Jurij Vega – the most internationally distributed Logarithm Tables

Gerlinde Faustmann

Georg (Jurij) Vega was born in Zagorica, a little village near Ljubljana, in the year **1754**. He spent the first years of his life in Zagorica. From the year **1767** to 1775 Georg attended the grammar school of Ljubljana.

In **1775** Georg graduated at the grammar school as the best pupil of his class. He got a position as an engineer ("k. k. Navigations-Ingenieur" in Innerösterreich). Five years later he decided to terminate his civil profession and to join the army. On November 18th, **1780** he was awarded the teachership of mathematics in the school for artillery ("Artillerieschule"). 1781 Georg became an "Unterleutnant" in the "Garnisons-Artillerie-Distrikt" in Vienna. This quick promotion was largely due to his talent. The inadequate equipment with textbooks was the reason for writing a mathematical textbook himself and in the year **1782** he published his first book and one year later his first logarithm tables were published.

On April 1st, **1784** Vega was promoted lieutenant ("Oberleutnant"). Three years later a higher artillery school was considered to be built. He got a position as a professor of mathematics in the "Bombardierkorps" with the range of a "Hauptmann" on March 1st, **1787**. In this year he also published a work with the title "Praktische Anweisung zum Bombenwerfen" and he married the 17-year-old Josefa Swoboda.

In the year **1788** Austria entered the war against Turkey and Georg should stay as a professor in Vienna. But he prefered to serve in the war to test his theoretical knowledge being confronted with the enemies. During this war he continued his mathematical works, and a testimony of a witness even delivered that Georg was calculating logarithms while cannonballs were flying above his head.
1791 the war ended with the treaty at Sistowa. During this year Vega's first son Heinrich was born. Georg returned to Vienna and continued his mathematical work.

On April 20th, 1792 the "first coalition war" started. In April 1793 Vega promoted to be major and in September his daughter Maria Theresia Regina was born.

During this war Vega sometimes travelled to Vienna and he wrote his third book about logarithms. In the year 1794 he stayed in Stuttgart for two months and he presumedly knew the circle around Schiller. In the same year he became a writing member of the Royal British Society of Science in Göttingen and his "Thesaurus logarithmorum completus ex arithmetica logarithmica et ex trigonometria" was published in Leipzig. During this war Vega noticed that guns would get more power and a longer range if they were adjusted and set up according to the rules of mathematics. In the spring-time of the year 1795 he arranged to cast guns according to his calculations. On May 11th, 1796 he was awarded the "Ritterkreuz des Maria Theresien Ordens" (Knight of the Iron Cross) which had been promised to him three years before.

In February 1796 Vega´s third child was born. The name of his second son was Franz. In the same year Vega got a further award for his research work during the war. The war was ended by the treaty of Campo Formido in the year 1797, from then onwards Vega could spend his time working scientifically and he published new editions of his work.

On January 2nd, 1798 he lectured on his petition of "Mathematische Betrachtungen über eine sich um eine unbewegliche Achse gleichförmig drehende feste Kugel" (mathematical studies about a fixed ball which is invariably rotating around a fixed axis). In the same year he published his "mathematical studies about a fixed ball which is rotating around a mobile axis and the result of it for the astronomy, geography and mechanics on our globe".

On July 7th, **1800** his wife Josepha died. 13 days later their youngest daughter Maria Aloisa died too. In August Vega became a **baron**. In this year he dedicated the fourth part of his "mathematical lectures" to his homecountry and he published his work "Versuch über die Enthüllung eines Geheimnisses in der bekannten Lehre der allgemeinen Gravitation" (Trial about the revelation of the secret of the well-known common gravitation theory).

In the year 1802 he worked on his "Das natürliche Maß-, Gewichts- und Münzsystem" (The natural measure-, weight- and monetary system). In this year he became a lieutenant colonel. There was a note about this promotion in the "Wiener Zeitung" on April 3rd. On September 11th he sent the manuscript of his last work to a bookseller in Vienna.

Since the middle of September **1802** Vega was missing and on September 26th, 1802 his dead body was found in the Danube. There were different opinions about his death; they reached from murder to suicide.

