

Mathematics throughout the ages

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“VIELLEICHT FÜR MENSCHLICHE KRÄFTE UNAUSFÜRBAR”

A Mathematical Proof of a Danish Astronomer?

(Dedicated to the 200th anniversary of Clausen’s birthday)

HARALD GROPP

1 Introduction

This paper is a short report on the Danish astronomer and mathematician THOMAS CLAUSEN based on my talk at the Novembertagung 1999 in Holbaek in Denmark. It is my contribution to the 200th birthday of this quite important scientist in January 2001. For the exact date of his birth in January 1801 see below.

This paper also contains material which I obtained after the Novembertagung talk in October 1999. In particular, I got further information during my stay in Denmark in October 1999 thanks to libraries and my friend SIGURD ELKJÆR.

A second talk was given by the author in Lilienthal (Bremen) in September 2000 during the conference of the Astronomische Gesellschaft. Thanks to ARNO LANGKAVEL who showed me a photo of CLAUSEN’s memorial plate I started to get further information on CLAUSEN’s birth and death dates. This topic will be discussed in detail below.

My first interest in this topic started some years ago when I discussed the history of a combinatorial structure in [7]. For all details which are not described in the following section please see my longer report of 1995.

2 The mathematical problem

2.1 A letter from Schumacher to Gauss

Der Beweis der vermutheten Unmöglichkeit für 10, so geführt wie er ihn für 6 geführt hat, würde wie er sagt, vielleicht für menschliche Kräfte unausführbar seyn.

This sentence occurs in a letter from Schumacher, astronomer in Altona, to Gauss, astronomer in Göttingen. The letter is written on August 10, 1842. Schumacher reports on mathematical results which his assistant Thomas Clausen possibly obtained. Schumacher claims that Clausen proved (in modern terminology) the nonexistence of 2 orthogonal squares of order 6 and that Clausen thinks that the same result for order 10 would be *not executable for human forces* if done in the same manner.

2.2 A few definitions

A *Latin square of order n* is a square matrix of order n with n different entries such that every element occurs once in each row and in each column. Today it is usual to use the numbers from 1 to n as entries. In the times of Euler Greek and Latin letters were more often used. This is the origin of the name of these squares.

Two Latin squares are said to be *orthogonal* if every ordered pair of elements occurs exactly once among the n^2 pairs of coordinates of entries in the corresponding position in the matrix.

2.3 An outline of the history from Euler to the 20th century

Euler's conjecture of 1782 is stated as follows.

... et je n'ai pas hésité d'en conclure qu'on ne sauroit produire aucun quarré complet de 36 cases, et que la même impossibilité s'étende aux cas de $n = 10$, $n = 14$ et en général à tous les nombres impairement pairs.

The only case in which Euler was true is $n = 6$. There are no two orthogonal Latin squares of order 6. This was proved by Tarry in 1900. Whether Thomas Clausen proved it already in 1842 is not clear. From the discussion below it follows that it may be the case but we should try to find further hints.

In all the other cases Euler was wrong. There are 2 orthogonal Latin squares of order 10, 14, 18, etc. The two of order 10 were constructed by Bose, Shrikhande, and Parker in 1960 with big help of computers. Even the New York Times reported about this mathematical result.

3 Clausen's biography

Clausen's biographical data are discussed here in detail since the generally known ones are not at all without doubt.

3.1 A memorial plate in Tartu

In Tartu (Estonia) there is a memorial plate for Clausen which says the following.

Professor Emeritus
Dr. Thomas Clausen
geb. in Schleswig-Holstein 16./28. Jan. 1801
gest. zu Dorpat 12./24. Mai 1885

I could see a photograph of this plate in September 2000 in Bremen during a meeting on history of astronomy.

It is remarkable that the birthplace is given as "Schleswig-Holstein". Today this is the northernmost federal state of Germany. This vague description without giving a town or village as exact birthplace hints to a problem which will be discussed below. "Dorpat" is the German name for the town which is now called Tartu.

The dates of birth and of death are given as two dates each (differing by exactly 12 days). This can only be understood as the Julian and the Gregorian calendar date resp.

