

# THOMAS CLAUSEN – FROM SHEPHERD BOY TO PROFESSOR

Tõnu Viik

## 1. Introduction

Thomas Clausen started to work as an observer of the Tartu University Observatory in 1842. Three years before that F.G.W. Struve had left for the new observatory at Pulkovo and J.H. Mädler had been elected the director of the Tartu Observatory. Clausen was already 41 when he was given the task to observe with the passage instrument and only after that he was entrusted to observe with the meridian circle. Since then Clausen remained loyal to that instrument. When J.H. Mädler resigned his job in October 1865 the university council found that the befitting candidate to the position of the professor of astronomy – Thomas Clausen – is already present. He held that position 17 long years and only in November 1872 he resigned, having worked in the University for 30 years. In connection with that the council expressed its “sincere and deeply recognized gratitude for the long-term activities towards the welfare of the Tartu University”. After having retired the old man lived 12 more years in Tartu and he died on May 12, 1885 (old style) at 5 o'clock in the morning. In his circular rector von Wahl wrote that he died on Sunday, May 11<sup>th</sup> but according to the Julian calendar there is no Sunday on that date. In the book of St John church in Tartu we found the right date – Sunday, May 12<sup>th</sup>, 1885.

## 2. The beginning of a long journey

Let us look more closely at the life and work of this man.

Thomas Clausen was born in the family of a poor farmer on January 16, 1801 in Schnabeck (Snogbæk at that time) close to Nübel not far from Düppel/Sundeved in Nordschleswig which belonged then to Denmark. He was the eldest child in the family where there were altogether eight children. Because of their poverty the boy started to work as a shepherd for local provost Georg Holst. Even at the age of 12 the boy could neither read nor write. The provost who himself was an amateur mathematician and astronomer and who even observed heavenly bodies sent the boy to a local school. The boy learned very fast everything the school could offer but especially good he was in mathematics. There were even rumours that while observing how big were the mouthfuls of grass the provost's horse could chew he calculated the time when he had to move the stake with the rope to a new place.

At the final examinations the boy was so good that provost Holst came up with the idea that he would take care of boy's education, in such a way freeing him from the field labour. During the following seven years the provost taught Thomas, giving lessons in Latin and Greek languages, mathematics, astronomy and other sciences. In addition to that Thomas learned French, English and Italian in order to be able to read books about mathematics and astronomy in their original language.

When the provost understood that he could not teach young Clausen any more he recommended him to Heinrich Christian Schumacher whom he knew aforetime and who was performing geodetic measurements close to Schnabeck.

H. C. Schumacher who was initially attorney had gained great fame as an



**Thomas Clausen ( 1801 – 1885)**

astronomer by that time and who was also the founder and editor of the astronomical journal *Astronomische Nachrichten*. He is connected with Livland since he had been a private tutor in Tartu in 1806. Evidently under the influence of Johann Wilhelm Pfaff who was the professor of mathematics and astronomy in Tartu University at that time he became an astronomer (perhaps a unique phenomenon in the long history of science).

H.Ch. Schumacher who at that time was the professor of astronomy in Copenhagen University situated in Altona which town belonged then to Denmark (by the way, F.G.W. Struve was born in that town), employed Thomas as a clerk and also to solve some minor mathematical problems.

But quite soon Thomas was able to engage himself in a serious scientific work. Namely, he proposed a method to determine the geographical latitude of a location



### **Heinrich Christian Schumacher**

which rested upon the eclipsing stars by the Moon. Schumacher sent Clausen's work to two prominent astronomers – to Olbers and Gauss. After Olbers had given his praise to this work Schumacher published the paper in his journal and wrote a short introduction to that. The final sentence of the introduction was: "Möge der Name Thomas Clausen einst unter denen genannt werden, die die Fackel der Wissenschaft empfangen und weitergeben!"

We do not know whether the king of mathematicians, C.F. Gauss expressed his point of view about Clausen's work.

### 3. The assistant of Schumacher

Having been completely convinced in Clausen's phenomenal talent, Schumacher hired him a room in Altona in the beginning of 1824 and gave him some astronomical problems to calculate. Later he entrusted him also to perform the observations. In October 1824 Gauss visited the neighbourhood of Altona in connection with the arc measurements. This circumstance was exploited by Schumacher who sent Clausen to Gauss. It is rumoured that Gauss was very glad about the new acquaintance.

