

Index of Field og andre viktige dokumenter relatert til verdensarvmonumentet «*Struves meridianbue*»

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Vitali Kaptüg: Index of Field and Other Important Manuscripts Relating to the Scandinavian Segment of the World Heritage Monument «Struve Geodetic Arc»

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Results of a search of archives in Russia, Norway and Sweden are presented. The manuscripts found originated from F.G.W. Struve, Chr. Hansteen and N.H. Selander's personal archives. They contain details of observations and the circumstances of field work carried out by Swedish, Norwegian and Russian scientists and surveyors from 1845 to 1852 between the Gulf of Bothnia and North Cape. In Russia almost all of the surviving archive material has been located, but recent findings in Norway and Sweden indicate that other important manuscripts may still remain to be found in those countries.

Key words: Struve Geodetic Arc, field records, original manuscripts.

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1. ON THE HISTORY OF THE SGA MANUSCRIPTS

Men of science in Europe and Russia have persisted in the idea of performing a meridian arc measurement through vast East-European plains since at least the 1720's, when an appropriate proposal by the French astronomer J.-N. De l'Isle was first submitted to the Russian authorities. Paying tributes to first attempts made by De l'Isle in 1737–1739 in Russia, one should note that real opportunities for «*measurements of degrees*» in the empire appeared only in the next century. This started in 1816 due to efforts by two great Russian workers in geodesy and surveying: military surveyor Carl Tenner and outstanding astronomer Wilhelm Struve. The first 15 years of measurements across the western provinces of Russia resulted in the united Tenner–Struve meridian arc of 8 degrees («*Russian arc*»). In 1831–1849 a considerable extension was achieved: northwards (under Struve's direction)

through the then autonomous Russian principality of Finland up to the town of Torneå and southwards as far as the Danube delta (headed by Tenner). An important «*Scandinavian extension*» of the Russian operations was ensured farther northwards from the Gulf of Bothnia and almost reaching the North Cape. Thus, Struve's long-standing idea (at least, since 1828, see [Struve 1840]) of reaching the limits of Europe was realized in the north. From 1845 to 1852 the Royal Swedish Academy of sciences (RSAS) exercised general management of the works extending to the north in what is now a *UNESCO World Heritage* property called *The Struve Geodetic Arc* (SGA). Scandinavian operations were carried out simultaneously in the historical Lapland by the Swedes and in the Norwegian Finmarken by the Norwegians.

The leader and main worker in Lapland was Nils Haqvin Selander (1804–1870), director of the Stockholm Royal observatory. His co-workers in field were General baron

1. Biographical notes: Born in 1947. Graduated in astronomy at the Faculty of Mathematics and Mechanics of the Leningrad University. Experience in satellite- and astronomical observations, management. Headed several volunteer expeditions to preserve artifacts of historic geodetic measurements. In 2003–2004 charged with compilation of the national documents for the FIG–UNESCO project «Struve Geodetic Arc». Since 2004, elected Secretary to the Board of the St. Petersburg Society for Surveying & Mapping. Member of the Russian Geographical Society. About 50 publications on historic geodetic measurements and artifacts.

F.J. Wrede, Prof. J.M. Agardh of University of Lund, captain–lieutenant Lilliehöök (Lillienhoek?), lieutenant of the marine C. Skogman, and others. In Norway the measurements were directed by Chr. Hansteen who headed the Geographical department of the Norwegian Ministry of the Interior. Field operations here were conducted by military engineers Fr.L. Klouman and Chr.A.B. Lundh. Astronomical observations and two baseline measurements for the Scandinavian measurements were performed in co–operation with the Main Imperial astronomical observatory in Pulkovo (Russia), in particular with Dr D.G. Lindhagen (a young Swedish astronomer then with the Pulkovo staff). F.G.W. Struve provided the best instruments available for the purpose and Lindhagen was responsible for success of the Russian co–operation. Personal documents originating from these scientists, wherever they may be kept nowadays, are valuable for studying the history of the Scandinavian part of the SGA, providing a window onto the professional, cultural and human aspects of the measurements.

The SGA operations and accompanying activities took about 40 years (from 1816 till 1855), so it is no wonder that they are reflected in a huge number of documents. They are in Russian, German (Struve was a native German), French (the language of Russian high life), Swedish and Norwegian. Both originals and copies may be found, and they can be of a specific or general nature. The basic field material, including that from Norway, was published in Struve and Tenner's final descriptions in a possibly comprehensive way. Unfortunately, however, the agreement of 1853 to issue a separate publication describing the Scandinavian meridian arc operations through Lapland and Finmarken (see the related Index item) was not carried out, for unknown reasons.