3.2 Some lexica

In a German lexicon of 1867 [1] the place and date of Clausen's birth is given as "Nübel im Schleswigschen", January 16, 1801. Since this lexicon was published long before Clausen's death let me cite here the two last entries concerning his time in Estonia.

*1842 Observator u. interimistischer Director der Sternwarte
in Dorpat, kaiserl. Russischer Staatsrath, im October 1865
Nachfolger des Professors Mädler auf dem Lehrstuhl der As-
tronomie zu Dorpat.*

The entry in a modern German lexicon of 1976 [9] tells that Clausen is born in Schnabek (Snogbaek), Ksp. Satrup (Sottrup), Nordschleswig on January 16, 1801, and that he died in Dorpat (Tartu) on May 23 (11), 1885.

Further confusion is created by the entry in "Deutsche Biographische Encyclopädie" which says: birth in Nübel (Schleswig) on January 16, 1801, death in Dorpat on May 24, 1885.

A similar entry can be found in "Brockhaus": birth in Nübel (Kreis Schleswig-Flensburg) on January 16, 1801, death in Dorpat on May 24, 1885.

In the Estonian encyclopedia ENE of 1987, published in Tallinn, the dates of Clausen are given as follows: birth in Põhja-Jüütimaa (i.e. Northern Juteland) on

January 16, 1801, death in Tartu on June 5, 1885.

In the Estonian biographical lexicon "Eesti teaduse biograafilises leksikonis" we find (concerning Clausen): birth in Snogbaek, Põhja-Jüütimaa on January 16, 1801, death in Tartu on May 23/11, 1885.

3.3 The birth place and date of Clausen

As far as I can see it means that Clausen was born on January 28, 1801 (Gregorian calendar in Denmark). Since this calendar has been in operation since then in Denmark, the 200th anniversary should have been celebrated on January 28, 2001 in Denmark, in Germany, and in Estonia. Probably, it was celebrated on January 16 (if at all) according to the relevant lexica.

The birth place is very probably Snogbaek, a small collection of farms only, now in Southern Denmark. At the time of Clausen's death it belonged to Germany. However, it is not in the *Kreis Schleswig-Flensburg* and, of course, not in Northern Juteland.

3.4 The date of death of Clausen

Concerning the date of death of Clausen it was probably on May 11, 1885 in Dorpat (Tartu) in the Julian calendar which corresponds to May 23, 1885 in the Gregorian calendar.

4 Clausen's importance as astronomer and mathematician

4.1 The logo of the Danish Mathematical Society DMF

The Dansk Matematisk Forening DMF chose as its logo a drawing of Clausen concerning the quadrature of the moons of Hippocrates (compare <http://www.dmf.mathematics.dk/clausen.html>). This shows

and proofs that Thomas Clausen is regarded as one of the most important Danish mathematicians, at least by the DMF.

4.2 A Danish book on astronomy

There is a 3 volume book on astronomy in Denmark from Tycho Brahe to modern times [8]. Schumacher occurs on ca. 30 pages, Clausen does not occur at all in this book, not as astronomer in Altona, not as a Danish amateur astronomer, and not as a Danish astronomer abroad.

This means that Clausen did not play a major role in Altona. Maybe he was just privately employed by Schumacher and not an official assistant in the observatory in Altona. However, Clausen should have been mentioned as a Danish astronomer in Tartu since there he played a leading role.

4.3 Are there "lost notebooks"?

In order to find out more about a possible proof of Clausen further research seems to be necessary, either in Tartu, or in Danish archives, or in German archives, or in other places. Maybe it is possible to find some lost notebooks which tell us more.

Two questions remain. If Clausen thought he had proved the result, why did he not publish it? Or did he find a gap in his proof later. At least, it looks as if he was convinced to have found a proof when he told it to Schumacher.

The last question is: What did Clausen mean by "für menschliche Kräfte unausführbar"? Does it mean: Only God could do it. Or did he think of other possible forces, maybe machines like computers in the middle of the 19th century?

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