Unfortunately the good relations between Schumacher and Clausen did not last long. As the hearsay goes Clausen characterized his superior pretty badly to a Norwegian surveyor. This did not remain in secrecy and Schumacher learned quickly about it. This did not bring their relations to an end but when Clausen broke an expensive barometer and ill-behaved towards Norwegian astronomer Chr. Hansteen then Schumacher threw him out of the house just before the Christmas 1824. The poor man did not have any good plan apart from going to Göttingen to visit Gauss. Clausen asked Gauss to speak with Schumacher in his favour. Gauss did it after having made clear with what Clausen was charged and then wrote a long letter to Schumacher in which he implored Schumacher to forgive Clausen. Gauss explained Clausen's behaviour with the fact that Clausen had had no social upbringing. According to Gauss this becomes apparent even from the aspect that Clausen did not plead guilty. Incidentally, Gauss wrote in this letter that breaking the barometer gives some footing to a thought that Clausen is not good for dealing with practical problems. Gauss's request impressed Schumacher and he reinstated Clausen but their relations were never as good as before these events.



**Georg von Reichenbach**

The reinstating was connected with a requirement that Clausen was to go home for some time in order to bury the hatchet. The situation at home was rather sad since because of the father's illness their farm went under the hammer and the family with three minors was in big trouble.

Schumacher let Clausen to compare the chronometers' readings in Greenwich, Helgoland and Altona for determining the differences of their geographical longitudes by the Gauss method. The results were not as good as Gauss had expected.

Clausen's peace of mind was troubled by falling in love with the niece of Schumacher who lived in the same house. This did not appeal to Schumacher who was the



**Joseph von Utzschneider**

favourite of Danish aristocracy and who had been given next to Tycho Brahe and Hans Oersted the Big Cross of the Dannebrog order (the same order was given also to Joseph von Fraunhofer). For Schumacher Clausen was a nobody – a “Habenicht”. At the same time Clausen worked hard and not a single issue of Schumacher's journal was without Clausen's paper. All this made Clausen well-known among astronomers.

In 1826 Schumacher employed another young astronomer – Christian August Friedrich Peters who was to become the director of Altona observatory. This did not make the relations between Clausen and Schumacher any better and Schumacher started to look around with the aim of finding some other job for Clausen.

#### 4. In the Munich institute of optics

In October 1826 Schumacher visited Joseph von Utzschneider in Munich. In June of that year Joseph von Fraunhofer had passed away, He had made the Utzschneider institute world-famous with his inventions and discoveries in the field of optics.

Now Utzschneider was in a serious need of a good theoretician. And Schumacher offered him Clausen.

After having returned from Munich Schumacher informed Clausen about it in writing. Clausen was very glad and he wrote a letter of acceptance to Utzschneider on November 3rd. In the beginning of the next year Utzschneider paid a certain sum to Clausen as agreed upon in the contract but he did not fulfill his promise to invite Clausen to start his job in Munich as of May 1827. Clausen was so sure of his new job that he had the courage to approach the niece of Schumacher but he was turned down again. In February 1827 he was denied the access to Schumacher's house and this affected Clausen very seriously.

Things got more complicated still. Namely Friedrich Wilhelm Bessel who was the professor of mathematics and astronomy in Königsberg University, visited Utzschneider in Munich and having seen how Utzschneider exerted without good opticians, recommended his former pupil Carl August von Steinheil (who later invented telegraph and started to cover the telescope mirrors with silver, independently of Foucault).

With this recommendation Bessel did not want to hinder Clausen's movement to Munich since he rated Clausen much better mathematician than Steinheil. But it caused a lot of confusion and Clausen's job in Munich moved into distant future.



**Georg Merz**

Utzschneider liked Bessel's idea very much since Steinheil was a rich man and Utzschneider hoped to use his money for financing his optical institute.

In the meantime Clausen got into big economical trouble for he had given notice to Schumacher, partly because of the big promises he was given. Yet the situation started to improve because Georg Merz who was substantially the leader of the optical institute after Fraunhofer's death, was afraid of Steinheil as a contender – somehow he was not afraid of Clausen. Clausen was given a promise that he could start his job in March 1828.

