



HAL
open science

The genealogy of Johann Theodor Peters's great mathematical tables

Denis Roegel

► **To cite this version:**

Denis Roegel. The genealogy of Johann Theodor Peters's great mathematical tables. [Research Report] LORIA, UMR 7503, Université de Lorraine, CNRS, Vandoeuvre-lès-Nancy. 2016. hal-01357846

HAL Id: hal-01357846

<https://inria.hal.science/hal-01357846>

Submitted on 30 Aug 2016

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.

The genealogy of Johann Theodor Peters's great mathematical tables

Denis Roegel

29 August 2016

Abstract

Johann Theodor (Jean) Peters (1869–1941) is the author of numerous mathematical tables, in particular the well-known 8-place tables of logarithms coauthored with Julius Bauschinger and published in 1910–1911. This article reviews Peters's main tables, and presents their genealogy, in order to supplement Peters's tables and their reconstructions.

In 2016, we published reconstructions of almost all of the large mathematical tables authored by Johann Theodor Peters (1869–1941), after having earlier already reconstructed a table of factors coauthored by Peters [60]. This represents a total of 22 volumes for which we have each time written an introduction and tried to analyze as best as we could the methods employed by Peters.

Working on all these tables, or even on only some of them, may give rise to some confusion and numbness, as one becomes easily drowned by the various tables, sometimes with almost identical titles. And yet, all these tables are actually different.

The purpose of this article is to sort all these tables out and to give a global picture. It does also serve as a general introduction to all the tables which have been reconstructed.

1 A brief biography

Peters was born Johann Theodor Peters in Köln in 1869 [33, 26, 32, 31, 30], but throughout his life he was mostly known as “Jean Peters.” He studied mathematics and astronomy at the University of Bonn. He became interested in calculations at the beginning of the 1890s. In his dissertation, he used eight



K. H. W. KRUSE, L. J. COMRIE, J. T. PETERS 1930

Figure 1: From left to right, the astronomer Karl Heinrich Willy Kruse (1889–1945), Leslie John Comrie (1893–1950) and Peters, 1930. (from [12])

lunar occultations of the Pleiades by the Moon to compute the coordinates and radius of the Moon. After having obtained his PhD in 1894, he stayed for a few years at the Bonn observatory.

In 1899, Peters came to the *Astronomisches Rechen-Institut* (ARI) in Berlin. In 1901 he was named “observator,” and in 1910 he obtained the position of professor.¹ He soon started to work on new general tables of logarithms and trigonometry, which would in particular be useful for astronomical applications.

Peters’s main work at the Institute was to compute the *Berliner Astronomisches Jahrbuch* in which he was involved for almost 30 years. He also worked on the *Nautisches Jahrbuch* and the Prussian *Grundkalender*.

From 1922 to 1924, Peters was the director of the ARI. He retired in 1934 and devoted himself to the sole computation of tables. In 1938, he was honored by the silver Leibniz Medal from the Prussian Academy of Sciences. He died in 1941.

¹For more particulars on Peters’s activities at the ARI, see Holland’s summary [30]. Holland has gone through the ARI annual research accounts in search of mentions of Peters. The ARI also holds a file on Peters with a few items, see Wielen’s summary of its contents [107].

2 Peters's tables

Although Peters has been working on mathematical and more specialized astronomical tables, we will concern ourselves only with his largest tables, which are general in nature, but particularly aimed at astronomical and geodetical applications. The range of Peters's tables displays both his interests and desire to provide a number of useful tables for different audiences, but also is a testimony to the changes in technology and usage. Tables of trigonometrical values started to gain importance in the 1910s and at the same time tables of logarithms were less needed, merely because calculating machines could be used for multiplications. Decimalization was another drive and at the end of the 1910s, Peters published tables where the arguments were given at intervals of thousandths of sexagesimal degrees, and not at intervals of seconds or tens of seconds. A few years later, total decimalization was reached with the centesimal division of the quadrant.² These changes have not taken over the old sexagesimal division, perhaps because in turn digital computers made it again easier to stick with the old division. This is the background of Peters's work, going from traditional hand-computed tables to more rational tables, and taking advantage of mechanical calculators, but without anticipating the death of table-computing.

2.1 Logarithms

Together with Julius Bauschinger, Peters published in 1910 and 1911 a table of the logarithms of numbers from 20000 to 20000 and the logarithms of trigonometrical functions for every second of the quadrant, all to 8 places [15]. For this table, the computations were done to 12 places, and in some cases to 20 places. The basis for this table were Briggs's tables published in 1624 [16] and 1633 [17].

Bauschinger and Peters's table spawned a number of other tables, as summarized in the genealogical chart below (figure 2).

From the 12-place table used in preparing the 8-place table, a 7-place table was derived in 1911 [38] and a 5-place table of the logarithms of the trigonometrical functions followed in 1912 [39], the latter mostly derived from the 8-place table.

Peters then prepared a 12-place manuscript table giving the logarithms of the trigonometrical functions at $0^\circ.001$ intervals. This table was used to construct the 10-place table of the logarithms of trigonometrical functions, together with a volume of auxiliary tables [44, 43].

²In 1937, decimalization was made mandatory in Germany for surveying, see [26, p. 349].

In 1919, Peters also published a fundamental table of 52-place logarithms [62]³ containing 52-place values of $\log a$, $\log(1 + a \cdot 10^{-n})$ and $\log(1 - a \cdot 10^{-n})$ for $1 \leq a \leq 9$ and $1 \leq n \leq 26$. Using a number of multiplications by numbers $1 \pm a \cdot 10^{-n}$, a given number can be expressed as a product of such factors, and consequently its logarithm can be found. This is the well-known “radix method” already used by Briggs [16].

