol. 11, Afdeling B (1900), pp. 41–42. Daníelsson had to take his doctoral degree at the University of Copenhagen in 1909 because a university did not exist in Iceland at the time. The Wikipedia website on the University of Iceland (founded 1911) does not list a single mathematician during its history among the “Notable faculty members.” H.K. Sørensen alerted me to the following Icelandic website that discusses Daníelsson: <https://www.visindavefur.is/svar.php?id=59732>.

way's independence from Sweden since 1905 and Finland's independence from Russia since 1917. These rather late emancipations (and the even later full independence of Iceland from Denmark in 1944) led to some delay in Nordic collaborative enterprises, because Norway, Finland and Iceland apparently first had to go through phases of consolidating their national identity. But Nordic collaboration in mathematics and the sciences, sometimes subsumed under a kind of Pan-Scandinavian ideology or "Scandinavianism", has been pursued all along, most visibly in the Scandinavian mathematical congresses since 1909 (Turner and Sørensen, 2013). The role of strong, and politically well-connected, mathematicians continuing the organizational work of Gösta Mittag-Leffler (1846–1927) and others³ will be occasionally visible also in our story (for instance in the cases of Zeuthen, Heegaard, H. Bohr, Størmer etc.), but cannot be discussed in detail.

Three further historical conditions for Nordic collaboration have to be considered as background as well. The German–Danish War of 1864 led to territorial losses for Denmark and to some (at least temporary) estrangement from fellow Scandinavians who had largely abstained from helping the Danes. During World War I the Scandinavian countries remained officially neutral, though with clear preference for the Western cause and with increasing estrangement from the Germans. This is particularly important for science and mathematics journals, because this estrangement was favorable to the gradual rise of English as a scientific language, also in Scandinavia. Another special circumstance was the German occupation of Denmark and Norway in April 1940, with an ensuing, if somewhat delayed, flight of several Jewish mathematicians from these countries to unoccupied Sweden. At the same time, Finland was involved in conflicts with Soviet Russia and temporarily even collaborated with Nazi Germany.

One will find traces of all these special political and historical developments also in publications (including reviews) in the mathematical journals to be discussed, and in the political actions of the mathematicians involved in these journals. *Acta Mathematica*, founded in 1882 by Gösta Mittag-Leffler, is an example of an outlet which was occasionally used (for instance in the special Weierstrass–Poincaré–Kovalevskaya volume (39) of 1923) to help normalize relations between scholars who had been estranged due to the World War (Dauben, 1980). In this article, *Acta Mathematica* will be less considered. This journal was from the beginning an enterprise with a focus on international mathematical communication. Much has been written on this journal, which today is among the leading journals worldwide (Barrow-Green, 2002; Domar, 1982; Turner and Sørensen, 2013).

Instead I will focus on the two main national journals in Scandinavia exclusively for mathematics and as a rule publishing in the vernacular. These were established first in Denmark (1859) and much later in Norway (1918). This sequence of events, and in particular, the lack of an equivalent publishing outlet in Swedish, was partly conditioned by the chronology of founding the mathematical professional societies in the three major Scandinavian countries which took place in Denmark in 1873, in Norway in 1918, and in Sweden only after WWII in 1950. Connected to the involvement of mathematical societies is the problem of funding which was sometimes secured through subscriptions and mathematical societies, sometimes via other scientific societies (academies), insurance companies, private foundations, and government sources.⁴

In addition to mathematical journals proper there existed in all Nordic countries more general journals, such as Academy proceedings, which carried mathematical and other scientific papers, and less general, specialized journals which were devoted to applications such as actuarial mathematics or which had a focus on educational topics or popularization.⁵ We will in particular mention examples of journals in ac-

³ Parallel to Mittag-Leffler, three former university professors of mathematics had reached very high administrative posts in their respective countries, Ole Jacob Broch (Norway), Lorens Leonard Lindelöf (Finland) and Carl Johan Malmsten (Sweden) (Domar, 1982, 4).

⁴ The dependence of the *Journal für die reine und angewandte Mathematik* (Crelle-Journal) founded in 1826, and of *Acta Mathematica* on government resources is well researched. For *Acta* see Barrow-Green (2002).

⁵ See remarks about intermediate journals in other countries at the time, for instance in the contributions by C. Ehrhardt and M.R. Enea to this issue.

tuarial mathematics because they showed tendencies towards Scandinavian collaboration which were even clearer than in the general mathematical journals. One important example is the Scandinavian journal for the application of mathematics in the actuarial sciences, now called *Scandinavian Actuarial Journal*.⁶

Due to lack of space I shall be unable to discuss many details of the scientific (mathematical) collaboration between Scandinavian mathematicians which manifested itself in journals. Content was not restricted to themes of research where Scandinavians were strong traditionally (mathematical astronomy, actuarial mathematics, difference equations, theory of functions, geometry), but comprised issues of educational reform as well; several articles were devoted to comparisons of national educational systems in the context of the International Commission of Mathematical Instruction (ICMI) founded under the influence of Felix Klein in 1908, in which for instance Poul Heegaard was heavily involved.

The sources which I have been able to use are uneven. The two Danish and Norwegian outlets which had the parallel Scandinavian names “mathematical journal” and which were both terminated with the merger in 1953, themselves contain articles with germs of historical reflection. They were broadly oriented towards the national and Scandinavian mathematical communities, and they did not include research articles alone but also papers on pedagogy and book reviews. The Danish mathematical journal has been repeatedly investigated by historians, to whose works I will refer.⁷ I will quote (in English translation) additional printed and unprinted material about both journals as far as the topic of Scandinavian collaboration is concerned. Both journals contain reflections on their own history.⁸ Unlike the two Danish and Norwegian (general) mathematical journals, the (international) Swedish journal *Acta Mathematica* and the two Norwegian and Swedish “Archives” (*Archiv* and *Arkiv*, to be briefly discussed below) were basically restricted to scientific articles, with the latter two carrying articles from the natural sciences as well. As to archival sources, my location in Kristiansand allowed me to draw more specifically on material pertaining to Norwegian developments. The library of the Institut Mittag-Leffler in Djursholm/Stockholm contains (mostly in copy) the correspondences of the founder of the institute and of *Acta Mathematica* with many Scandinavian and non-Scandinavian mathematicians. These letters will without doubt allow further research into the history of Scandinavian mathematical journals.⁹

All translations from the three Scandinavian languages in this paper are mine. Mainly due to restrictions of space I will quote the original passages only in case of non-printed materials, which do not allow for an easy check.

2. The Danish *Mathematisk Tidsskrift* (from 1859), and the gradual internationalization of Scandinavian research publishing. The impact of *Acta Mathematica* (from 1882)

The first Scandinavian journal specializing in mathematics started in 1859 in Copenhagen as *Mathematisk Tidsskrift* (Mathematical Journal; Figure 2).

In their preface the Danish founders Hans C.F.C. Schjellerup (1827–1887) and Camillo Tychsen (1826–1888) stressed the pioneering and experimental character of the new journal, and its focus on teaching:

To make an attempt to determine whether a mathematical journal may thrive under our conditions. . . .
The work must be directed as much as possible to all interests . . . not to restrict ourselves to the field of

⁶ See below in section 3, where I largely follow the article by Djehiche and Sandström (2014).

⁷ Ramskov (2000), Sørensen (2006), Branner (2003), and Schøtt (1980).

⁸ The Danish journal is much more widely accessible. It is available online through JSTOR, unlike its Norwegian counterpart which may not even be easy to trace in libraries outside Norway.

⁹ This includes the case of *Scandinavian Actuarial Journal*, where Mittag-Leffler seems to have been one of the initiators as well.