Despite of that it did not happen since Utzschneider could not decide which man to employ! In the meantime an obscure idea surfaced that Clausen was to be employed by a northern observatory. At last it was enough for Clausen and in December 1828

he arrived at Munich. He had come through Göttingen where he had visited Gauss. After that Utzschneider wrote to Schumacher that Clausen appeared suddenly! And yet Utzschneider had employed Steinheil, too. These two young men got along unexpectedly well. Steinheil even wrote to Bessel that Clausen is much better in mathematics than he (Steinheil) and their friendship meant a lot for his education.

In addition he wrote that during the first four months Merz did not allow Clausen to enter the premises of the optical institute. Worse still, he had told Clausen that there would be no reforms in the institute. Everything should be preserved like it was during the Fraunhofer time. But science does not stand still!

What concerns Clausen's living conditions then they were not bad at all – he lived in Utzschneider's house and he was having meals together with his master. He spent his evenings chatting with the host and hostess.

Scientifically he and Steinheil were active in computing the ephemerids of comets. In addition to that he studied the pendulum clock made by Franz Joseph Mahler. This problem was given him by Utzschneider himself who remained satisfied with Clausen's results.

Naturally one is inclined to ask why Utzschneider as a wise man did not manage his enterprise better and did not end the Merz stagnation. There are at least two motives present. Firstly, at that time Utzschneider was close to his seventies and secondly, he as a good businessman had a lot of other enterprises to look after.

As Clausen was not interested in observational astronomy, he dealt with solving the pure mathematical problems and sent some papers about these to August Leopold Crelle's *Journal für die reine und angewandte Mathematik*. In the long run this did not appeal to Utzschneider and he made it explicit in his letters to Schumacher. In addition to that the relations between Clausen and Steinheil got worse and it is not

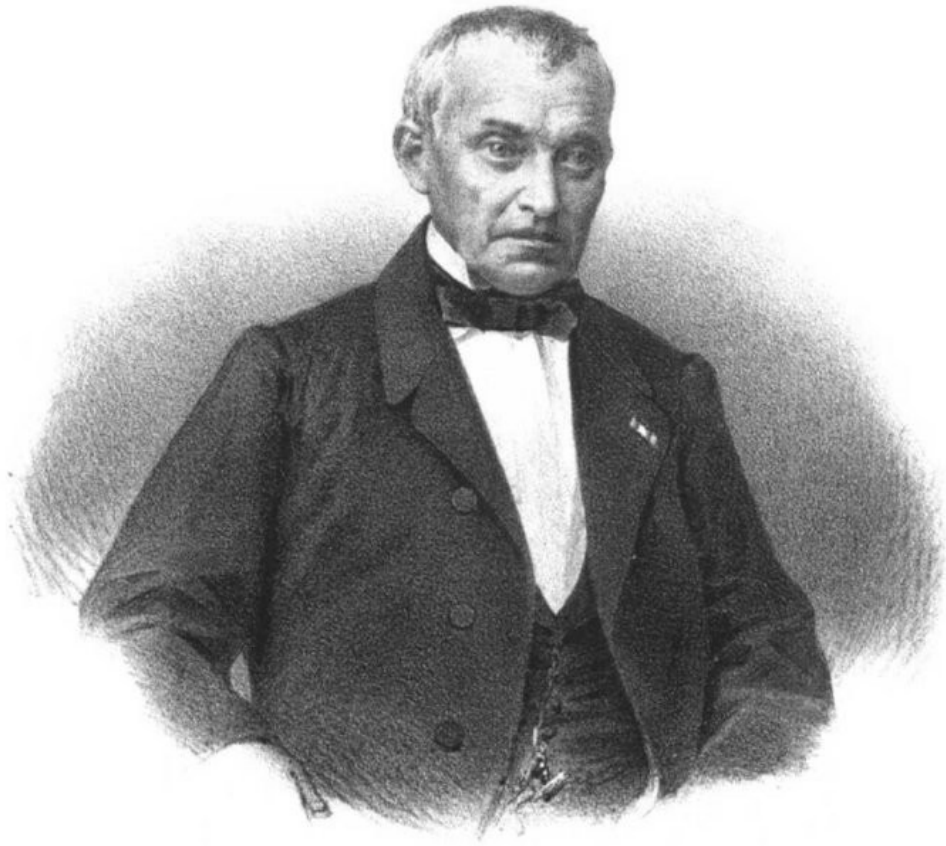
clear who is to be blamed. In the end of 1832 Clausen found out that Utzschneider would never make him the successor of Fraunhofer and this message was extremely oppressive for Clausen.