Gerlinde Faustmann, A-Wr. N.

In Vienna a street was named after Vega and Vega-Payer-Weyprecht-barracks should remind us of Georg von Vega. Furthermore there are a lot of the tracks and memorial tablets of Vega in Slovenia.

The following table shows an overview about Jurij Vega´s life:

24. 3. 1754	- christening ceremony
1767 - 1775	- grammar school - Ljubljana
1775	- engineer
7. 4. 1780	- artillery
18. 11. 1780	- teachership of mathematics in the school for artillery
1782	- publication of his first book
1783	- publication: “Logarithmische, trigonometrische,und andere zum Gebrauche der Mathematik eingerichtete Tafeln und Formeln“
1. 4. 1784	- promotion
1. 3. 1787	- professor of mathematics ("Bombardierkorps")
1787	- marriage - Josepha Swoboda
1788	- war
1789	- siege of Belgrad - changed the mortar-batteries
1791	- son Heinrich was born
1793	- major
	- daughter Maria Theresia Regina was born
	- member of the academy of science in Erfurt
13. 10. 1793	- attack - "Weißenburger Linien" - peace
10. 11. 1793	- conquest of Forts Louis - attest
1793	- publication: “Logarithmisch trigonometrisches Handbuch“
1794	- Stuttgart
	- writing member of the Royal British Society of Science in Göttingen
1794	- publication: “Thesaurus“
1795	- Mannheim
11. 5. 1796	- knight of the Iron Cross
1796	- son Franz was born
7. 7. 1800	- wife Josepha died
22. 8. 1800	- baron
1802	- lieutenant colonel
26. 9. 1802	- Vega´s dead body was found in the Danube

Gerlinde Faustmann, A-Wr. N.

Next I will lineout exact details about Vega´s Logarithm Tables:

In the year **1783** he published his first logarithm tables.
This is the **first page of Vega´s tables**:
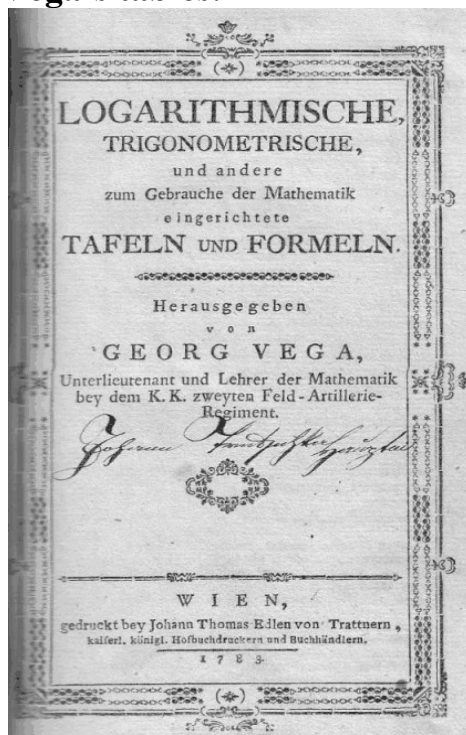
Together with his pupils Vega tried to write faultless tables and formulas and the selling-price should be low. He calculated many tables new and compared them with the tables of SCHULZE, GARDINER, VLACQ and PITISCI. In the prologue he promised to pay one ducat for every mistake.

We can find the common logarithms of the natural numbers from 1 to 100 000 with seven places of decimals. The logarithms of the first 1000 numbers are written together with the index. In the prologue it is exactly explained how to find the logarithm of a number.

In the II. table all factors of the natural numbers from 1 to 10 500 are listed which cannot be divided by 2, 3 and 5.

The third table contains the natural logarithms with the index and 8 places of decimals of the natural numbers 1 - 1000 and of the prime numbers from 1000 to 10 000.

In the 4th table we can find the expressions of the base e by the power of integer numbers. For using this table, an example is deduced which results from the curve of a shoot off ball.

Gerlinde Faustmann, A-Wr. N.

Besides, we can find 20 other tables in this book and a lot of them should be usefull for daily life.