MATHEMATISK TIDSSKRIFT

UDGIVET

AF

H. C. F. C. SCHJELLERUP OG CAMILLO TYCHSEN.

FØRSTE AARGANG.

KJØBENHAVN.

I COMMISSION HOS L. SCHÖNBERG.

COHENS BOGTRYKKERI.

1859.



Figure 2. Title page *Mathematisk Tidsskrift* (1859).

mathematics as such . . . but to serve the purpose of education and give students the opportunity to test their strengths. (Schjellerup and Tychsen, 1859, 1)

In a footnote to this preface (Schjellerup and Tychsen, 1859, p. 2) the monthly appearance of the journal is mentioned and the fact that subscriptions “which cover a year are received in any bookshop in Denmark, Norway and Sweden.” Somewhat contrary to the preface, contributions by school teachers or those directed at elementary mathematics would be rare in the first years of *Mathematisk Tidsskrift*, which contained basically research papers on a modest level and exam questions at school and university levels (including Norway and Sweden) with answers.

The editors, the astronomer Schjellerup and the mathematician Tychsen¹⁰ have been described as coming from the periphery of academic mathematics (Sørensen, 2006, 201). Following Schjellerup’s resignation, Tychsen took full responsibility for the journal after only one year. In 1865, when, at an age of nearly forty, Tychsen relaunched the journal under a slightly different name as *Tidsskrift for Matematik* (Journal for Mathematics), he still signed as “cand. math. & phys.”¹¹

¹⁰ Both men, as well as several other mathematicians, have biographical entries (written in Danish) in the *Dansk Biografisk Lexikon* of 1903 and later editions, now available online at <http://denstoredanske.dk>.

¹¹ Tychsen (1865). This was about equivalent to a master degree today. Living on an inheritance as a son of a pharmacist, the trained optician Tychsen had taken his mathematical master degree in 1850 at the Polyteknisk Læreanstalt. In the following years he published several books (1862, 1870) with elementary analytical content. In 1866 Tychsen received the philosophical (apparently mathematical) doctoral degree from the university of Jena in Germany. In 1870 Tychsen took a job as mathematical expert at *Statens*

On the further history of *Tidsskrift for Matematik*, Kurt Ramskov has reported in this journal (*Historia Mathematica*):

The content was then [i.e. in 1865, R.S.] divided into a section for elementary subjects such as mathematical school problems [with answers published, R.S.] and a section for more advanced subjects. It was not intended to be a scientific journal but rather to be a journal for mathematics teaching. A competing journal, *Maanedsskrift for den elementære Matematik* [The Monthly Journal for Elementary Mathematics], was founded in 1886. It contained only mathematical school problems. In 1890 the two journals joined as *Nyt Tidsskrift for Matematik* [New Journal for Mathematics], which was published in two series. Series A contained elementary mathematics, i.e., school mathematics, and hence may be viewed as a successor of *Maanedsskrift*, while Series B now became a scientific journal containing articles on more advanced topics, allowing articles in foreign languages.¹²

The growing importance of *Series B* of the new journal for Danish research mathematicians has been characterized by Henrik Kragh Sørensen with the following words:

Many Danish mathematicians used *Mathematisk Tidsskrift* for the presentation of pre-studies for forthcoming more detailed work or for presentation of the main results in a form adapted to a broader public. Thus they contributed to . . . both increased communication in the Danish mathematical milieu and presentation of research outside the country's borders. This role of *Mathematisk Tidsskrift* was not different from the one which a number of smaller national journals in other disciplines and other countries played.¹³

Lützen et al. point to the importance which the Danish mathematical journal had for the international (Scandinavian) recognition of Julius Petersen (1839–1910), who became particularly known for his early contributions to graph theory. Referring to the second period (1865–1888) of the repeatedly renamed journal they say:

By publishing in Danish, Petersen did not only address a Danish audience, but a Scandinavian one; he actually participated actively in several of the Scandinavian Meetings of Natural Scientists. Moreover, the *Tidsskrift for Matematik*, in which Petersen published the large majority of his papers was, as the only Scandinavian journal of mathematics (until the creation of *Acta Mathematica* in 1882) widely used and read in the sister nations. (Lützen et al., 1992, 39)

The same authors then refer to Hieronymus G. Zeuthen (1839–1920), the noted geometer and historian of mathematics, together with Petersen, as being in the “triumvirate” of most influential Danish mathematicians of almost the same age, which included the astronomer and statistician Thorvald Nicolai Thiele (1838–1910) as the third:

It [*Tidsskrift for Matematik* and later *Nyt Tidsskrift for Matematik*] even enjoyed an international reputation, in particular during the years 1871–1889, when Zeuthen edited it (from 1883 together with Gram). *Zeuthen's Journal*, as it was often called, was regularly reviewed in the *Jahrbuch über die Fortschritte der Mathematik*

Livsforsikringsanstalter. He kept this position at a state insurance agency until his death in 1888. The character of the job which determined the content of several publications by Tychsen in his journal on the mathematical foundations of actuarial mathematics (one of 1875 was even reprinted three times as a separate of 9 pages) underlines an important source of support of mathematics in the Scandinavian countries in the period considered.

¹² Ramskov (2000, 231). One recognizes here a configuration of the circulation space for mathematics by segmenting the publics, as discussed by the editors in the introduction to the present issue.

¹³ Sørensen (2006, 203) refers here to, among other journals, *Archiv for matematik og naturvidenskab* in Norway which we will discuss briefly below. The translation from Danish is mine.

REDACTION

SVERIGE:

A. V. BÄCKLUND,	Lund.
H. TH. DAUG,	Upsala.
H. GYLDÉN,	Stockholm.
H. HOLMGREN,	“
C. J. MALMSTEN,	Upsala.
G. MITTAG-LEFFLER,	Stockholm.

NORGE:

C. V. BJERKNES,	Christiania.
O. J. BROCH,	“
S. LIE,	“
S. SYLOW,	Fredrikshald.

DANMARK:

L. LORENZ,	Kjöbenhavn.
J. PETERSEN,	“
H. G. ZEUTHEN,	“

FINLAND:

L. LINDELÖF,	Helsingfors.
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Figure 3. Editorial board *Acta Mathematica* (1882).

and once a year Zeuthen wrote a report on its contents in Darboux’s *Bulletin des Sciences Mathématiques*. . . . Around 1880 Danish mathematics gained an international reputation it had not enjoyed since the time of Erasmus Bartholin (1625–1698) and Georg Mohr (1640–1697). (Caspar Wessel’s (1745–1818) contribution to the geometry of the complex numbers was not internationally known until the 1890s.) (Lützen et al., 1992, 39/40)

At about the same time (1873) the Danish Mathematical Society (*Matematisk Forening*) was founded under major involvement of the same mathematicians, i.e. the “triumvirate.” This had obvious consequences for the standing of the journal as “national” and for the distribution of the journal, although the Society took official responsibility for the journal only after WWI.

Sørensen refers to the new possibilities of international communication opened by the foundation of *Acta Mathematica* in 1882, where leading Danish mathematicians such as L.V. Lorenz, Zeuthen and Petersen became members of the editorial board (Figure 3). However, Sørensen qualifies this:

Acta Mathematica did not immediately become the great organ for Danish mathematics one could have hoped for: in the course of the first 35 volumes (1882–1912) of *Acta Mathematica* “only” 15 Danish articles appeared, a third of them written by Zeuthen or Petersen, but also including interesting contributions by privately-employed ‘amateurs’ such as J.L.W.V. Jensen and P. Gram. (Sørensen, 2006, 203)¹⁴

¹⁴ Among the 203 authors in *Acta* until 1913 there were 37 Scandinavian authors: 18 Swedes, 9 Danes, 5 Norwegians, and 5 Finns. This follows easily from the Table Générale of *Acta Mathematica*, published as a separate issue in 1913 (with biographies, portraits and titles of all publications).