In 1921, Peters derived 6- and 7-place tables of the logarithms of trigonometrical functions [45, 46] from the above mentioned 12-place manuscript.

Then in 1922, Peters published a 10-place table of the logarithms of the numbers [47], being the first volume of the tables published in 1919. This first volume also contained an extensive appendix with numerous auxiliary tables, written with Johannes Stein.

After a long hiatus devoted to other types of tables, Peters returned to logarithms in 1940, when he published a 2-volume 7-place table of logarithms of numbers, of antilogarithms, of addition and subtraction logarithms and of logarithms of trigonometrical functions for the new division [58].

2.2 Trigonometrical functions

In 1911, Peters computed a fundamental table of 21-place values of sines and cosines at $10'$ intervals in the semi-quadrant, as well as at $1''$ intervals between 0° and $10'$ [37].⁴ These values can therefore be used to compute 20-place values for other angles in the quadrant. Peters also gave the first, second and third differences of the values for arguments below $10'$, and they could be used to perform interpolations.

But Peters’s first large table of trigonometrical functions for every day purpose was his 7-place table published in 1918 [42]. It gave the values of the trigonometrical functions at intervals of $0^\circ.001$ and was derived from Briggs’s table published in 1633 [17].

In 1929, Peters published a table of 6-place values of all six trigonometrical functions [48], this time based on Andoyer’s great tables published in 1915–1918 [3].

A 6-place table published in 1930 and giving the trigonometrical values for the new centesimal division [51] was actually derived from an 8-place manuscript table, and so may have been the 6-place table published in 1938 [56].

In 1937, Peters published a sexagesimal 6-place table of trigonometri-

³This table has not yet been reconstructed, but might be reconstructed in the future.

⁴This table has also not yet been reconstructed, but might be reconstructed in the future.

cal and involute functions, with auxiliary tables useful for gear computations [55].

The 8-place table published in 1939 with Leslie Comrie and giving the sines, cosines, tangents and cotangents for every sexagesimal second [57] was ultimately based on Andoyer's tables [3]. The secants and cosecants had also been computed, but could not be published.

Peters's final publication was a 7-place table for the new centesimal division and published in 1941 [59].

2.3 Other tables

Apart from tables of logarithms and trigonometrical functions, Peters prepared, and sometimes published, several other general mathematical tables.

Peters's first large table was a multiplication table, published in 1909 [36]. It gave the products of all integers from 0 to 9999 by all integers from 1 to 99, and spanned 500 pages.

In 1922, Peters revised the Hütte tables [63].

Peters also published several more specialized tables for astronomical purposes, in particular in the 1930s [40, 49, 61, 52, 53, 54].

Around 1929 [30], Peters was working on a table of factors up to 100000. This table was collated with two other tables computed independently by Lodge, Ternouth and Gifford and published in 1935 [60].

Peters left unpublished manuscripts for a 8-place table of the trigonometrical functions, presumably to the 1000th of the degree of the old division (and used in the table published in 1930 [51], although the latter is for the new division), for a 8-place table of reciprocals (computed around 1924 [30]) and for 8-place tables of antilogarithms, and 8-place tables of addition and subtraction logarithms (computed between 1924 and 1926). Whether any of these manuscripts do still exist is unknown.

In his obituary [33], Kopf mentioned that a traverse table ("Strichtafel") was due to be printed, but such a table never seems to have been published.⁵

3 Chronology of Peters's great tables

We give here a chronological list of Peters's main mathematical tables, and table 1 shows a summary organized by the main features of the tables.

⁵An example of an early table of that kind can be found in the *Handbuch der Schifffahrtskunde* published in 1819 [27]. For another example, see Shortrede's table published in 1864 [100].

		places					
		3	5	6	7	8	10
	log N	100 to 999 (1913)			10000 to 100000 (1940)	20000 to 200000 (1910)	10000 to 99999 (1922)
trig	old ($^{\circ}$)	6' (1913)		0.01 $^{\circ}$ (1937) 10'' (1929)	0.001 $^{\circ}$ (1918)	1'' (1939)	
	new ($^{\text{g}}$)			0.01 $^{\text{g}}$ (1930) 0.001 $^{\text{g}}$ (1938)	0.001 $^{\text{g}}$ (1941)		
log trig	old ($^{\circ}$)	6' (1913)	15'' (1912)	0.001 $^{\circ}$ (1921)	0.001 $^{\circ}$ (1921) 1'' (1911)	1'' (1911)	0.001 $^{\circ}$ (1919)
	new ($^{\text{g}}$)				0.001 $^{\text{g}}$ (1940)		

Table 1: Summary of the features of Peters's great tables. The lines correspond to the types of tables (for instance of logarithms of trigonometrical functions), the columns give the number of places, and at the intersections of the lines and columns we give the ranges or the intervals, and the years the tables were published.

- 1909: Multiplication table, with products of 1 to 99 by 0 to 9999 [36];
- 1910: Logarithms of the numbers 20000 to 200000 to eight places (with Julius Bauschinger) [15];
- 1911: Logarithms of trigonometrical functions to eight places and at intervals of 1'' (with Julius Bauschinger) [15];
- 1911: Logarithms of trigonometrical functions to seven places at intervals of 1'' [38];
- 1912: Logarithms of trigonometrical functions to five places and at intervals of 15 seconds of the arc [39]; (log sin and log tan every 1.5'' below 2 $^{\circ}$)
- 1913: Trigonometrical functions and of logarithms of trigonometrical functions, all to three places, and at intervals of 6' [41];
- 1918: Trigonometrical functions to seven places, at intervals of 0.001 $^{\circ}$ [42];
- 1919: Logarithms of trigonometrical functions to ten places, at intervals of 0.001 $^{\circ}$ [44];
- 1922: Logarithms of numbers 10000 to 99999 to ten places [47];
- 1921: Logarithms of trigonometrical functions to six places, at intervals of 0.001 $^{\circ}$ [45];