In the beginning of 1833 Clausen fell ill. It is not clear what kind of disease it was but we may still conclude that it was a mental disease. This lasted six long years – perhaps there were periods of convalescence since when Clausen arrived at Altona he had a lot of manuscripts with him. Yet we do not know what really happened and how Clausen coped with himself during that grievous period of his life.

Why did Utzschneider not use him – his “diamond” as he used to call Clausen – in a more suitable way both for his institute's and for Clausen's benefit? There is nobody to answer that question and we can only make assumptions.

## **5. Back in Altona**

In the middle of June 1840 Clausen is back in Altona, sunbathed to dark brown and his garments torn to shreds. He had come by foot from Munich to Altona and as far as he lacked money he had camped out. All his property consisted of his mathematical ideas and manuscripts. Driven by necessity he found Gauss who wrote to Schumacher that he should not let Clausen go down. This letter had an effect on Schumacher and he endowed Clausen with ten thalers. However, he wrote to Bessel that Clausen whom he had thrown out of the house was back again! Yet he wrote also to Friedrich Georg Wilhelm Struve at Tartu, asking him to find a job for Clausen that Struve could not allow.



**Johann Heinrich Mädler**

In his letters both to Gauss and Bessel Schumacher claimed that Clausen was completely healthy, he had got rid of his dumb laughter and he had become more tranquil. As an example of his previous behaviour we may bring a passage from the letter of the daughter of the Tartu teaching region's curator Alexander Friedrich Michael Lebrecht Nikolaus Arthur, Graf von Keyserling who remembered –"... Professor Clausen who happened to burst into unmotivated laughter; during nights he was heard loudly laughing. It was told that when he was introduced to the King of Denmark he broke into homeric laughter. He was not even able to answer the King's benevolent address. Later he had explained that he had always imagined a king as a playing card from the pack, with a sceptre and crown. He had been very surprised to see the King clad as a common citizen".

At the same time there were negotiations between Schumacher, Gauss and the German mathematician Karl Gustav Jakob Jacobi about the job for Clausen. Jacobi had got a 250 thaler stipend from the Berlin Academy to study the perturbations in the planetary movements and he was in need of a “Rechenknecht” for such a big computational work. This plan, too, failed after all.

At the same time Clausen continued to study some mathematical problems, coming forward with an interesting theorem in pure mathematics which dealt with the Bernoulli numbers. Unfortunately another mathematician – Karl Georg Christian von Staudt had discussed this same problem a couple of years earlier and when Clausen published his result, von Staudt gave his correction notice. Today this theorem is called the Staudt–Clausen theorem.

This work was followed by a paper about the integrability of Hippocrates lunes – moon-shaped areas between circular arcs – which solved the problem known already from classical antiquity.

Many magnificent results in pure mathematics belong to this period: the proof of the complex roots of equations, research in primes and lemniscat etc, but also a dispute with Jacobi since Clausen criticized his planetary perturbation theory. Clausen was not alone in doing so thus we may suppose that Clausen was right in this.

## **6. Tartu period**

Already from the beginning of 1840 Schumacher had written to Johann Heinrich Mädler in Tartu that he should find a job for Clausen. Mädler was not interested in that since he wanted to have Johann Gottfried Galle from Berlin observatory (who

later discovered planet Neptune). But as Galle did not want to come he contented himself with Clausen. Correspondence flourished between Schumacher, Gauss and Mädler. Sometimes Gauss put also a word in in favour of Clausen. On February 8th, 1842 Mädler informed Clausen that faculty council of Tartu University agreed to name Clausen an observer in the university observatory. Perhaps it also helped that Struve recommended Clausen to the Minister of Education Count Sergey Uvarov.