After the foundation of *Acta Mathematica* the editors of *Tidsskrift for Mathematik*, Jørgen Pedersen Gram (1850–1916) and Zeuthen, acknowledged in February 1883 that their journal had a more elementary character than the new Swedish publication, that it mostly aimed at teaching, and that this trait would probably become even more visible in the future:

It goes without saying that *Tidsskrift for Mathematik* cannot remain unaffected by this event which otherwise is such a happy one for the development of science. One has to expect that certain papers of conspicuous scientific importance will go to *Acta Mathematica* which can create for them a broader distribution than this journal is able to do.¹⁵

Gram and Zeuthen still hoped that “the increased contribution by Norwegian and Swedish colleagues” to recent issues of *Tidsskrift for Mathematik* would continue (Gram and Zeuthen, 1883, 2).

Nevertheless, when finishing their editorship in 1889, and passing the baton to the noted projective geometer Christian S. Juel (1855–1935) and the educator P.T. Foldberg (1861–1925), Gram and Zeuthen stressed the primarily national, Danish orientation of the journal with emphasis on general mathematical education and on geometric themes:

It is in above all one field, where this aim [of general education] has been pursued. This is synthetic geometry and in particular geometric constructions. . . . No other journal has published such a series of beautiful examples of geometric constructions often with very elegant solutions. . . .

All Danish mathematicians now living have to thank this journal because it has sent their first tentative efforts out to the world at a time, when they would have hardly found space in the bigger journals abroad. (Redaktionen, 1889, 231)

Based on the 1909 report by the then editors Juel and Viggo Trier (1862–1916)¹⁶ on the first 50 years of *Mathematisk Tidsskrift* and its successors (Juel and Trier, 1909), Sørensen comes to the following conclusions with respect to international communication:

The subscription rate was from the beginning rather high and included readers both from the capital and from the provinces, but also subscribers in the rest of Scandinavia.

Although the main part of the contributions and the majority of readers of *Mathematisk Tidsskrift* were Danish, there were also foreign authors who found their way to the pages of the journal. Thus during the first 50 years there were articles written by 42 different non-Danish Scandinavians, several of them with several contributions, and 17 authors from outside Scandinavia. The by far dominating languages were Scandinavian. Foreign authors were translated and only very few articles were published in one of the main languages.¹⁷

¹⁵ Gram and Zeuthen (1883, 1).

¹⁶ Trier was a mathematics teacher in Copenhagen. See the obituary (Heegaard, 1916). There is also a short entry on the following website devoted to Jewish heritage: <https://www.geni.com/people/Viggo-Peter-Trier/6000000003013596705>.

¹⁷ Sørensen (2006, 200), based the numbers also on the journal’s *Generalregister* (1909) which was published with support of the Danish Carlsberg Fund. While I am not certain about the writers of some anonymous papers, I find at least 25 Norwegian, 37 Swedish and one Icelandic (Ó. Danielsson) contributions, 18 alone written by three mathematicians from the Norwegian Guldberg family (Cato, Axel and Alf) with various topics from geometry to differential equations. Of prominent Norwegian authors one finds four, three, and three articles respectively by Axel Thue, Elling Holst, and Carl Størmer, with mostly geometric and number theoretic content, and two by Kristian Birkeland with physical themes. Holst and Thue contributed, in addition, several exercises and solutions. Most prominent among the Swedes is T. Brodén (geometry 1889). Other noted Norwegian and Swedish authors such as Sylow, Lie, Mittag-Leffler, Fredholm and H. v. Koch are missing. Prominent non-Scandinavians include Hermite and Cayley with one article each.

Thus there were about one or two articles on average per year written by non-Danish Scandinavian authors. This was barely a sign of intense Scandinavian collaboration within the then only existing general mathematical publishing outlet in a Scandinavian language. But it served a collaboration-building purpose among Scandinavian mathematicians who were otherwise used to communicating in the main European languages on the pages of *Acta Mathematica*.

3. Specialized Scandinavian journals before World War I

As indicated above, the foundation of *Acta Mathematica* around 1882 changed the situation of Scandinavian research publishing considerably. One offspring of *Acta* was Gustav Eneström's (1852–1923) well-known journal *Bibliotheca Mathematica*, devoted to the history of mathematics, which originally (starting in 1884), had been published as a supplement to *Acta*. The history of this journal which ended in 1914 deserves a more detailed investigation also with respect to its possible specific inner-Scandinavian aspects – if there are any in the first place (Andersen, 2002). According to Arild Stubhaug's biography of Mittag-Leffler, the increasing conflict between the uncrowned king of Scandinavian mathematics and his former "assistant" Eneström became unbridgeable when the latter "not only argued against governmental support [for *Acta*], but also advised Swedish schools not to subscribe to *Acta* because the contents and degree of difficulty were above the level that any teacher in the lower schools or secondary schools would be able to understand" (Stubhaug, 2010, 360).

While this claim, which points to the problems of increasing specialization, may deserve further investigation, there is good documentation (Domar, 1982; Barrow-Green, 2002) that the Norwegian Sophus Lie (1842–1899) had been, in 1881, the initiator of *Acta Mathematica*. The precondition for this Nordic journal (*Acta Mathematica*)¹⁸ was that it, in the words of Lie, "only take in papers from the great languages of culture. This claim must be satisfied if one is to compete on the world market."¹⁹ For some unclear reason Lie never published in *Acta Mathematica*, although he planned at least one contribution, according to a letter he wrote to Mittag-Leffler in October 1882, which is quoted by Stubhaug:

Before I send You my first Piece, I want to secure myself by having a Conference with Darboux and others, to ensure that the Content is new. I certainly always have enough Material. But the Issue is that my first Work should be short, easy to read, and of value. These three Claims limit my Choices to a great Degree.²⁰

This seems to indicate that Lie himself entertained a certain doubt about presenting his results immediately to a broader international public. Maybe this had been one of the reasons for which Lie, in 1876, had founded *Archiv for Matematik og Naturvidenskab* (Archives for mathematics and natural sciences) in Kristiania (now Oslo), together with the biologist Georg Sars (1837–1927), and the physiologist Jacob Worm-Müller (1834–1889) (Figure 4).

While his Norwegian colleagues from the natural sciences were looking for a journal free from ideological influence, in particular free from anti-Darwinist restrictions, Lie was aiming at an easily accessible and quick publication outlet for his mathematical papers. In fact, Lie would be the only mathematician

¹⁸ The words "Nordic journal" are Stubhaug's in his Lie-biography below. To gain support for *Acta*, it was sometimes cast as an international and sometimes as a Scandinavian journal. In fact, Norwegian mathematicians quite often called *Acta* "Nordisk matematisk tidsskrift." They did this, in particular, vis-à-vis the Norwegian ministry for education when they applied for subsidies for this joint Nordic journal. In 1953, a journal was eventually founded under the same (this time official) name (later in 1979 abbreviated to NORMAT). However, this journal had a quite different, largely pedagogical aim (see below).

¹⁹ Stubhaug (2002, 287). Lie to Mittag-Leffler, 5 April 1882. I thank Mikael Rågstedt, librarian at the Institut Mittag-Leffler, for providing me with a copy and the date of this and the following letter by Lie.

²⁰ Stubhaug (2002, 292). Lie to Mittag-Leffler, 7 October 1882. The capitalization in the quote apparently follows Lie's Norwegian text. Today Norwegian nouns are no longer capitalized.