- 1921: Logarithms of trigonometrical functions to seven places, at intervals of 0.001° [46];
- 1929: Trigonometrical functions to six places, at intervals of $10''$ [48];
- 1930: Trigonometrical functions to six places, at intervals of 0.01^g (new division) [51];
- 1937: Trigonometrical functions and involute functions to six places, at intervals of 0.01° [55];
- 1938: Trigonometrical functions to six places, at intervals of 0.001^g (new division) [56];
- 1939: Trigonometrical functions to eight places, at $1''$ intervals [57];
- 1940: Logarithms of numbers (10000 to 100000), antilogarithms, addition and subtraction logarithms, all to seven places [58]
- 1940: Logarithms of trigonometrical functions to seven places, at intervals of 0.001^g (new division) [58];
- 1941: Trigonometrical functions to seven places, at intervals of 0.001^g (new division) [59].

4 Conclusion

It is very easy to be impressed by the considerable volume of tables produced by Peters, and it is therefore not surprising that Archibald called Peters “perhaps the greatest mathematical table maker of all time” [12, p. 68].

Having worked through most of Peters’s tables as well as many other great tables, we think that Archibald’s statement is somewhat exaggerated. Peters has indeed produced a large number of tables, and these tables were all remarkable for their quality. But Peters’s main tables do not make use of very advanced concepts, and they lack the groundbreaking features found in Napier’s [71], Briggs’s [16, 17], Prony’s [72], Sang’s [22] and some other tables. Instead, the greatness of Peters lies in his ability to organize computations, to check them, to use simple interpolations with first and second differences, in particular with calculating machines, to anticipate which tables would be needed, and to have been able to produce remarkable tables using earlier large tables. None of the large tables constructed by Peters were actually

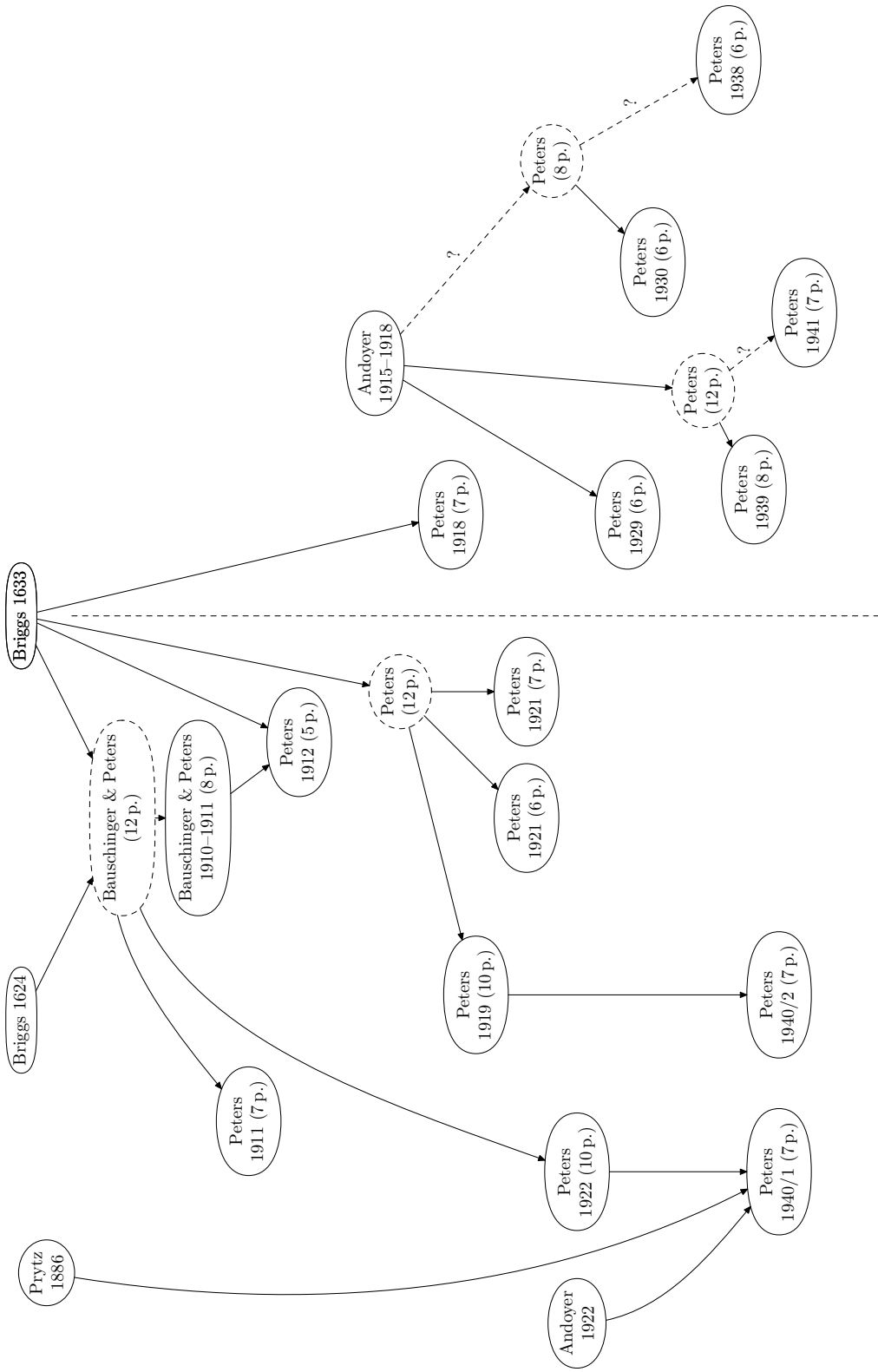


Figure 2: The genealogy of Peters's major numerical tables. Dashed circles indicate manuscript tables. The vertical line separates the tables of logarithms (left) from the (non logarithmic) tables of trigonometrical functions (right).

produced *de novo*, but they were based almost entirely on those of Briggs and Andoyer.