The SGA manuscripts were never kept at one place, due to both the inter–institutional and international nature of the measurements. The largest volume was preserved until 1941 in the archive of the former Pulkovo Observatory near St. Petersburg (its original German and French spellings were: Pulkowa and Poulkova). It was directed by

Struve from 1839 to 1862. Except during his last years of life, this outstanding astronomer was continually in charge of scientific guidance and publication of results from the enterprise after 1821. Field registers, diaries, records, reports, calculation sheets and related correspondence were in continuous demand by Struve and his associates until the end of the publication process, which produced three editions during 1856–1861. A large volume of documents related to the «*Russian Arc*» was gathered in the archive of the former Military Topographers' Corps of the Russian army. Smaller collections of SGA documents, mostly correspondence, were kept at the Empire University of Dorpat, at the Russian Empire Academy of sciences, at the Russian Ministry of Public Instruction and at the Russian Geographical society [Kaptüg 2002]. A few reports of SGA workers have been published by Struve.

Today, the surviving original «*Pulkowa*» manuscripts which relate to the SGA «*Scandinavian part*» are kept in the St. Petersburg branch of the Archive of the Russian Academy of Sciences. Here one can see field material, calculations, metrological research records, drawings and maps, letters and reports by workers, draft copies of published material, and official correspondence related to the work in Norway [Kaptüg 2006] and Finland under Struve's responsibility. In the future some drawing materials and maps (not yet available for study) will hopefully be found. Other Russian archives do not contain important documents relating to the SGA Scandinavian segment. Outside Russia, important field material and related correspondence was originally kept in the archives of Stockholm Royal Academy of Sciences, the National Land Survey of Sweden (Lantmäteriet, Gävle), Norwegian Ministry of the Interior (Departementet for det Indre) and Norwegian Mapping Authority (Statens Kartverk, formerly Norges Geografiske Oppmåling, Hønefoss). Items were also kept in the family archives of the participants: Selander, Wrede, Skogman, Lilliehöök, Agardh, Hansteen, Klouman, Lundh, Lindhagen in particular, and others. At present much of the material is still kept at these places. Some manuscripts have recently been viewed in

Stockholm and Hønefoss, and [Pettersen 2007] also refers to documents found in Germany and Norway.

2. THE CONTENT AND STRUCTURE OF THE INDEX

The Index to follow presents the following types of archive material related to the SGA:

- 1) Registers of field and indoor measurements and research, either original or copied by the observers themselves. These may relate to trigonometric (horizontal or vertical angles), base (linear) or astronomical measurements and are marked with the letters T, B and A correspondingly;
- 2) Notebooks, cards or simple sheets of paper containing mathematical calculations, often inseparable from ivestigations related to computed items, are marked with the letters C or CI;
- 3) Diagrams, instrument situation plans, maps and other drawn material are marked with the letter D;
- 4) Manuscript (text) material such as reports, letters etc., containing important or interesting details and circumstances which can be deciphered from mostly illegible German or French handwriting are marked with the letter M.

Thus, every type of material included into the Index is denoted with a given letter for quicker recognition. The material is further separated into the *Finmarken* (Norway) and *Lapland* (Sweden and northern Finland) *arc segments* as first distinguished by Struve. Geographical names are spelled as they were in the archive sources involved. Years of «field works» also correspond to the original documents; they cover reconnaissance surveys and the measurements themselves. In the 2nd column of the Index, words in *italics* indicate originals. Use of square brackets, e.g. [1854], means that the information in brackets (here, the year 1854) is derived from a different reference than the described document. In the 3rd column of the Index, the location (archive reference code) is given. Numeral codes relate to the abovementioned St. Petersburg archive. The parts of the code



are separated by dots and commas, identifying, in this order:

- number of the particular collection
- running number of the inventory within the collection
- running number of the folder within the inventory, followed by:
- running numbers of sheets of the identified document, where sheets may be presented in these forms:
 - not specified, if the entire folder's content relates to the item described,
 - 3 ÷ 5 means «from sheet 3 to sheet 5»,
 - 3 ÷ means «beginning from the sheet 3» (the end was not recognized),
 - ÷ 5 means «ending with the sheet 5» (the beginning was not recognized),
 - 14r means the reverse of the sheet 14.