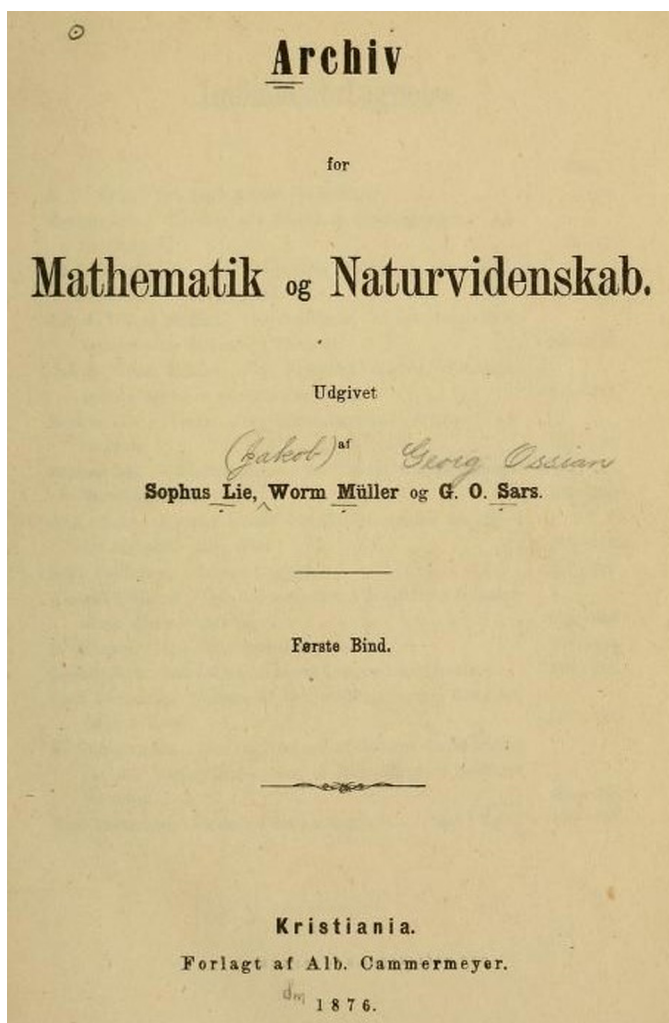


Figure 4. Title page *Archiv for Mathematik og Naturvidenskab* (1876).

to publish in the first four volumes of the *Archiv* (1876–1879). Quite unlike the other mostly biological papers in *Archiv*, which were in general written in Norwegian, all but one²¹ of Lie’s 19 contributions to the first four volumes were published in German, almost exclusively on his theories of “Transformations-Gruppen.” German and French were, of course, the two leading mathematical languages of the time. Lie needed German during his studies in Berlin in 1869, and in 1886 he would even take a professorship in Leipzig.

However, in spite of using German in the *Archiv for Mathematik og Naturvidenskab*, many of Lie’s publications

remained nonetheless unknown among the scientific public – a condition, according to Study,²² that was due in part to the fact that the Norwegian journal was little known, and partly due to the complicated form

²¹ The one exception being an article in French.

²² Stubhaug refers here (p. 363) to Eduard Study’s review of the first volume of Lie’s *Theorie der Transformationsgruppen* (1888) in *Zeitschrift für Mathematik und Physik* 34, 1889, pp. 171–191.

in which the works had been presented. . . . In a sense the production was in three phases: the first were a bit like unpolished drafts published in the Norwegian journal, the second were polished adaptations published in *Mathematische Annalen*, and the third were the serious works undertaken with the assistance of Engel and Scheffers. (Stubhaug, 2002, 363/373)

In any case, *Archiv for Matematik og Naturvidenskab*, after initially having been “monopolized”²³ by its cofounder Lie in its mathematical part, was later used also by other Norwegian mathematicians, occasionally using the Norwegian language.²⁴ Not surprisingly, number theory, which developed a strong tradition in Norway particularly after Axel Thue (1863–1922), was well represented.

On the other side of the Norwegian–Swedish border²⁵ another “Archive” for both mathematical and scientific contributions was founded in 1903. This was *Arkiv för Matematik, Astronomi och Fysik*, which we will briefly discuss below.

Both the international (*Acta Mathematica*) and the national (*Archiv*) journals were financially supported through a commission of the Norwegian parliament.²⁶ This support was visible both during the founding of *Archiv*²⁷ and *Acta* and later from memos written by C.A. Bjerknes and Ludvig Sylow (repeatedly from 1886 in favor of *Acta*, Sylow 1916 in favor of *Archiv*), Carl Størmer (repeatedly from 1904 in favor of *Acta*, 1916 in favor of *Archiv*). In particular, the 1916 letters by Størmer (1874–1957) and Sylow (1832–1918) in favor of *Archiv*, which was then under threat of losing state support, illustrate the value which the two leading Norwegian mathematicians attributed to this local Norwegian journal. Størmer in his letter, dated 19 November 1916, emphasized that *Archiv* was, along with the memoirs (*Skifter*) of the Norwegian Academy of Sciences in Kristiania/Oslo, the only national journal for mathematical publications. Størmer pointed also to the value of the journal as an asset for the acquisition of foreign journals through library exchange. On December 10, 1916, Ludvig Sylow, the noted algebraist of Sylow-group fame, wrote another, much more detailed 3-page letter to the then editor of *Archiv*,²⁸ making interesting remarks about the importance of the journal particularly for young Norwegian mathematicians. Sylow says that even the *Skifter* of the Academy were not a realistic choice for young mathematicians because the members of the Academy had to take responsibility for the correctness of the results and therefore had to invest too much time:

The beginning mathematician needs precisely a journal, where he can print his work at his own responsibility and which is at the same time a journal of reputation both abroad and at home.²⁹

Sylow then remarks in his letter that, except for the years 1898–1901, there was only one volume among the 34 published so far which did not contain a single mathematical contribution:

²³ We do not have evidence though that Lie excluded other authors.

²⁴ This is valid for Thue (1893). Other publications by Norwegians in *Archiv* were by Carl Størmer (in 1906), Richard Birkeland (1909), Viggo Brun (1910), Atle Selberg (1943), all four in English, German or French.

²⁵ Legally speaking, it was in the same country until 1905, because Norway and Sweden were in a union under Swedish dominance, although with relative independence of the Norwegian parliament (Stortinget).

²⁶ These various letters and memos are kept by Riksarkivet in Oslo with the files of the Kirke- og utdannings departementet (KUD) under Katalog 1251, Tidsskrifter D, nos. 10 and 816/817. *Acta Mathematica* was also supported by the Swedish, Danish and Finnish governments (Barrow-Green, 2002).

²⁷ Sources are in KUD with letters by Lie and Bjerknes.

²⁸ The editor was the Danish–Norwegian physiologist Sophus Torup (1861–1937).

²⁹ KUD, Katalog 1251/16, no. 816. “Den begyndende Matematiker behøver netop et Tidsskrift, hvor han kan faa sit Arbejde trykt paa eget Ansvar og netop et Tidsskrift af Anseelse ude og hjemme.”

The termination of *Archiv* would be frustrating for the ambitions of young mathematicians. Nothing is more important in small communities than taking care of the younger generation, and making the right selection among them, and this is done best by giving the able young mathematicians opportunities to stand out.³⁰

In the end, *Archiv* survived for almost five more decades until it terminated in 1961.