On October 28<sup>th</sup> Clausen arrived at Tartu where he was given a salary of 800 silver roubles per year and the observatory flat which was not ready, though. All the astronomers who knew Clausen were glad that such a worthy man found a good job at last.

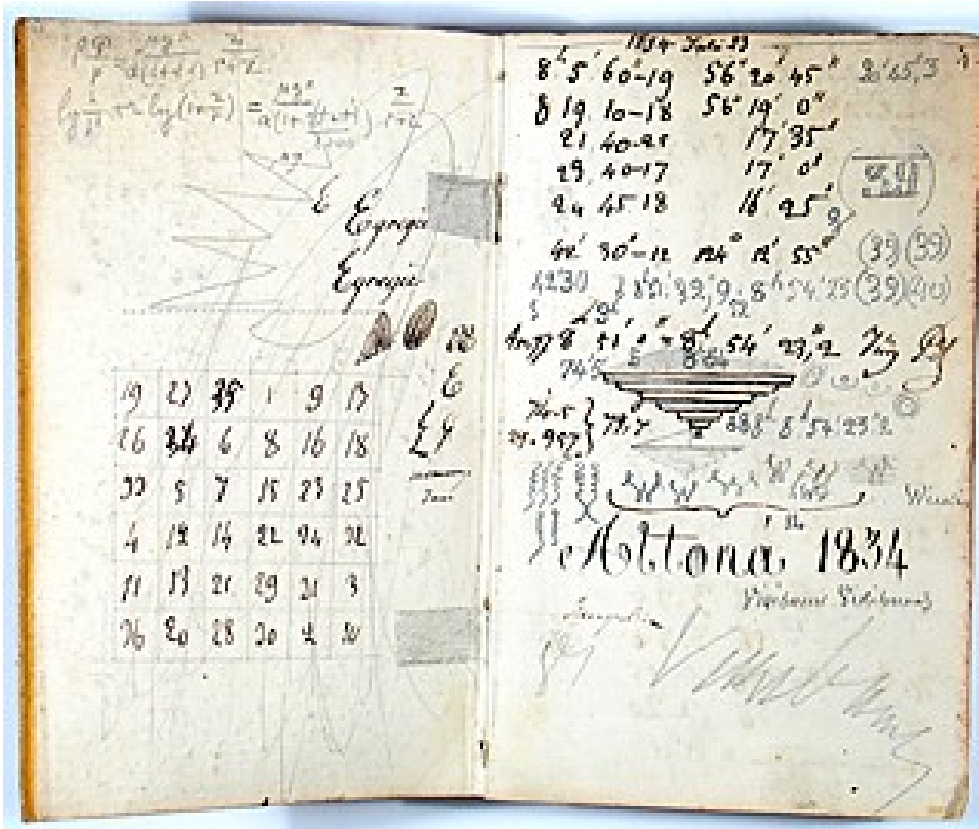
However, Schumacher and Bessel worried about how Clausen and Mädler would get along. But they worried in vain since these men made friends very quickly. Even more, when the Königsberg University celebrated its 300<sup>th</sup> anniversary, Mädler asked Bessel to give Clausen a title of doctor *honoris causa*. Bessel agreed eagerly because Clausen was worth of it and because he remembered well how he himself – an autodidact, too – had got the same title from Gauss in Göttingen University.

In Tartu Clausen continued to solve mathematical problems getting sometimes inspiration from the fact that some mathematician declared a problem unsolvable.

This declaration spurred Clausen on and in some occasions he was even able to find the solution opening up completely new avenues.

He calculated comets' orbits, altogether for 14 comets, made calculations about the oblateness of the Earth, considered the problem of factorising numbers of the type  $2^{64} + 1$  in primes.