2000 copies of this work were sold and therefore Vega published a second edition. He wrote the prologue to this edition during the first coalition war in February 1797. He also announced his plan to publish three further books of logarithms. One book should be for beginner pupils of the mathematics, another for mathematicians and applied mathematicians. The third book should have a large volume and be useful for astronomers, navigators, professors and all lovers of mathematics who have to make exact calculations. Furthermore he wrote in this prologue that it was impossible for him to find an editor for his books in Vienna and so he was forced to go abroad. This was the reason for publishing the 2nd edition in Leipzig in the year 1797.

A lot of scientists praised this book. There was a note in the "Allgemeinen Literaturzeitung" of Jena on February 17, 1798 and the mathematician Kästner praised these tables in the "Göttinger Anzeiger" of October 21st, 1797.

In spite of his military mission at the "Rhein" he spent a lot of time on writing the "**Logarithmisch-trigonometrisches Handbuch**". It was published in the year **1793** in Leipzig. It was written in German and Latin with the title "Manuale logarithmico trigonometricum matheseos etc." This work contains common logarithms with index and 7 places of decimals of the natural numbers from 1 to 100 000 and the logarithms of the trigonometric functions. I could not find a book of the 1st edition. In the year 1800 the 2nd edition was published and I have a copy of the first page and a lot of other pages. Vega inscribed this edition to his former teacher Joseph von Maffei. Maffai was his teacher in the grammar school in Ljubljana and he soon noticed Georg´s tremendous memory of numbers. I want to give you a translation of this dedication: "I always think of my first lectures which you gave me at the grammar school at Laibach and I happily remember this time when you brought me from the outside to the inside of mathematics and I gratefully dedicate you a book .."

In the prologue the theory of logarithms is explained in full detail in Latin and German. But Vega used fewer mathematical formulas than in his first work. We can also find examples for using the tables. This book had more than 80 editions and it was translated into English, French, Italian, Dutch and Russian. The later editions were done by Hülsse, Bremiker and Tietjen.
But now let me turn to Vega's **largest tables**. In the meantime the tables of Vlacq were out-of-print and a lot of people were looking for new tables. Moreover France changed all measures to decimal positions and the director of the "Bureau du cadastre" got the order to make new tables. Perhaps 70 to 80 mathematicians calculated the "sinusnumbers" with 25 places of decimals and
Gerlinde Faustmann, A-Wr. N.

their logarithms with 14 places of decimals. The logarithms of the natural numbers from 1 to 10 000 were calculated with 19 places of decimals and these of 10 000 to 200 000 with 14 places of decimals. These tables would have needed 1 200 pages and because of the devaluation of banknotes they could never be printed. And so Vega's third tables were published at the accurate time in the year 1794. I am going to show you the **first page** of this voluminous book:
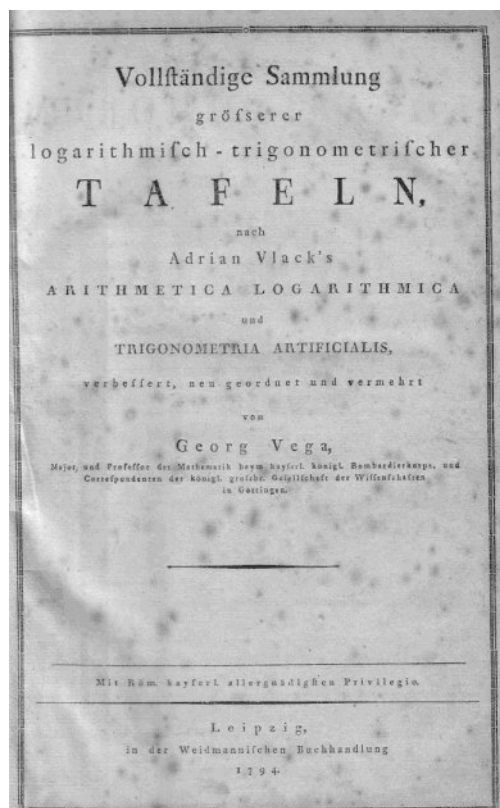
This book was published for astronomers, navigators, professors and all lovers of mathematics who had to make exact calculations. This work is based on Vlacq's "Arithmetica logarithmica seu logarithmorum chiliades centum .. (1628) and "Trigonometria artificialis ... (1633)". Vega corrected wrong digits and added new tables. Together with mathematicians from the artillery corps in Vienna he controlled the printed book. One of these mathematicians was Ignaz Lindner. The prologue of this work is more detailed than in his other books. Similar to the calculation of logarithms in his first tables he explained it in this book.