Another “Archive” was founded in 1903 by the Swedish Academy of Sciences under the name of *Arkiv för Matematik, Astronomi och Fysik*.³¹ In 1949 the journal specialized further and was divided into four separate journals, one of which was *Arkiv för Matematik*. In 1971, the Institut Mittag-Leffler took over the publication of *Arkiv* which since 2017 is accessible online free.³² From the beginning, the journal had a strong Swedish profile on a high mathematical level. It has published Swedish authors such as Cramér, Nagell (originally Norwegian), and Carleson but also some mathematicians from non-Nordic countries. Since 1949 it has carried only research articles. In the 1980s and 1990s, *Arkiv* was broadly used for the publications of Swedish mathematical theses. Since then the journal has aimed at increasing its international level and any special treatment of Swedish authors has disappeared. It is today a general international mathematical journal with articles usually no longer than 30 pages.

While *Archiv* and *Arkiv* in their first years helped the careers of young, not yet established, mathematicians, it was the actuarial profession, which was well developed in Scandinavia, and which also needed a mathematical journal for its special needs. There was a flourish of inter-Scandinavian activities, a reorganization of national societies for actuarial mathematicians, and resulting foundations of journals even before 1914. These developments were partly delayed by the dissolution of the Norwegian–Swedish Union in 1905, and they were slowed down by World War I. They came to fruition only after the War and I will therefore go into them briefly in the next section.

While joint Scandinavian publication efforts in research mathematics (*Acta Mathematica*) had been well under way for several decades, this was less the case with respect to a journal for issues of mathematical education,³³ in spite of activities of Felix Klein’s ICMI (since 1908) and the start of Scandinavian Mathematical Congresses at about the same time. As Kurt Ramskov has already noticed, the idea of a joint Scandinavian journal for elementary mathematics was discussed between the Danish topologist Poul Heegaard (1871–1948) and Mittag-Leffler in 1911. Heegaard raised the topic for discussion because he thought the Danish journal, now under the new title *Nyt Tidsskrift for Matematik*, did not work very well and he imagined a Scandinavian successor would work better; but the idea was not carried out at that time.³⁴ In the letter to Mittag-Leffler from 30 September 1911, to which Ramskov has also alluded, Heegaard said:

There is really not the slightest need for a scientific mathematical journal in the North in addition to *Acta Mathematica*. However, I believe that a journal which is directed towards high school teachers has its justification.³⁵

³⁰ KUD, Katalog 1251/16, no. 816. “Archivets Ophør vilde virke nedtrykkende paa de unge Matematikeres Stræben. Men intet er vigtigere i smaa Forhold, end at tage sig af Eftervækster, de unge, og faa gjort det rigtige Udvalg mellem dem, og dette sker allerbedst ved at give de dygtige anledning til at udmærke sig.”

³¹ The following information about the Swedish *Arkiv*, I owe mostly to Mikael Rågstedt, the librarian of the Institut Mittag-Leffler in Djursholm/Stockholm, in particular through emails addressed to me September 5, 2016 and July 17, 2017.

³² *Arkiv för Matematik* from 1949, together with *Acta Mathematica* from 1882, is freely accessible through the Project Euclid via <http://projecteuclid.org/all>.

³³ This was somewhat insufficiently resolved by NORMAT in 1953, see below.

³⁴ Ramskov (2000, 235). The author refers to letters from Poul Heegaard to Gösta Mittag-Leffler, 30 September, 14 October, 1, 10 and 18 November 1911.

³⁵ “Til et virkelig videnskabeligt matematisk Tidsskrift i Norden udover Acta er der jo ikke den ringeste Trang. Derimot tror jeg et Tidsskrift der særlig tog Sigte på Gymnasiallærerne . . . faa Eksistensberettigelse.” Letters by P. Heegaard to G. Mittag-Leffler, 1911, letter 8 (Institut Mittag Leffler, Djursholm).

Heegaard added with reference to the notion of “Scandinavianism”:

This could at the same time become a contribution to spiritual Scandinavianism, the importance of which is becoming more and more clear to me.³⁶

4. The reorganization of Scandinavian mathematical research publishing after World War I

World War I was a turning point not only politically but also with respect to science and its social infrastructure (reviewing, publishers, publishing costs etc.), both internationally (Remmert and Schneider, 2008) and in Scandinavia. The promises given to the Scandinavians to organize a first International Congress of Mathematicians on Scandinavian soil (Stockholm, 1916) had not been fulfilled due to the war. The Scandinavian Mathematical Congresses had started in 1909, and the moving spirit, Mittag-Leffler, managed to organize one of those in Stockholm in 1916 instead of the ICM, but participation from non-Scandinavian countries was basically nil (Turner and Sørensen, 2013). The death of Mittag-Leffler in 1927 and problems with financing his institute led to a relative, and temporary decline of the role of Swedish mathematicians within Scandinavian mathematics. However, the role of Sweden as a haven for Jewish mathematicians particularly after 1943, and, finally, the foundation of a first national society of mathematicians in Sweden after WWII in 1950 changed this situation again (see below).

The decades between the two World Wars saw considerable progress in the development of the research infrastructure in Norway and Denmark, partly supported by the states, partly by private money from foundations (Rask-Ørsted and Carlsberg in Denmark, various national insurance companies) and the national governments. In Oslo, the University campus at Blindern was developed extensively, in Denmark the University of Aarhus was founded in 1928 (but did not have a mathematics department until 1954), and the University of Copenhagen got its first proper mathematical institute in 1934. An important event for the international visibility of Scandinavian mathematics was the organization of the first International Congress of Mathematicians in Scandinavia (Oslo in 1936), generously supported by the Norwegian state.³⁷

In certain areas of predominantly regional and applied character, in particular in actuarial mathematics, specific Scandinavian collaboration was particularly important, because it provided the necessary “critical mass” for having a reasonable return on the efforts invested.

In 1918, the Danish *Nyt Tidsskrift for Matematik* (New Journal for Mathematics) published a review by P.H. (undoubtedly its then editor Poul Heegaard) about a new journal: “*Skandinavisk Aktuarietidskrift*, published by the Danish, Norwegian and Swedish societies of actuaries.” The reviewer said among other things:

Svenska Aktuarieföreningens Tidskrift which had been edited by Dr. N.V.E. Nordenmark has been terminated. After some negotiations between the actuaries of the Nordic countries it has been replaced by a journal with the title above. . . . The number of actuaries in the Nordic countries is so limited that this has to be welcomed. The closest contact between actuaries of these countries is important. . . . Financial foundation for the journal is guaranteed by the life insurance companies of the three countries.³⁸

³⁶ “Samtidig . . . det blev et Led i den aandelige Skandinavisme, hvis Betydning bliver mig mere og mere klar.” More on Scandinavianism as an ideology also in science in Turner and Sørensen (2013).

³⁷ See Hollings and Siegmund-Schultze (forthcoming).

³⁸ “Skandinavisk Aktuarietidskrift, utgiven af Foreningen af danske Aktuarer, Den norske Aktuarforening och Svenska Aktuarieföreningen,” *Nyt tidsskrift for matematik*, vol. 29, Afdeling A (1918), pp. 18–19.

More details about the origins of *Skandinavisk Aktuarietidskrift* are given in an article written by two former editors of *Scandinavian Actuarial Journal* in 2014 on the occasion of the centenary of the foundation of their journal:

In the early 1900s, a number of Scandinavian academics expressed an interest in establishing a Scandinavian Society for Danish, Norwegian and Swedish academics and practitioners in the actuarial field. Professor Gösta Mittag-Leffler, Stockholm, argued that this was a necessary step towards the publication of a pure insurance mathematical journal. However, when the Danish Society was founded in 1902, the idea of a Scandinavian society was abandoned and in 1904 the Norwegian and Swedish societies were subsequently established. Later that year, at the Nordic Congress on Life Insurance in Copenhagen, the first issue of a joint journal, *Aktuaren*, was presented. The editor was Dr. J.P. Gram, Copenhagen.