Peters's work first highlights the greatness of Briggs's work, as well as the importance and usefulness of such fundamental tables as constructed by Andoyer, and second stresses the importance of an efficient management in the construction of tables, and that great tables can be produced without computing everything from scratch.

References

- [1] ??? On the eight-figure table of Peters and Comrie. *Mathematical Tables and other Aids to Computation*, 1(2):64–65, 1943. [The title is ours, and there are actually two notices, on the accuracy of the table published in 1939 [57], and its comparison with other tables].
- [2] Marie Henri Andoyer. *Nouvelles tables trigonométriques fondamentales contenant les logarithmes des lignes trigonométriques. . .* Paris: Librairie A. Hermann et fils, 1911. [Reconstruction by D. Roegel in 2010 [67]].
- [3] Marie Henri Andoyer. *Nouvelles tables trigonométriques fondamentales contenant les valeurs naturelles des lignes trigonométriques. . .* Paris: Librairie A. Hermann et fils, 1915–1918. [3 volumes, reconstruction by D. Roegel in 2010 [68]].
- [4] Raymond Clare Archibald. J. T. Peters, Achtstellige Tafel der trigonometrischen Funktionen für jede Sexagesimalsekunde des Quadranten. *Mathematical Tables and other Aids to Computation*, 1(1):11–12, 1943. [review of the edition published in 1939 [57]].
- [5] Raymond Clare Archibald. J. T. Peters, Seven-place values of trigonometric functions for every thousandth of a degree. *Mathematical Tables and other Aids to Computation*, 1(1):12–13, 1943. [review of the edition published in 1942 [42]].
- [6] Raymond Clare Archibald. Tables of trigonometric functions in non-sexagesimal arguments. *Mathematical Tables and other Aids to Computation*, 1(2):33–44, 1943.
- [7] Raymond Clare Archibald. J. T. Peters, Eight-place table of trigonometric functions for every sexagesimal second of the quadrant. Achtstellige Tafel der trigonometrischen Funktionen für jede

- Sexagesimalsekunde des Quadranten. *Mathematical Tables and other Aids to Computation*, 1:147–148, 1944. [review of the edition published in 1939 [57]].
- [8] Raymond Clare Archibald. J. T. Peters, Siebenstellige Logarithmentafel. *Mathematical Tables and other Aids to Computation*, 1:143–146, 1944. [review of the edition published in 1940 [58]].
- [9] Raymond Clare Archibald. Johann Theodor Peters. *Mathematical Tables and other Aids to Computation*, 1(5):168–169, 1944. [obituary notice].
- [10] Raymond Clare Archibald. J. T. Peters, Sechsstellige Werte der trigonometrischen Funktionen von Tausendstel zu Tausendstel des Neugrades. *Mathematical Tables and other Aids to Computation*, 2(19):298–299, 1947. [review of 9th edition of [56] published in 1944].
- [11] Raymond Clare Archibald. J. T. Peters, Siebenstellige Werte der trigonometrischen Funktionen von Tausendstel zu Tausendstel des Neugrades. *Mathematical Tables and other Aids to Computation*, 2(19):299, 1947. [review of the 1941 edition [59]].
- [12] Raymond Clare Archibald. *Mathematical table makers. Portraits, paintings, busts, monument. Bio-bibliographical notes*. New York: Scripta Mathematica, 1948. [contains a photograph of Peters].
- [13] Julius Bauschinger. Interpolation. In Wilhelm Franz Meyer, editor, *Encyklopädie der mathematischen Wissenschaften mit Einschluss ihrer Anwendungen*, volume 1(2), pages 799–820. Leipzig: B. G. Teubner, 1904. [a French translation appeared in [98]].
- [14] Julius Bauschinger and Johann Theodor Peters. *Logarithmic-trigonometrical tables with eight decimal places etc*. Leipzig: Wilhelm Engelmann, 1910–1911. [2 volumes, English introduction. See [15] for the German edition.].
- [15] Julius Bauschinger and Johann Theodor Peters. *Logarithmisch-trigonometrische Tafeln mit acht Dezimalstellen etc*. Leipzig: Wilhelm Engelmann, 1910–1911. [2 volumes, German introduction. See [14] for the English edition; these volumes have been reprinted in 1936, 1958 and 1970, but the introductions vary. In particular, details of the construction of Hamann’s machine were

dropped in the last editions. Reconstructions are given in [75] and [76].].