Other acronyms used are:

NMA – for the Norwegian Mapping Authority;
 ITA – for the Institute of Theoretical Astrophysics of the University of Oslo, Norway;
 CHS – for the Center for History of Science of the Royal Swedish Academy of sciences, Stockholm.

3. THE FINMARKEN ARC SEGMENT

Field works in 1845–1847 and 1850 in Northern Norway, under the guidance of Hansteen.

CODE	DESCRIPTION	ARCHIVE REFERENCE
T, CI	Field registers (« <i>Trigonometriske observationer...</i> ») of 1846–1847, 1850, copied by Klouman, in Norwegian; calculations and notes added by Lindhagen, sometimes by Struve, in German. [1850–1856].	721.1.83, 54 ÷ 161 (four notebooks «2» to «5»); 721.1.88, notebooks «X», «XI», «XII letztes».
	Field register of angular measurements at 3 base extension points, original by Lindhagen of 1850, in German.	721.1.86, notebook «III», part 3a.
B	Field register of the base measurement at Alten, original by Lindhagen of July 1850, in German.	721.1.86, notebooks «II», «III».
B, CI	« <i>Basismessung bei Alten. Tagebuch von Fred. Klouman. 1850</i> », clean copy, in German [after 1852].	721.1.86, 374 ÷ 409 (the last notebook).
A	Field registers of the latitude and azimuth observations at Fuglenaes, originals by Lindhagen of 1850, in German.	721.1.86, six notebooks «IV» to «IX».
CI	Two registers of investigations made with the Struve base apparatus in Pulkowa in May 1850, and in Bosekop, June to July 1850, originals by Lindhagen, in German.	721.1.86, notebooks «I», «II», «III».
	Registers of final investigations of the instruments: « <i>Zwei supplement Hefte zu den Operationen in Finnmarken und Lapland</i> », originals of 1852 [by Lindhagen], in German.	721.1.87, notebooks «I», «II».
C	« <i>Berechnung der Norwegischen Grundlinie von Lindhagen</i> », a copy of an original report by Lindhagen, 1851, in German.	archive of Hansteen's correspondence, ITA (filed under the letter «S»).
	Computation material related to the base measurement and astronomical observations, originals by Lindhagen, Struve, etc. [1850–1856].	within 721.1.84.
D	Drawing material, maps.	703.12.339, 703.12.340, 703.8 (not yet available).
	Position of the astronomical instruments at Fuglenaes, scheme, ink, original by Lindhagen [1850].	721.1.86, notebook «V», 200r.
	Drawing of the monument at Fuglenaes, gouache, pencil, 18 x 30 cm, original, signed in ink: « <i>Christiania, 14/8 – 54, von Hanno</i> », 1854.	721.1.79, sheet 1.

CODE	DESCRIPTION	ARCHIVE REFERENCE
M	Three annual reports on the progress of the field works of 1845, 1846, 1847; originals by Klouman and Lundh, of 31 Dec. 1845, 7 Nov. 1846, 8 Febr. 1848, in Norwegian.	NMA archives.
	Report on results of the negotiations in Christiania and Stockholm, original of November 30, 1849 by Lindhagen, in German.	721.1.85, 240 ÷ 250.
	Receipt listing the Pulkowa instruments taken for the measurements in Finmarken, original of May 20, 1850 by Klouman, in German.	721.1.85, 267.
	Notes on the comparison of the Norwegian and Swedish baselines; a draft inscription for the proposed monument at Fuglenaes – these within the original letter by Struve to Hansteen of September 14/2, 1853, in German.	721.1.85, 612 ÷ 617.
	« <i>Ueber den geodätischen Theil der Norwegischen Gradmessungsoperationen</i> », report by Lindhagen, corrected fair copy, in German [spring 1854].	721.1.32, 401 ÷ 440.
	Notes on general circumstances of the field works: « <i>Momenter til Indledning ved Beskrivelsen over Gradmaalingen i Finmarken</i> », original by Klouman, in Norwegian [1853 ?]; followed by translation to German, by Lindhagen, dated March 20, 1856.	703.12.67, 102 ÷ 112.
	Notes about progress of the measurements: « <i>Suplement til...Struves historiske Beratning om Gradmaalingen...</i> », original by «K.» [Klouman], in Norwegian [1853?].	721.1.85, 582 ÷ 583r.
	« <i>Über das Gradmessungsmonument bei Fuglenaes</i> » – description of the monument at Fuglenaes, translated by Lindhagen from a missing letter by Klouman, in German [before 1856].	703.12.68, 11 ÷ 12; the inscription on the monument: 14 ÷ 14r.
	Correspondence between Struve and Hansteen: - 20 originals by Hansteen and 6 drafts by Struve*, in German. 1848–1855;	within 721.1.85;
	- 3 originals by Struve, in German. 1849–1850;	NMA archives;
	- 5 originals by Struve, in German. 1851–1855.	archive of Hansteen's correspondence, ITA (filed under the letter «S»).