Pertaining to public affairs, once the author of this paper was in need of  $\pi$  with as many significant figures as possible and he found unexpectedly that Clausen had



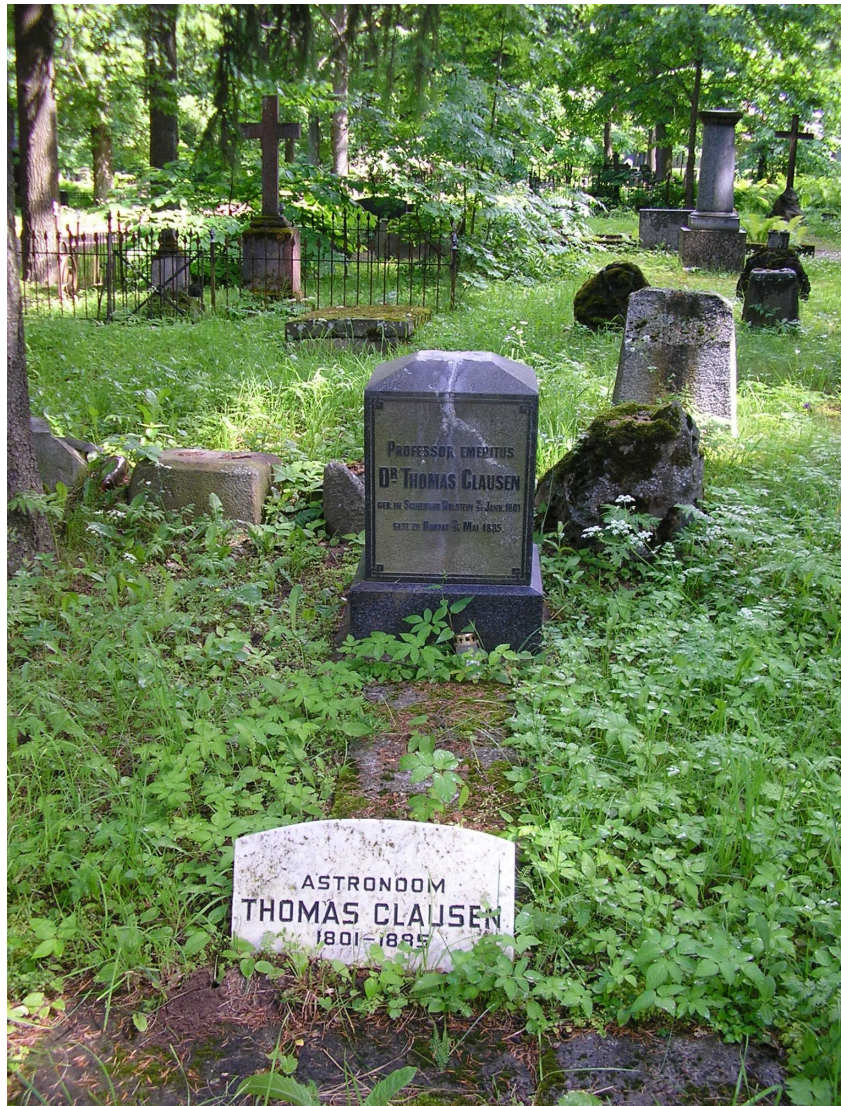
Pages from Clausen's notebook

calculated  $\pi$  with 250 figures already in 1847. This event marked the beginning of author's long-lasting interest in Clausen.

As an observing astronomer Clausen did not make any outstanding discoveries but in theory he was very successful. For example, he explained the fabulous halo that was observed by Tartu citizens on June 5<sup>th</sup>, 1849 as the refraction and reflection of light on ice crystals.

In summer 1851 Mädler and Clausen traveled to Brest-Litovsk in order to observe the solar eclipse but the weather was cloudy and it started raining so the observations failed.

Clausen's untiring work in the field of science was not left without attention in Russia. In 1848 he was named the court councillor, in 1852 - the collegiate



**The grave of Thomas Clausen in Raadi Cemetery (Tartu)**

councillor, in 1862 – the state councillor and in 1871 – the actual state councillor. This title meant that the person was automatically included into hereditary nobility. In 1848 he was elected an associate member of the Royal Astronomical Society (according to data by H. Eelsalu). On December 29th, 1856 he was elected a corresponding member of the St Petersburg Academy. This happened to be two years after Clausen was elected a corresponding member of the Göttingen Learned Society according to a proposal by Gauss. Again two years later the same society

gave Clausen silver and bronze medals, made for the commemoration of Gauss.