- [16] Henry Briggs. *Arithmetica logarithmica*. London: William Jones, 1624. [The tables were reconstructed by D. Roegel in 2010. [70]].
- [17] Henry Briggs and Henry Gellibrand. *Trigonometria Britannica*. Gouda: Pieter Rammazeyn, 1633. [The tables were reconstructed by D. Roegel in 2010. [69]].
- [18] Heinrich Bruns. *Grundlinien des wissenschaftlichen Rechnens*. Leipzig: B. G. Teubner, 1903.
- [19] Heinrich Bruns and Julius Bauschinger. Denkschrift über neue achtstellige Logarithmentafeln für den astronomischen Gebrauch. *Vierteljahrsschrift der Astronomischen Gesellschaft*, 39:158, 232–240, 1904.
- [20] Leslie John Comrie. Logarithmic and trigonometrical tables. *Monthly Notices of the Royal Astronomical Society*, 85(4):386–388, 1925. [mentions several of Peters’s tables].
- [21] Leslie John Comrie. J. T. Peters, Sechstellige Tafel der trigonometrischen Funktionen, . . . , Berlin, 1929. *Mathematical Tables and other Aids to Computation*, 1(5):162, 1944. [Attributes errors in the first edition of [48] to one of the proofreaders of the table.].
- [22] Alex D. D. Craik. The logarithmic tables of Edward Sang and his daughters. *Historia Mathematica*, 30(1):47–84, February 2003.
- [23] Harold Thayer Davis, editor. *Tables of the higher mathematical functions*. Bloomington, In.: The principia press, Inc., 1933, 1935. [2 volumes].
- [24] Alan Fletcher, Jeffery Charles Percy Miller, and Louis Rosenhead. *An index of mathematical tables*. London: Scientific computing service limited, 1946.
- [25] Alan Fletcher, Jeffery Charles Percy Miller, Louis Rosenhead, and Leslie John Comrie. *An index of mathematical tables (second edition)*. Reading, Ma.: Addison-Wesley publishing company, 1962. [2 volumes].

- [26] Erwin Gigas. Professor Dr. Peters und sein Werk. *Nachrichten aus dem Reichsvermessungsdienst. Mitteilungen des Reichsamts für Landesaufnahme*, 17:346–350, 1941.
- [27] Hamburgische Gesellschaft zur Verbreitung der Mathematischen Wissenschaften. *Handbuch der Schifffahrtskunde*. Hamburg: Perthes und Besser, 1819.
- [28] James Henderson. *Bibliotheca tabularum mathematicarum, being a descriptive catalogue of mathematical tables. Part I: Logarithmic tables (A. Logarithms of numbers)*, volume XIII of *Tracts for computers*. London: Cambridge University Press, 1926.
- [29] Samuel Herrick, Jr. Natural-value trigonometric tables. *Publications of the Astronomical Society of the Pacific*, 50(296):234–237, 1938.
- [30] Peter Holland. Biographical notes on Johann Theodor Peters, 2011. www.rechnerlexikon.de/en/artikel/Johann_Theodor_Peters.
- [31] Wilhelm Rudolf Alfred Klose. Prof. Dr. Jean Peters gestorben. *Zeitschrift für Angewandte Mathematik und Mechanik*, 22(2):120, 1942. [obituary notice].
- [32] Otto Kohl. Jean Peters. *Vierteljahresschrift der Astronomischen Gesellschaft*, 77:16–20, 1942. [includes one photograph].
- [33] August Kopff. Jean Peters †. *Astronomische Nachrichten*, 272(1):47–48, 1941.
- [34] Christine Krause. *Das Positive von Differenzen : Die Rechenmaschinen von Müller, Babbage, Scheutz, Wiberg, ...*, 2007.
- [35] A. V. Lebedev and R. M. Fedorova. *A guide to mathematical tables*. Oxford: Pergamon Press, 1960.
- [36] Johann Theodor Peters. *Neue Rechentafeln für Multiplikation und Division mit allen ein- bis vierstelligen Zahlen*. Berlin: G. Reimer, 1909. [also published in 1919 and 1924 by Walter de Gruyter & Co.; the library of the Paris observatory also has a variant of the 1909 edition with the French title “Nouvelles tables de calcul pour la multiplication et la division de tous les nombres de un à quatre chiffres” (as well as a French introduction), which the library kindly checked for us; and the 1924 edition seems to be an English one with the title “New calculating tables for multiplication and division by all

numbers of from one to four places.” We have only had the 1919 edition in hands, and we reconstructed it in [93].].

- [37] Johann Theodor Peters. *Einundzwanzigstellige Werte der Funktionen Sinus und Cosinus : zur genauen Berechnung von zwanzigstelligen Werten sämtlicher trigonometrischen Funktionen eines beliebigen Arguments sowie ihrer Logarithmen*. Berlin: Verlag der Königl. Akademie der Wissenschaften, 1911. [54 pages, Appendix 1 to the “Abhandlungen der Preußischen Akademie der Wissenschaften, Physikalisch-Mathematische Klasse.”, not seen, but reprinted at the end of the English edition of [57]].
- [38] Johann Theodor Peters. *Siebenstellige Logarithmentafel der trigonometrischen Funktionen für jede Bogensekunde des Quadranten*. Leipzig: Wilhelm Engelmann, 1911. [reconstructed in [82]].
- [39] Johann Theodor Peters. *Fünfstellige Logarithmentafel der trigonometrischen Funktionen für jede Zeitsekunde des Quadranten*. Berlin: Reimer, 1912. [reconstructed in [80]].
- [40] Johann Theodor Peters. *Tafeln zur Berechnung der Mittelpunktsgleichung und des Radiusvektors in elliptischen Bahnen für Excentrizitätswinkel von 0° bis 24°* . Berlin: Ferd. Dümmler, 1912. [second edition in 1933].
- [41] Johann Theodor Peters. *Dreistellige Tafeln für logarithmisches und numerisches Rechnen*. Berlin: P. Stankiewicz, 1913. [not seen, second edition in 1948 (seen), reconstructed in [77]].
- [42] Johann Theodor Peters. *Siebenstellige Werte der trigonometrischen Funktionen von Tausendstel zu Tausendstel des Grades*. Berlin-Friedenau: Verlag der Optischen Anst. Goerz, 1918. [Reprinted in 1938 and 1941, as well as in 1942 in English with the title “Seven-place Values of trigonometric functions for every thousandth of a degree.”, all four editions seen. Reconstructed in [83]].
- [43] Johann Theodor Peters. *Zehnstellige Logarithmentafel : Hilfstafeln zur zehnstelligen Logarithmentafel*. Berlin: Preuß. Landesaufnahme, 1919. [not seen, second edition in 1957 (seen), reconstructed in [78]].
- [44] Johann Theodor Peters. *Zehnstellige Logarithmentafel, volume 2 : Zehnstellige Logarithmen der trigonometrischen Funktionen von 0° bis 90° für jedes Tausendstel des Grades*. Berlin: Reichsamt f.