* Three Struve's draft letters in St. Petersburg do not yet have the matching clean copies found in Oslo.

4. THE LAPLAND ARC SEGMENT

Field works in 1845–1852 northwards across Lapland up to Kautokeino in Finmarken, un-

der the guidance of Wrede (1845) and Selander (from 1846 till 1852).

CODE	DESCRIPTION	ARCHIVE REFERENCE
T, D	Notebook labelled: «1849. Avasaxa, Perrawara, Kakamawara, Huitaperi, Torneå. 1850. Af Agardh. Oiwi, Kuivas-kerro» – clean copy of field registers of August–September 1849 [of Skogman?] and July–August 1850 of Agardh, by unidentified author [Selander? Lindhagen?], in ink, in Swedish.	CHS archives, the folder of 6 notebooks ascribed to «Agardh».
T, A, CI, D	Notebook labelled: «1850. Agardh» – field register of «July» [1850?], original by Agardh, apparently relating to the astronomic station <i>Stuor-oivi</i> [«Oiwi»], pencil, calculations in ink, in Swedish.	ibid.
T, CI, D	Notebook labelled: «Winkelobservationer. 1852» and «Agardh 1852» – field register of August–September 1852, original by Agardh, pencil, calculations in ink, in Swedish.	ibid.
B	Field registers of the base measurement at Öfver–Torneå, originals by Lindhagen, in German, 1851.	703.7.155, notebooks «I», «II».
A, D	Notebook labelled: «Astron. observ. på S. Oivi» – field register of astronomical observations of latitude at <i>Stuor-oivi</i> in June–July 1850, original by Selander, pencil, in Swedish.	CHS archives, the folder of 5 notebooks ascribed to «Selander».
A	Notebook labelled: «Astron. observationer i Haparanda. 1851» – field register of astronomical observations with universal instrument and vertical circle, the readings dated September 1850 and September 1851, original by Selander, pencil, in Swedish.	ibid.
A, D	Field registers of the astronomical observations at <i>Torneå</i> , including a situation plan, originals by Lindhagen and Wagner, in German; June to September 1851.	703.7.155, notebooks «III» to «VII».
CI	Results of a linkage of the Swedish and Finnish arc segments, original by Lindhagen, 1851.	721.1.84, 548.
	Finalized angular directions observed from <i>Torneå</i> to <i>Bäll-jatzvaara</i> , incl. base extension stations, Struve's copy of the missing Selander's original of «27 Juli 1853».	2.1/1850.2, 81 ÷ 82.
	Paper cards of computation of the arc chain from <i>Torneå</i> to <i>Alten</i> , originals by Struve. 1853.	721.1.90, 78 ÷ , 551 ÷ , 614 ÷ .
	Original computation material by Lindhagen, Struve, etc. related to the base measurement and astronomical observations, [1851–1856].	within 721.1.84.

CODE	DESCRIPTION	ARCHIVE REFERENCE
D	Drawing material, maps.	703.12.339, 703.12.340, 703.8 (not yet available).
	Situation plan of the astronomical instruments established near Torneå, original [by Lindhagen, 1851].	721.1.84, 537.
	Diagrams of the Öfver–Torneå base extension points, originals by unidentified author, August 1853.	721.1.90, 516, 519 ÷ 520.
M	Report on results of the negotiations in Christiania and Stockholm, original of November 30, 1849 by Lindhagen, in German.	721.1.85, 240 ÷ 250.
	Report on the arc measurement works accomplished by 1851, [original by Selander or a copy by Lindhagen, 1851], in Swedish.	721.1.85, 334 ÷ 335.
	Minutes of the joint Russian–Swedish–Norwegian meeting of the leaders of the meridian arc measurements of 1816–1852, signed on July 26, 1853 by Hansteen, Selander and Struve [one of the 3 originals]; in German.	721.1.85, 563 ÷ 564; 2.1–1850.2, 87 ÷ 87r.
	« <i>Ueber den geodätischen Theil der Schwedischen Gradmessungsoperationen, nach Herrn Professor Selander vorläufigen Mittheilungen</i> », report by Lindhagen, the second half is missing, fair copy, in German [1855].	721.1.89, 318 ÷ 340.
	Correspondence between Struve (5 draft copies of 1845–1855) and Selander (10 originals of 1844–1853), Wrede, Wahlberg, Lindhagen, RSAS; in German.	within 721.1.85.
	Letters to RSAS and Academy's permanent secretary P.F. Wahlberg, originals by Selander. [1846 – 1852].	CHS archives; access via the box «Se – « of the alphabetic catalogue of correspondence.