On June 27th, 1864 the Tsar of Russia gave him the Second Class Order of Saint Anna. The Royal Learned Society of Denmark gave him an award for the calculations of the orbit of the comet in 1770. For these calculations Bessel highly commended Clausen. And together with the Professor of mathematics in Tartu University, Ferdinand Minding he was elected the honorary member of the St Petersburg University.

Actually Clausen did not like to give lectures at all and we cannot find anybody who could call himself his pupil. Much more he liked to do his calculations alone.

If we try to analyse the character of Clausen then we crash into difficulties for both Schumacher and Utzschneider were very critical in his regard. Especially Schumacher who called Clausen an egotist, ungrateful and tactless. Utzschneider added moodiness still. At the same time when the Steinheils lost their newlyborn child, Clausen was the only one who tried to cheer up the family.

Likewise he did not hide his gratefulness towards provost Holst and Schumacher. He got along very well with his superior Mädler.

Still it is difficult to understand why Clausen did not inform his parents about his new job in Tartu. His father Claus died nine years and his mother Cecilie 20 years after Clausen had taken up his residency in Tartu. Most surely the parents would have been more than happy to visit their son and be proud of his position. We do not know whether he had substantially endowed his parents though Peters reminded him about this.

He was never married and he had no children. Clausen is buried in Raadi cemetery in Tartu. All these wars which have swept over Estonia since, have left only the base of his grave monument intact.

He belongs to many nations, the Danes claim that he was a Danish mathematician and astronomer, the Russians – that he was a Russian astronomer and the Estonians – that he was an Estonian mathematician and astronomer. They all are evidently right.

All in all – we stand before the fact that he was an outstanding person whose works bear the seal of a genius as expressed by the Greifswald professor of mathematics Johann August Grunert.

## 7. Chronology

- 16.01.1801, Clausen was born in Snogbæk close to Nübel in Danish Nordschleswig;
- 1824, the cooperation with Schumacher begins;
- 1813(?), goes to the local school;
- 1824, the first scientific paper about the determination of the geographical coordinates by observing the eclipses of stars by the Moon;
- 1824 October, becomes acquainted with Gauss;
- 1824, before the Christmas Schumacher throws him out of the house;
- 1825 (?), Schumacher takes Clausen back on Gauss' request;
- 1826, Schumacher employs Christian August Friedrich Peters;
- 1828 December, Clausen arrives at Munich to Utzschneider's optical institute;
- 1829 August, travel to Switzerland in order to get the data about the year 1770 comet's orbit;
- 1832, the Royal Society of Denmark gives him a medal for calculating the orbit of

year 1770 comet;

- 1833, in the beginning of this year Clausen fell ill;
- 1840 , middle of June, Clausen arrives at Altona;
- 06.03.1842, employed as an observer of Tartu University Observatory. On his employment list: foreigner, not married, without land property, the relatives are also without land property, educated in private manner, Lutheran, has not taken vow of allegiance to Russian Empire, has not taken part in military campaigns, has not been fined, has not had vacation, has not resigned, has not been under inquest or in the court of justice, single;
- 17.10.1842, elected an ordinary professor of astronomy (this is strange since at that time Mädler was the professor);
- 1844, received the degree of doctor of philosophy of the Königsberg University *honoris causa*;
- 1848, elected an associated member of the London Royal Society;
- 12.03.1849, received the title of the collegiate councillor (retrospectively);
- 04.07.1851, sent to Brest-Litovsk to observe the solar eclipse, back in 02.08.1851;
- 1852, awarded the rank of the collegiate councillor;
- 1854, Clausen was elected a corresponding member of the Göttingen Learned Society according to the proposal of Gauss;
- 1856, the Learned Society of Göttingen gives Clausen silver and bronze medals dedicated to the commemoration of Gauss;
- 29.12.1856, elected a corresponding member of the St Petersburg Academy;
- 23.12.1862, awarded a bonus of 400 roubles from university's managing fund;
- 1862 – awarded the rank of the state councillor;