- Landesaufnahme, 1919. [not seen, second edition in 1957 (seen); also Russian editions in 1964 and 1975; reconstructed in [95]].
- [45] Johann Theodor Peters. *Sechsstellige Logarithmen der trigonometrischen Funktionen von 0° bis 90° für jedes Tausendstel des Grades*. Berlin: Verlag der preussischen Landesaufnahme, 1921. [reconstructed in [91]].
- [46] Johann Theodor Peters. *Siebenstellige Logarithmen der trigonometrischen Funktionen von 0° bis 90° für jedes Tausendstel des Grades*. Berlin: Verlag der preussischen Landesaufnahme, 1921. [reconstructed in [92]].
- [47] Johann Theodor Peters. *Zehnstellige Logarithmentafel volume 1 : Zehnstellige Logarithmen von 1 bis 100000 nebst einem Anhang mathematischer Tafeln*. Berlin: Reichsamt f. Landesaufnahme, 1922. [not seen, second edition in 1957 (seen); also Russian edition in 1964 and perhaps in 1975; reconstructed in [94]; the appendices on mathematical tables are by Peters, J. Stein and G. Witt].
- [48] Johann Theodor Peters. *Sechsstellige Tafel der trigonometrischen Funktionen : enthaltend die Werte der sechs trigonometrischen Funktionen von zehn zu zehn Bogensekunden des in 90° geteilten Quadranten u. d. Werte d. Kotangente u. Kosekante f. jede Bogensekunde von $0^\circ 0'$ bis $1^\circ 20'$* . Berlin: Ferd. Dümmler, 1929. [seen, reprinted in 1939, 1946, 1953, 1962, 1968 and 1971; in Russian in 1975, and perhaps already in 1937 and 1938; reconstructed in [84]].
- [49] Johann Theodor Peters. *Tafeln zur Verwandlung von rechtwinkligen Platten-Koordinaten und sphärischen Koordinaten ineinander*. Berlin: Ferd. Dümmler, 1929. [Veröffentlichungen des Astronomischen Rechen-Instituts zu Berlin-Dahlem, number 47].
- [50] Johann Theodor Peters. *Multiplikations- und Interpolationstabeln für alle ein- bis dreistelligen Zahlen*. Berlin: Wichmann, 1930. [reprinted from [51]; reconstructed in [81]].
- [51] Johann Theodor Peters. *Sechsstellige trigonometrische Tafel für neue Teilung*. Berlin: Wichmann, 1930. [seen, third edition in 1939 and fourth in 1942; an excerpt was reprinted as [50]; reconstructed in [85]].
- [52] Johann Theodor Peters. *Präzessionstabeln für das Äquinoktium 1950.0*. Berlin: Ferd. Dümmler, 1934. [Veröffentlichungen des Astronomischen Rechen-Instituts zu Berlin-Dahlem, number 50].

- [53] Johann Theodor Peters. *Tafeln zur Berechnung der jährlichen Präzession in Rektaszension für das Äquinoktium 1950.0*. Berlin: Ferd. Dümmler, 1934. [Veröffentlichungen des Astronomischen Rechen-Instituts zu Berlin-Dahlem, number 51].
- [54] Johann Theodor Peters. *Hilfstafeln zur Verwandlung von Tangentialkoordinaten in Rektaszension und Deklination*. Berlin: Ferd. Dümmler, 1936. [Veröffentlichungen des Astronomischen Rechen-Instituts zu Berlin-Dahlem, number 52].
- [55] Johann Theodor Peters. *Sechsstellige Werte der Kreis- und Evolventen-Funktionen von Hundertstel zu Hundertstel des Grades nebst einigen Hilfstafeln für die Zahnradtechnik*. Berlin: Ferd. Dümmler, 1937. [not seen, reprinted in 1951 and 1963 (seen); reconstructed in [90]].
- [56] Johann Theodor Peters. *Sechsstellige Werte der trigonometrischen Funktionen von Tausendstel zu Tausendstel des Neugrades*. Berlin: Wichmann, 1938. [seen, 3rd edition in 1940, 5th and 6th in 1942, 7th in 1943, 9th in 1944, 10th in 1953, 12th in 1959, 14th in 1970, and other editions in 1973 and other years; reconstructed in [86]].
- [57] Johann Theodor Peters. *Achtstellige Tafel der trigonometrischen Funktionen für jede Sexagesimalsekunde des Quadranten*. Berlin: Verlag des Reichsamts für Landesaufnahme, 1939. [reprinted in 1943 (Ann Arbor, Michigan, perhaps in German, but with an English title) and in 1963, 1965 and 1968 in English under the title “Eight-Place Tables of trigonometric functions for every second of arc.”; the last three editions have [37] as an appendix; there have also been two limited English editions in 1939 and 1940 [4]; the main table was reconstructed in [79]].
- [58] Johann Theodor Peters. *Siebenstellige Logarithmentafel*. Berlin: Verlag des Reichsamts für Landesaufnahme, 1940. [2 volumes, 1: Logarithmen der Zahlen, Antilogarithmen, etc., 2: Logarithmen der trigonometrischen Funktionen für jede 10. Sekunde d. Neugrades, etc.; reconstructed in [87] and [88]].
- [59] Johann Theodor Peters. *Siebenstellige Werte der trigonometrischen Funktionen von Tausendstel zu Tausendstel des Neugrades*. Berlin: Verlag des Reichsamts für Landesaufnahme, 1941. [reprinted in 1952, 1956 and 1967; reconstructed in [89]].