Two notes

One important letter from Selander to Struve (August 10, 1855) included the rest of his final results relating to the Swedish arc segment. Until it was received, Struve had only been able to perform interim linkage computations south and north of the segment, based on the data submitted by Lindhagen. Unfortunately, Selander's original letter has not been found.

In the CHS Stockholm folder of 5 notebooks ascribed to «*Selander*» there is a notebook labelled «*Höjdoobservationer i Lappmarken. 1852. Selander I*». It contains a separate (torn out) piece of paper which reads: «*22 hæften Selanders och Agardhs och Skogmans Gradmåtningsjournaler i Lappland. 1846–1852*». It appears to be written by G. Lindhagen and refers to a complete set of field registers relating to the SGA Lapland segment.

REFERENCES

- Kaptüg, V., 2002. General Review of the History of the Manuscripts Related to the Struve – Tenner Arc Measurements. *STRUVE ARC 150. Reports of the International Scientific Conference*, p. 68–71. Tallinn – Tartu, Association of Estonian Surveyors, et al.
- Kaptüg, V.B., 2006. What Was Found in the Russian Archives About Geodetic Works in the Norwegian Part of the Struve Arc (1844–57). *Read*

- at the Norwegian Mapping Authority (Statens Kartverk)*. August 24, 2006. 15 p. Hønefoss.
- Petterson, B.R., 2007. The Norwegian Part of The Struve Geodetic Arc – an Original Instrument Rediscovered. *Survey Review*, 39, 306 (October), p. 294–307.
- Struve, M. [Monsieur, F.G.W.], 1840. Sur la mesure des degrés de méridien en Russie. *Bulletin scientifique publié par l'Académie Imp. des sciences de St. Pétersbourg*, VII, 163 (19), p. 282.

Aktuell debatt

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Ivar Johansen, bystyremedlem i Oslo (SV)

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Forslaget illustrerer imidlertid at det er et politisk spørsmål hva man velger å dekke over skattededdelen og hva man mener det er riktig direktebetales av brukerne av en tjeneste.

Jeg er ikke ofte enig med Kapitalredaktør Trygve Hegnar, men i debatten om å benytte prismekanismen for å begrense biltrafikken i Oslo har han et poeng: Nesten uansett hvor høye priser det blir i bomringen vil dette aldri ha begrensende virkninger for Trygve Hegnar eller Petter Stordalen, men det vil ha stor betydning for den lavtlønte hjelpeleieren. Egenbetaling og avgifter har derfor også et klasse- og fordelingsperspektiv over seg. De som har god råd kan greit kjøpe seg kunnskap og tjenester.

Jeg har hørt et argument for at kommunens kartdata ikke skal være gratis for offentligheten: hvorfor skal vi subsidiere eller levere ut gratis kartdata til gigantiske konserner som Microsoft eller Google?

Tja, det kan man nå si, men forholdet er at jo at det multinasjonale konsernet Microsoft i dag må betale nøyaktig samme pris for å få ut komplette kartdata for Oslo kommune som den relativt ubemidlede studenten og nyskaperen som har et spen-

nende forretningskonsept som kan legge grunnlag for en bedrift med svært mange arbeidsplasser og gode skatteinntekter for kommunen. For Microsoft er kostnadene relativt mikroskopiske, men det er ikke sikkert studenten er i stand til å legge et sekssifret beløp på bordet.

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Statens Kartverk har nå frigjort svært mye datainformasjon til gratis bruk, og de gjør det bl.a. i et samarbeid med kommuner som Bærum, Drammen, Stavanger, Bergen og Trondheim. Og som det heter på Statens Kartverks sine sider: «Målsettingen med åpning av tjenestene er å stimulere til kreativ og utvidet bruk av geografiske tjenester.» Andre større kommuner går foran.

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