- 27.07.1864, in connection with the 25<sup>th</sup> anniversary of the Pulkovo (Nikolai) Main Observatory Clausen was given the Second Class Order of Saint Anna;
- 11.09.1864, the university government gives him allowance of 152 roubles and 88 kopecks for the travel to Pulkovo Main Astronomical Observatory to take part in the celebrations of their 25<sup>th</sup> anniversary;
- 31.12.1865, approved in the position of the ordinary professor of astronomy;
- 07.01.1866, Verwaltung des Dorpatschen Lehrbezirks informs that Thomas Clausen is festively approved in the position of ordinary professor of astronomy with annual salary of 2400 roubles;
- 27.11.1867, is established in this position for another five years;
- 22. 06.1868, a old-age pension is decreed for the service of 25 years - 1429 roubles and 60 kopecks (otium cum dignitate);
- 1869, becomes together with Ferdinand Minding the honorary member of the St Petersburg University;
- 24.12.1871, awarded the rank of the actual state councillor. This rank meant automatically the membership in hereditary nobility;
- 29.09.1872, dean Grewingk addresses the Council of the Tartu University:” On October 1872 we celebrate the 30 years when Dr Thomas Clausen was named the Director of the observatory and the Professor of astronomy of our university. I propose to release him from the performance of his duties after a suitable period of time and to give him scientific pension together with the honorary title “Professor Emeritus”;
- 25.11.1872, released from the duties. He was given the honorary title of “Professor Emeritus”;
- 12.mail 1885 the rector issued a circular no 328 which informs “... dass unsere

College Professor emeritus Dr. Thomas Clausen Sonntag am 11 mai um 5 Uhr Morgen gestorben ist". Signed: rector von Wahl, Grewingk, Lindstedt, Vogel, Hoffmann etc;

- May 14<sup>th</sup> 1885 the next circular is issued which says that the seeing off of Professor Clausen "...den 14ten Mai, um 1 Uhr Mittag von der Universitäts Stattfinden wird".

## 8. Acknowledgements

I like to express my cordial thanks to Dr Erki Tammiksaar, Prof Ülo Lumiste, Prof Tiit Rosenberg, Dr Stefan Krämer, Dr Ivar Aavatsmark and to the kind personnel of the Estonian Historical Archives who helped me in writing this paper.

## References

1. G. Levitskij, *Astronomy Jurjevskago universiteta s 1802 po 1894 god.* 3 – 224, Jurjev, tipografiya K. Mattisena, 1899.
2. Kurt-R. Biermann, *Thomas Clausen, Mathematiker und Astronom*, Journal für die reine und angewandte Mathematik, band 216, heft  $\frac{3}{4}$ , 159 – 198, 1964.
3. Kurt-R. Biermann, *Thomas Clausen als Astronom*, Janus (Revue internationale de l'histoire des sciences, de la médecine, de la pharmacie et de la technique), LVII, 4, 299 – 305, 1970.
4. Kurt-R. Biermann, *Genie ohne Chance*, Kultur & Technik, 3, 42 – 45, 1991.
5. Harald Gropp, *Thomas Clausen, a danish astronomer and mathematician*, Astronomische Gesellschaft Abstract Series, Vol. 17. Abstracts of Contributed

Talks and Posters presented at the Annual Scientific Meeting of the Astronomische Gesellschaft at Bremen, September 18–23, 2000.

6. Georgi Zhelnin, *Astronomicheskaya Observatoriya Tartuskogo universiteta (1805 – 1948)*, *Istoricheskij ocherk*, W. Struve nimelise Tartu Astrofüüsika Observatooriumi Publikatsioonid, XXXVII, 5 – 169, 1969.
7. J. Gaiduk, *Thomas Clausen ja tema matemaatika-alane looming*, *Matemaatika ja kaasaeg*, XII, 116 – 122, 1967.
8. Ülo Lumiste, *Täiendus Th. Clauseni biograafiale*, *Matemaatika ja kaasaeg*, XII, 123 – 125, 1967.
9. *Ülo Lumiste bibliograafia*, 5 – 123, Eesti Matemaatika Selts, Tartu, 1999.
10. *Thomas Clausen*, <http://www-history.mcs.st-andrews.ac.uk/~history/Mathematicians/Clausen.html>
11. *Dansk Matematisk Forening*,  
[http://www.dmf.mathematics.dk/clausen\\_en.html](http://www.dmf.mathematics.dk/clausen_en.html)
10. Eesti Ajalooarhiiv, fond 402, nimistu 3, säilik 786.
11. <http://runeberg.org/dbl/3/0636.html>