- [60] Johann Theodor Peters, Alfred Lodge, Elsie Jane Ternouth, and Emma Gifford. *Factor table giving the complete decomposition of all numbers less than 100,000*. London: Office of the British Association, 1935. [introduction by Leslie J. Comrie, and bibliography of tables by James Henderson, reprinted in 1963] [reconstructed in [73]].
- [61] Johann Theodor Peters and Karl Pilowski. *Tafeln zur Berechnung der Präzessionen zwischen den Äquinoktien 1875.0 und 1950.0*. Berlin: Ferd. Dümmler, 1930. [Veröffentlichungen des Astronomischen Rechen-Instituts zu Berlin-Dahlem, number 49].
- [62] Johann Theodor Peters and Johannes Stein. *Zweiundfünfzigstellige Logarithmen*. Berlin: Ferd. Dümmler, 1919. [Veröffentlichungen des Astronomischen Rechen-Instituts zu Berlin, number 43].
- [63] Johann Theodor Peters, Walter Storck, and F. Ludloff. *Hütte Hilfstafeln : zur I. Verwandlung von echten Brüchen in Dezimalbrüche ; II. Zerlegung der Zahlen bis 10000 in Primfaktoren ; ein Hilfsbuch zur Ermittlung geeigneter Zähnezahlen für Räderübersetzungen*. Berlin: Wilhelm Ernst & Sohn, 1922. [3rd edition].
- [64] Johann Theodor Peters and Gustav Stracke. *Tafeln zur Berechnung der Mittelpunktsgleichung und des Radiusvektors in elliptischen Bahnen für Exzentrizitätswinkel von 0° bis 26°* . Berlin: Ferd. Dümmler, 1933. [Veröffentlichungen des Astronomischen Rechen-Instituts zu Berlin-Dahlem, number 41; second edition, first edition in 1912].
- [65] Denis Roegel. A reconstruction of Adriaan Vlacq's tables in the *Trigonometria artificialis* (1633). Technical report, LORIA, Nancy, 2010. [This is a recalculation of the tables of [104].].
- [66] Denis Roegel. A reconstruction of De Decker-Vlacq's tables in the *Arithmetica logarithmica* (1628). Technical report, LORIA, Nancy, 2010. [This is a recalculation of the tables of [103].].
- [67] Denis Roegel. A reconstruction of Henri Andoyer's table of logarithms (1911). Technical report, LORIA, Nancy, 2010. [This is a reconstruction of [2].].
- [68] Denis Roegel. A reconstruction of Henri Andoyer's trigonometric tables (1915–1918). Technical report, LORIA, Nancy, 2010. [This is a reconstruction of [3].].

- [69] Denis Roegel. A reconstruction of the tables of Briggs and Gellibrand's *Trigonometria Britannica* (1633). Technical report, LORIA, Nancy, 2010. [This is a recalculation of the tables of [17].].
- [70] Denis Roegel. A reconstruction of the tables of Briggs' *Arithmetica logarithmica* (1624). Technical report, LORIA, Nancy, 2010. [This is a recalculation of the tables of [16].].
- [71] Denis Roegel. Napier's ideal construction of the logarithms. Technical report, LORIA, Nancy, 2010.
- [72] Denis Roegel. The great logarithmic and trigonometric tables of the French Cadastre: a preliminary investigation. Technical report, LORIA, Nancy, 2010.
- [73] Denis Roegel. A reconstruction of the table of factors of Peters, Lodge, Ternouth, and Gifford (1935). Technical report, LORIA, Nancy, 2011. [This is a recalculation of the tables of [60].].
- [74] Denis Roegel. A reconstruction of Shortrede's traverse tables (1864). Technical report, LORIA, Nancy, 2013. [This is a reconstruction of [100].].
- [75] Denis Roegel. A reconstruction of Bauschinger and Peters's eight-place table of logarithms (volume 1, 1910). Technical report, LORIA, Nancy, 2016. [This is a reconstruction of [15].].
- [76] Denis Roegel. A reconstruction of Bauschinger and Peters's eight-place table of logarithms (volume 2, 1911). Technical report, LORIA, Nancy, 2016. [This is a reconstruction of [15].].
- [77] Denis Roegel. A reconstruction of Peters's 3-place tables (1913). Technical report, LORIA, Nancy, 2016. [This is a reconstruction of [41].].
- [78] Denis Roegel. A reconstruction of Peters's auxiliary tables to his ten-place logarithms (1919). Technical report, LORIA, Nancy, 2016. [This is a reconstruction of [43].].
- [79] Denis Roegel. A reconstruction of Peters's eight-place table of trigonometric functions (1939). Technical report, LORIA, Nancy, 2016. [This is a reconstruction of [57].].