When the union between Sweden and Norway was dissolved in 1905, the political and economic situation made financing the journal impossible and the project was postponed. At the Nordic Life Insurance Meeting in Stockholm 1912, a joint journal was once again on the agenda. A committee consisting of Dr. J.P. Gram, Denmark, Cabinet Minister L. Lindelöf, Finland, Manager Th. Faernley, Norway, and Professor Gösta Mittag-Leffler, Sweden, looked into the possibility of finally realizing a Nordic journal. There were many obstacles, however, which led the Swedish Society to consider publishing a journal of its own. . . . *Svenska Aktuarietidskrift* was published in four volumes 1914–1917.³⁹

Finally, in 1918 *Skandinavisk Aktuarietidskrift* was founded by Swedish, Danish, and Norwegian actuaries, and, in 1923, the newly created Finnish Society of Actuaries adopted the journal as its official publication. Under its original name in English translation (from 1973), *Scandinavian Actuarial Journal* is now a specialized research journal, publishing in English and with a strong focus on applications in actuarial mathematics. Similar to other mature research journals, it no longer contains many historical reflections. It contains many valuable articles from both Scandinavian and non-Scandinavian authors exhibiting the growing international collaboration in this field. The first decades of this journal, in particular, deserve a more detailed historical study, because the journal seems to have been of utmost importance also from the standpoint of a more general development of mathematical statistics.⁴⁰

At about the same time, along with *Skandinavisk Aktuarietidskrift*, there were other statistical journals founded with “Nordic” ambitions, partly differing in their focus of applications. Among these was *Nordisk Statistisk Tidskrift* (edited by Thor Andersson in Stockholm 1922–1932). *Nordisk försäkringstidskrift*,⁴¹ which belongs to the society Svenska Försäkringsföreningen (founded 1875), has been published from 1921 and has broader aims than just mathematics, being the organ of a society for the insurance industry. The Swedish–Finnish astronomer Hugo Gylden (1841–1896) was among the founders of Svenska Försäkringsföreningen, which prides itself for its emancipatory policies having elected Sofia Kovalevskaya as a member in 1885.⁴² Also mathematical astronomy, traditionally a strong field in Nordic countries, led to new “Nordic” journals at the time, such as *Nordisk Astronomisk Tidsskrift* (Copenhagen, 1916–1967). The

³⁹ Djehiche and Sandström (2014, 16).

⁴⁰ One finds articles, for instance, by Polish–German L. v. Bortkiewicz on homogeneity and stability in statistical reasoning (1918), the Austrian E. Blaschke on the cognitive restructuring of mathematical statistics (1921), the German–Austrian H. Pollaczek-Geiringer on Charlier series (1928), and the Swede H. Cramér on the foundations of actuarial science (1931). In addition, *Skandinavisk Aktuarietidskrift* in its first decades carries many reports about statistics abroad, book reviews and obituaries.

⁴¹ Apparently printed from 1 (1921) to 90 (2009). Now online under <http://www.nft.nu/sv> and advertised as “Nordisk försäkringstidskrift. Ett samarbete mellan försäkringsföreningarna i Danmark, Norge och Sverige” (Nordic insurance journal. A collaboration between the insurance associations of Denmark, Norway, and Sweden).

⁴² Kleverman and Lönnborg (2015). The authors refer for details to Larsson and Lönnborg (2014). It sounds strange that an ordinary membership for a woman was considered as something emancipatory.

astronomical journals may deserve more detailed historical investigation as well, in particular with respect to interconnections with mathematical statistics and celestial mechanics.⁴³

As these examples have shown, actuarial mathematics, which for decades had been and continued to be a substantial basis for the livelihood of many mathematicians⁴⁴ (not only in Scandinavia), was an important factor for the foundation and sustenance of mathematical journals as well. This went beyond more applied journals such as *Skandinavisk Aktuarietidsskrift*, and it was visible in another important development, the foundation of the Norwegian *Norsk Matematisk Tidsskrift* (Norwegian Mathematical Journal) in 1918/1919.

Here an important role was played by Poul Heegaard, who was, as we have seen, originally involved in the Danish mathematical journal. On the situation of the latter journal during WWI Kurt Ramskov has reported in *Historia Mathematica*:

Until 1918 the journal was run on a private basis independently of the Mathematical Society even though information from the Society appeared in the journal from time to time. . . . When the Society took over the journal from Heegaard its name was changed back to *Matematisk Tidsskrift*. The editorial board was now to be elected at the annual general meeting of the Society according to the new rules of the Society.⁴⁵

In fact, Heegaard's short editorship of the Danish journal had been overshadowed from its beginning in 1916 by a controversy with Harald Bohr and other Danish mathematicians (J. Hjelmslev) described in Ramskov (2000, 230). In 1918 Heegaard left the journal and his country Denmark, and he assumed a professorship at the University in Kristiania (renamed Oslo in 1925). The Danish Mathematical Society took official responsibility for their journal for the first time. They even paid Heegaard an amount for handing it over to them (Crone, 1923, 90). Government support for the Danish journal is documented, at least for the period 1912–1923 (Crone, 1923, 89/90).

While the Danish mathematicians lost Heegaard as an editor, this turned out to be a gain for Norway. In an anonymous review in *Matematisk Tidsskrift* in 1921 one reads under the title heading *Norsk Matematisk Tidsskrift. Organ For Norsk Matematisk Forening*:

This organ with which we have now established a journal exchange – under the editors Poul Heegaard and Olav Thalberg – has sent out the volumes for 1919 and 1920 . . .

Even though the journal does not contain as much purely elementary material as the Danish one does, it keeps nevertheless a middle ground between elementary and genuinely scientific journals. Unfortunately, we will probably now welcome Norwegian guests in our journal less frequently but we are glad to see that there is so much life in the Norwegian study of mathematics that such a journal is required, and this can of course also be stimulating. (Anon, 1921)

In 1943, on the occasion of the 25th anniversary of the Norwegian Mathematical Society, Heegaard's coeditor, Olaf M. Thalberg (probably 1890–1981), reported in detail about the foundation of the society in 1918 and about its close connection to the new journal *Norsk Matematisk Tidsskrift (N.M.T.)* founded at the same time. Thalberg quotes from the protocol on the foundation of Norwegian Mathematical Society (Norsk Matematisk Forening, NMF) written by the actuarial mathematician Arnfinn Palmstrøm (1863–1922):

⁴³ Gyldén was an insurance mathematician at the Thule company in Stockholm. Swedish astronomer Carl Vilhelm Ludwig Charlier (1862–1934) played an important role in Swedish statistics too.

⁴⁴ Earlier in our article Tychsen and Gram, who had jobs in the insurance industry, have been mentioned. Mittag-Leffler himself was the principal cofounder of the Victoria insurance company, and Eneström published on actuarial mathematics as well. On the Dane Gram we find the following in Sørensen (2006, 210): “Although he had a full job at Hafnia, Gram produced mathematical research, which secures that his name today occurs in introductory courses in linear algebra as one of the creators of Gram–Schmidt orthogonalization.”

⁴⁵ Ramskov (2000, 231), referring to Fabricius-Bjerre (1952).

On 27 September 1918 the following gentlemen met in the [Kristiania–Oslo] office of the last mentioned, at the Brage Life insurance Company in order to discuss the foundation of a Norwegian mathematical society and, in connection, the publication of a mathematical journal:

Professor Alf Guldberg – professor Poul Heegaard – professor Carl Størmer – docent Th. Skolem – rektor Magnus Alfsen – overlærer [senior teacher] Anton Alexander – overlærer Anders Sjøgaard – actuary Dr G. Holtsmark – actuary N. Solberg – cand. real Viggo Brun – stud. real Trygve Nagel – actuary A. Palmstrøm.