In the **first table** we can find the common logarithms of the natural numbers from 1 to 101 000 with ten places of decimals together with the index. In the prologue you are given many examples how to find the logarithm of a number.

In the II. table with the title "Magnus Canon logarithmorum trigonometricus" we can find the logarithms of the trigonometric functions. On the first page there are the logarithms of the trigonometric functions for the range of 2 degrees with an intervall of 1 second. The values of the further angles of the first quadrant are

tabulated with an intervall of 10 seconds together with the differences. You can also find many examples and the reasons for the exact calculation of parts of seconds which were needed by calculations of spherical triangles.

Furthermore, you can find other trigonometric tables in this book and π with **140** decimal places.

This "Thesaurus logarithmorum completus" has the volume of 713 pages and it had a great success when it was published. The selling price was also low. Georg Simon Klügel (1739-1812) wrote in his mathematical dictionary that the title "Thesaurus logarithmorum completus" was legitimated by this book. In the "Astronomische Nachrichten" (astronomical news) of May 2nd, 1851 Carl Friedrich Gauss made a critical notice because there were a lot of wrong numbers on the last digit. But it was a personal note of Gauss to give a bad press.

But nearly hundred years after the first publishing the mathematician Bremiker, who published the 82nd edition, said that the "Thesaurus" was still the best table with 10 places of decimals.

Vega´s tables were still printed in the 20th century, the following table gives you an overview of all editions:

Gerlinde Faustmann, A-Wr. N.

Logarithm Tables

Title	Edition	Town, Editor, Year
Logarithmische, trigonometrische, und andere zum Gebrauche der Mathematik eingerichtete Tafeln und Formeln.		Wien, Trattner **1783**
" **I. Band. , verb., verm. und gänzlich umgearb. Aufl.**	2.	Leipzig, Weidmann **1797**
"	3.	" **1812**
"	"	" **1814**
" **II. Band. , verb., verm. und gänzlich umgearb. Aufl.**	2.	Leipzig, Weidmann **1797**
"	3.	" **1812**
"	3.	" **1814**
Sammlung mathematischer Tafeln. Als neue und völlig umgearb. Aufl. von logar. trigonom. Tafeln. Herausg. I.A. Hülsse.	1.	Leipzig, Weidmann **1840**
"verm. mit den Zech'schen Tafeln für Addition und Subtraktion der Logarithmen	2nd Reprint	**1849**
"	3rd Reprint	**1865**
"	"	**1875**
Prospectus von Thesaurus logarithmorum completus.		Leipzig,Weidmann **1792**
Logarithmisch-trigonometrisches Handbuch anstatt der kleinen Vlackischen, Wolfischen,und anderen dergleichen, meistens sehr fehlerhaften, logarithmisch-trigonometrischen Tafeln, für die Mathematikbeflisseneneingerichtet.		Leipzig, Weidmann **1793**
", verb. und verm. Aufl.	2.	**1800**
"	102.	**1966**
"	Reprint	**1969**
"	"	**1971**
Thesaurus logarithmorum completus – Vollständige Sammlung grösserer logarithmisch-trigonometrischer Tafeln.		Leipzig, Weidmann **1794**
"Reproduktion-Fotokopie, Militärisches Geographisches Institut		Florenz **1889**
"		**1896**
"		**1910**
10 place logarithms including Wolfram's tables of natural logrithms	Reprint 1794	New York,Stechert **1923**
"	"	**1946**
"	"	New York,Kafner **1958**
"	"	**1962**

Gerlinde Faustmann, A-Wr. N.