- [80] Denis Roegel. A reconstruction of Peters's five-place table of logarithms of trigonometric functions (1912). Technical report, LORIA, Nancy, 2016. [This is a reconstruction of [39].].
- [81] Denis Roegel. A reconstruction of Peters's multiplication and interpolation tables (1930). Technical report, LORIA, Nancy, 2016. [This is a reconstruction of [50].].
- [82] Denis Roegel. A reconstruction of Peters's seven-place table of logarithms of trigonometric functions (1911). Technical report, LORIA, Nancy, 2016. [This is a reconstruction of [38].].
- [83] Denis Roegel. A reconstruction of Peters's seven-place table of trigonometric functions (1918). Technical report, LORIA, Nancy, 2016. [This is a reconstruction of [42].].
- [84] Denis Roegel. A reconstruction of Peters's six-place table of trigonometric functions (1929). Technical report, LORIA, Nancy, 2016. [This is a reconstruction of [48].].
- [85] Denis Roegel. A reconstruction of Peters's six-place table of trigonometric functions for the new division (1930). Technical report, LORIA, Nancy, 2016. [This is a reconstruction of [51].].
- [86] Denis Roegel. A reconstruction of Peters's six-place table of trigonometric functions for the new division (1938). Technical report, LORIA, Nancy, 2016. [This is a reconstruction of [56].].
- [87] Denis Roegel. A reconstruction of Peters's table of 7-place logarithms (volume 1, 1940). Technical report, LORIA, Nancy, 2016. [This is a reconstruction of [58].].
- [88] Denis Roegel. A reconstruction of Peters's table of 7-place logarithms (volume 2, 1940). Technical report, LORIA, Nancy, 2016. [This is a reconstruction of [58].].
- [89] Denis Roegel. A reconstruction of Peters's table of 7-place trigonometrical values for the new division (1941). Technical report, LORIA, Nancy, 2016. [This is a reconstruction of [59].].
- [90] Denis Roegel. A reconstruction of Peters's table of involutes (1937). Technical report, LORIA, Nancy, 2016. [This is a reconstruction of [55].].

- [91] Denis Roegel. A reconstruction of Peters’s table of logarithms to 6 places (1921). Technical report, LORIA, Nancy, 2016. [This is a reconstruction of [45].].
- [92] Denis Roegel. A reconstruction of Peters’s table of logarithms to 7 places (1921). Technical report, LORIA, Nancy, 2016. [This is a reconstruction of [46].].
- [93] Denis Roegel. A reconstruction of Peters’s table of products (1909). Technical report, LORIA, Nancy, 2016. [This is a reconstruction of [36].].
- [94] Denis Roegel. A reconstruction of Peters’s ten-place table of logarithms (volume 1, 1922). Technical report, LORIA, Nancy, 2016. [This is a reconstruction of [47].].
- [95] Denis Roegel. A reconstruction of Peters’s ten-place table of logarithms (volume 2, 1919). Technical report, LORIA, Nancy, 2016. [This is a reconstruction of [44].].
- [96] Sa. Review of “J. Peters: Achtstellige Tafel der trigonometrischen Funktionen für jede Sexagesimalsekunde des Quadranten”. *Astronomische Nachrichten*, 269(2):120, 1939. [review of [57]].
- [97] Karl Schütte. *Index mathematischer Tafelwerke und Tabellen aus allen Gebieten der Naturwissenschaften*. München: R. Oldenbourg, 1955.
- [98] Dmitriï Selivanov, Julius Bauschinger, and Marie Henri Andoyer. Le calcul des différences et interpolation. In Jules Molk, editor, *Encyclopédie des sciences mathématiques pures et appliquées*, volume 1(4) (fasc. 1), pages 47–160. Paris: Gauthier-Villars, 1906. [includes a French edition of [13]].
- [99] Daniel Shanks. Jean Peters, Eight-place tables of trigonometric functions for every second of arc. *Mathematics of Computation*, 18(87):509, 1964. [review of the edition published in 1963 [57]].
- [100] Robert Shortrede. *Traverse tables to five places for every 2' of angle up to 100 of distance*. Edinburgh: William Blackwood and sons, 1864. [edited by Edward Sang, reconstruction by D. Roegel, 2013 [74]].
- [101] Gustav Stracke. Julius Bauschinger. *Monthly Notices of the Royal Astronomical Society*, 95(4):336–337, 1935.

- [102] John Todd. J. Peters, Ten-place logarithm table. *Mathematical Tables and other Aids to Computation*, 12:61–63, 1958. [review of the 2nd edition published in 1957 [47, 44]].
- [103] Adriaan Vlacq. *Arithmetica logarithmica*. Gouda: Pieter Rammazeyn, 1628. [The introduction was reprinted in 1976 by Olms and the tables were reconstructed by D. Roegel in 2010. [66]].
- [104] Adriaan Vlacq. *Trigonometria artificialis*. Gouda: Pieter Rammazeyn, 1633. [The tables were reconstructed by D. Roegel in 2010. [65]].
- [105] Stephan Weiss. Die Differenzmaschine von Hamann und die Berechnung der Logarithmen, 2006.
www.mechrech.info/publikat/HamDiffM.pdf.
- [106] Stephan Weiss. Difference engines in the 20th century. In *Proceedings 16th International Meeting of Collectors of Historical Calculating Instruments, September 2010, Leiden*, pages 157–164, 2010.
- [107] Roland Wielen and Ute Wielen. *Die Reglements und Statuten des Astronomischen Rechen-Instituts und zugehörige Schriftstücke im Archiv des Instituts. Edition der Dokumente*. Heidelberg: Astronomisches Rechen-Institut, 2011. [pp. 255–258 on some archives on Peters].
- [108] Roland Wielen and Ute Wielen. *Von Berlin über Sermuth nach Heidelberg : Das Schicksal des Astronomischen Rechen-Instituts in der Zeit von 1924 bis 1954 anhand von Schriftstücken aus dem Archiv des Instituts*. Heidelberg: Astronomisches Rechen-Institut, 2012. [various information on Peters, including photographs].
- [109] Roland Wielen, Ute Wielen, Herbert Hefe, and Inge Heinrich. *Die Geschichte der Bibliothek des Astronomischen Rechen-Instituts*. Heidelberg: Astronomisches Rechen-Institut, 2014. [various information on Peters].
- [110] Roland Wielen, Ute Wielen, Herbert Hefe, and Inge Heinrich. *Supplement zur Geschichte der Bibliothek des Astronomischen Rechen-Instituts*. Heidelberg: Astronomisches Rechen-Institut, 2014. [lists several of Peters’s tables].