According to the same protocol, the committee sent applications for economic support to life insurance companies and banks through Den Norske Bankforening and an application for state support to the Church and Education Ministry [Kirke- og Undervisningsdepartementet: KUD].⁴⁶ Carl Størmer was elected “foreman” (formann) of the new NMF, which was founded 2 November 1918; the meeting was again organized by Palmstrøm from the Brage insurance company. Palmstrøm remarked on this occasion with slight exaggeration that the foundation would not have come about without Heegaard’s move to Norway: “He had many years of experience as editor of a mathematical journal in Copenhagen” (Thalberg, 1943, 66).

As remarked in the 1921 review in the Danish *Matematisk Tidsskrift* the Norwegian twin journal did not have a separation between research articles and more popular publications. As coeditor Thalberg said in 1943:

Already during its first year in 1919 N.M.T. received many more manuscripts than it could print due to lack of space. The pressing economy restricted the number of pages. However, due to support by well-to-do men and specially after Heegaard’s appeal “Videant Consules” in volume 1920 (p. 48) the printing of mathematical papers outside the *N.M.T.* was organized as *Norsk Matematisk Forenings skrifter* (since 1921 and in single issues). (Thalberg, 1943, 71)

In his appeal, with its title “Videant Consules” alluding to procedures in the ancient Roman Senate, Heegaard had evoked the pressing economic problems of mathematical publishing after the war:

The situation has now become such that one has to wait several years before one can hope that a scientific work will be published, . . . which can change scientific employment into a luxury for rich people with a taste for it. . . . The efficiency of money spent on publishing has been reduced to one fourth.

Norsk Matematisk Forenings skrifter was a kind of equivalent to the series B of the Danish *Matematisk Tidsskrift*. In its first series between 1921 and 1928 a total of 18 treatises by Norwegians was published, among others by T. Nagel, Ø. Ore, T. Skolem, and R. Frisch. Several of the issues were doctoral dissertations. Within the pages of *N.M.T.* – of which after Heegaard’s departure in 1923 the logician Thoralf Skolem (from 1930) and Thalberg (from its beginning) were the longest-serving editors – most publications were written by Norwegians. A few publications by foreign mathematicians (such as F. Engel, W. Lorey, M. Dehn) were included as well, in particular talks, which had been presented to the Mathematical Society (Norsk Matematisk Forening, NMF), translated into Norwegian. One cannot find, however, a particular emphasis on (non-Norwegian) Scandinavian authors compared to non-Scandinavians.⁴⁷ Some articles were research contributions, but usually with an appeal to the broader mathematical public. As to the pedagogic aspirations of the journal there were several categories, listing exam assignments from Norwegian univer-

⁴⁶ In the files of KUD in the Oslo Riksarkiv (Katalog 1251, Tidsskrifter D, no. 817) one finds documentation for continued state support for the Norwegian journal, in particular for the period 1935–1950. The sums for the journal granted by the Parliament (Stortinget) were e.g. 600 kroner in 1935, 1200 kroner in 1938, 1000 kroner in 1950.

⁴⁷ Except for the fact that the Norwegian number theorist Trygve Nagel, who published repeatedly, was in Uppsala from 1931 and apparently changed his name to the more Swedish-looking Nagell for this reason.

sities and high schools but also putting special assignments (oppgaver) to high school students, many of which were formulated by T. Nagel (Nagell).⁴⁸

The journal is notable for its many historical contributions (many written by Viggo Brun, Heegaard, and Størmer), for example about Abel, Lie (in particular in connection with the edition of his works by the German F. Engel) Galois, and Thue. The review section of *N.M.T.* contains interesting evaluations, including occasional political allusions to developments in Nazi Germany seen from a neutral country.⁴⁹

Norway, similarly to Denmark, was a country of transit for refugees from Nazi Germany, but this was much less reflected in *N.M.T.* (Dehn, 1939) than in the parallel Danish *Matematisk Tidsskrift*.⁵⁰ The latter, in particular due to Harald Bohr being one of the editors of Series B from 1919 to 1942, became more international at the time, as an increasing proportion of the contributions came from foreign mathematicians (Ramskov, 2000, 233).

The overall impression is that the foundation of *N.M.T.* and its development until WWII reflected temporarily divergent developments in Scandinavian mathematics and even diminishing collaboration between Scandinavians. This seems a bit surprising in view of the political developments, particularly after 1933, which would suggest increased Scandinavian collaboration given reduced possibilities of exchange with nearby mathematical powerhouse Germany.

It was probably a natural consequence of this focus on national consolidation in the various countries that the creation of proper inter-Scandinavian mathematical journals did not occur before World War II. All three major Scandinavian mathematical environments also had to deal with the consequences of immigration of refugees from Nazi Germany after 1933, which contributed to another push for internationalization, but going beyond the Scandinavian level. In the end, this push and the dominant role of English in mathematics became more and more obvious. This showed that Scandinavian journals, even joint ones between several Scandinavian countries, were only one step on the way to internationalization.

5. Another reorganization of Nordic-Scandinavian mathematical research publishing after World War II

Also Danish mathematicians have frequently published in foreign languages and in the past few years almost all contributions to our journal have been written in one of the main languages.⁵¹

This exaggerated remark (which certainly did not apply to the more elementary series A of the journal) is contained in a 1952 article on the history of *Matematisk Tidsskrift* by its last editor Fr. Fabricius-Bjerre (1903–1984) in which he announces the termination of that journal. He then finds optimistic words for the profit to be drawn from two new Nordic mathematical journals “in order to establish close collaboration with the other Nordic countries.”

In 2003, based on material from the archives of the journal *Mathematica Scandinavica*, Bodil Branner wrote a detailed article on the foundation of that joint Scandinavian mathematical research journal half a century before (Figure 5). This journal continues to flourish today, edited from Aarhus, and now accessible

⁴⁸ Thalberg gives a list of the 23 winners of the yearly competition for Norwegian high school students between 1921 and 1942, in which an average of 5 pupils took part (Thalberg, 1943, 70). Best known among them is Ernst Selmer (1920–2006), the winner for 1937, who later became an influential Norwegian number theorist.

⁴⁹ The journal, which, unfortunately, seems difficult to access due to its language and its scarce availability in non-Norwegian libraries, is therefore a valuable source still to be explored by historians of mathematics. A first approach could be through Thalberg’s article of 1943 which, although also in Norwegian, gives a first impression and many details.

⁵⁰ See Sørensen (2014, 180) on contributions by O. Neugebauer, Käte and Werner Fenchel in the Danish journal; Siegmund-Schultze (2009) on Dehn, Siegel and Jacobsthal in Norway.

⁵¹ “Også danske matematikere har ofte publiceret på et fremmed sprog, og i de sidste år har næsten alle bidrag til tidsskriftet været skrevet på et af hovedsprogene” (Fabricius-Bjerre, 1952, 106).

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Figure 5. Title page *Mathematica Scandinavica* (1953), which gives Copenhagen as a place of publication, soon to be replaced by Aarhus.

online. From the beginning the journal only accepted articles in English, French or German. Authors were originally mostly from Scandinavia, but this has changed particularly since the 1970s towards a much bigger proportion of non-Scandinavian authors as well.

As Branner explains the foundation of this journal cannot be discussed without looking at the parallel foundation of the more elementary *Nordisk Matematisk Tidsskrift* (Nordic Mathematical Journal). While *Mathematica Scandinavica* was supposed to replace the series B of the Danish mathematical journal and the corresponding more advanced parts in the Norwegian journal, *Nordisk Matematisk Tidsskrift* was meant to continue the more elementary parts of both journals (Redaksjonelt, 1953).

For both new Nordic journals the Danish mathematician Svend Bundgaard (1912–1984) was the driving force. The new developments in journals cannot be considered separately from the reorganization of the Scandinavian research environment at the same time. Bundgaard was also the founder of the department of mathematics at the Danish University of Aarhus in 1954. International comparison not only within Scandinavia was decisive for Bundgaard in both efforts.

As Branner describes there were concerns both on the Norwegian and the Danish sides. For the Norwegians (Viggo Brun being strongly involved) it was apparently not easy to give up the Norwegian journal for the survival of which they had struggled during several decades. Another reason for hesitance was that the Danish and the Norwegian journals had been used as exchange items to obtain foreign journals. For example, in 1951, the Danish *Matematisk Tidsskrift* was sent to a large number of libraries and departments of mathematics all over the world, and in exchange the library at the Department of Mathematics at the University of Copenhagen received about 135 other mathematical journals. The department paid half price for the copies sent abroad in exchange (Branner, 2003, 8/9).

As Branner reports, there was originally even some fear of scientific competition from *Acta Mathematica* (then edited by N.E. Nørlund). But in the end an unanimous decision was taken by the five Nordic countries in favor of founding the new research journal, with all five mathematical societies appearing on the title page even today.

However, there was originally even more resistance against the more elementary journal, because here the interests of broader and dispersed mathematical circles (research mathematicians and teachers) and existing journals⁵² had to be overcome, in addition to special national interests.

Finally, *Nordisk Matematisk Tidsskrift* was founded in the same year 1953, also published by the five Nordic mathematical societies. It was originally edited from Oslo but since then the place of the editorial office has been located in various Nordic countries, currently it is in Göteborg (Sweden). However, considerable delays in the publication of NORMAT (its official name since 1979) in recent years⁵³ seem to indicate that the Nordic community of mathematicians and mathematics teachers may be unable or unwilling to sustain a journal of this kind. One of the main issues is apparently that the journal continues to publish in the three main Scandinavian languages Danish, Norwegian and Swedish. Additionally, in contrast to the research journal *Mathematica Scandinavica*, NORMAT has never reached online status.

A long and emotional appeal for support, written by the Swedish editor Ulf Persson in April 2013, points to problems such as the lack of subscriptions, competition by similar journals (Persson points to the *Bulletin of the American Mathematical Society*), and the lack of personal stimulus and rewards for publishing in NORMAT. Persson asks for more popular contributions by professional mathematicians. He then summarizes his appeal in the following somewhat resigned and pessimistic note (Persson, 2013, 7):

It is clear that 60 years ago Nordisk Matematisk Tidsskrift had a very important function. Can one say the same thing today? Times have changed and with them the mathematical landscape.

6. Conclusions and conjectures

Not all reasons and all background for the developments described in this article could be fully investigated and many questions remain open. Geographical factors such as the more densely populated community of mathematicians in Denmark, a small state with focus on Copenhagen, may have contributed both to an early foundation of a mathematical journal (1859) and a concomitant society (1873). The nearness of the mathematical powerhouse Germany created special conditions for the Danish. Greater geographical distances in Norway (between the three main cities Christiania/Oslo, Trondheim and Bergen) and in Sweden (between Uppsala/Stockholm and Lund) may have prioritized more local developments⁵⁴ in these two countries. The existence of a mathematical journal in a Scandinavian language or of a soci-

⁵² Some of them have not even been introduced here in the article due to lack of space, such as *Elementa* in Sweden from 1917, *Matemaattisten* and *Arkhimedes* in Finland from 1936 and 1949.

⁵³ The first issue for 2013 has just appeared in early 2017.

⁵⁴ In particular special mathematical societies; there exist even today two national academies of science in Norway, one in Oslo, another one in Trondheim.

ety with international connections was not necessarily a condition for national prowess in mathematics, as the example of Sweden shows.⁵⁵ Here the towering figure of Gösta Mittag-Leffler, his journal *Acta Mathematica* and the institute in Djursholm played a unique role. Sweden had to wait until 1950 for a national mathematical society, and by then, the creation of a research journal in a Scandinavian language was no longer a priority. Academy publications⁵⁶ in all Nordic countries around 1900 often carried important specialized memoirs on numerical methods (Nyström), the mathematics of the northern lights (Størmer), and celestial mechanics (Sundman). Academy outlets were more prestigious publication venues than the fledgling Scandinavian journals, and those memoirs were often too extensive for the latter. It seems that special and traditional scientific strengths in Nordic mathematics (mathematical astronomy, actuarial mathematics, difference equations, function theory) were primarily fostered in more internationalized journals like *Acta* and *Skandinavisk Aktuarietidskrift*, in Academy publications and in monographs, while various national Scandinavian journals focused on distinct strengths of their respective national communities such as on geometry (Denmark), number theory (Norway), and theory of functions (Sweden and Finland). The latter journals thus offered young mathematicians an initial national visibility on a research scene with a Scandinavian language.

The scarcity of job opportunities, which left the important Norwegian mathematicians Øystein Ore (emigration to the U.S.), Trygve Nagell (emigration to Sweden) and Thoralf Skolem in limbo for quite a while (the last being editor of *Norsk Matematisk Tidsskrift*), may have forced several mathematicians either to look for employment beyond Scandinavia or to prioritize their national visibility through national publication outlets.

In addition to these largely unexplored questions and conjectures the present paper may allow the following conclusions:

With the exception of *Acta Mathematica*, and some specialized journals for applications, interplay between general mathematical journals of the Scandinavian countries (Denmark, Sweden, Norway, Finland) during the 19th and 20th centuries mostly occurred at a rather elementary level (exchange and comparison of exam assignments, reviewing of publications in the other countries, and exchange of experiences in running mathematical journals). Such interplay did not, however, manifest itself in the exchange of research articles or mixing of editorial boards to any large degree. In spite of increasing personal communication between Scandinavian mathematicians, the organization of Scandinavian mathematical congresses (from 1909) and commonalities between the national communities in linguistic, content-related, and political respects, each of the four major Nordic mathematical communities found its own way to full internationalization. Public or private funding of mathematical journals was a prerequisite in all Nordic countries, and mathematicians thus prioritized the national publication outlets. An exception was again *Acta Mathematica*, which was funded by all four major Nordic countries in addition to private financial contributors (not least by Mittag-Leffler himself).

The merger of various Nordic mathematical journals in 1953 to *Mathematica Scandinavica* (for research) and *Nordisk Matematisk Tidsskrift* (for the more elementary parts, from 1979 *NORMAT*) partly confirmed increasing communication between maturing Scandinavian mathematical communities. At the same time the merger originated from practical considerations, seeking a critical mass for economically viable publications. Abandonment of the Scandinavian languages from the beginning in *Mathematica Scandinavica* and the gradually diminishing ratio of Scandinavian mathematicians' publishing in it, as well as the increasing problems in recent years to sustain the intra-Scandinavian journal *NORMAT* testify to the priority of international communication beyond the Scandinavian countries and beyond their national languages.

⁵⁵ “In the beginning of the 20th century Sweden had a great and proud mathematical tradition, and their Danish colleagues envied them for the many positions with three universities and developed mathematical centers” (Sørensen, 2006, 198).

⁵⁶ On the role of academy outlets within the development of a mathematical research environment in Sicily in the 19th century see the contribution by R. Tazzioli in this issue.

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