22 - 23 September 2000, Ede - The Netherlands

Proceedings

6th International Meeting of Slide Rule Collectors

DUTCH CIRCLE OF SLIDE RULE COLLECTORS

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Ede - The Netherlands

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Published by the Organising Committee of the 6th International Meeting of Slide Rule Collectors.

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The Editor

Introduction

Welcome to IM2000

It has become an addictive habit, not only our collecting of slide rules, but also our annual meeting somewhere in Europe.
This year again, we are "collected" together in The Netherlands. Back to Holland.
Many of us remember the first European meeting in Utrecht, where we started this annual tradition in 1995.
When we look back, many things have changed since then. Let me point out a few.

Firstly, globalisation of slide rule collecting has become a reality. We emphasised this trend by using the "World-wide" mantra, back in Utrecht. Now we see many collectors are indeed exchanging more and more information (and slide rules, of course!) beyond national borders. Thanks to this trend and assisted by modern technology like the Internet, our collective knowledge on a wide range of slide rule collecting areas is growing impressively. We can see this trend reflected in the increasing professional standard of publications: in our respective newsletters, the Oughtred Society Journal, the Catalogue on CD-ROM and especially the publishing of quality books on slide rules (and even more books are being worked on).

Secondly I feel that our scope is expanding. This is certainly my own personal experience. I notice many of us have progressed from a mere collector of items to a collector of "knowledge" about slide rules. For example, I see people transcending the border of the "slide rule as just an isolated tool" into areas and professions where the slide rule has been applied (discovering unexpected new fields of application like cattle feeding or organ pipe design).
There is a trend of diversification in collecting. Collectors who restricted themselves to one type of object now also include related objects in their scope. For example, from slide rule to mechanical and electronic calculators, to drawing tools or to scientific instruments at large. These trends are to be welcomed because knowledge cannot grow in isolation. Let us continue this trend, as illustrated by the wide range of objects I expect to see offered at the IM2000 swapping and "auction".

And last but not least, we have the growth of our personal contacts and evolving friendships. After all has been said and done, we are just people who welcome social interaction. In simple words, let us enjoy this opportunity to be together, talk and discuss our common interest and of course, have fun.

In practical terms, this meeting follows the pattern set by all previous ones, as you will see in the Proceedings, the agenda and other handout material. We decided to follow tradition because many of you have indicated you prefer a proven routine of social, commercial and professional events. However, any suggestions to further improve future meetings will be greatly appreciated.

On behalf of the Organising Committee for IM2000, I welcome all of you -and your partners- to the Sixth International Meeting of Slide Rule Collectors.
I do hope all your expectations will be fulfilled and you will return home a happier, richer and wiser collector.
In that case, the contributions of many individuals, organisations -like the Oughtred Society- and the efforts of the IM2000 Organising Committee have been well spent.

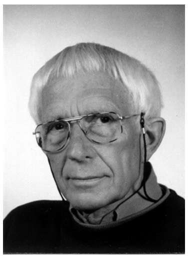
Otto van Poelje

Acknowledgements

Many individuals and institutions have contributed to the realisation of this event, the IM2000, and the Proceedings, which the participants have received as a record of the presented papers.
Of course the list of people who have worked to make this event a success is too exhaustive to mention them all, but some contributions deserve a special mention.

In the first place the Organising Committee, drawn from members of the Dutch Circle of Slide Rule collectors, made this event possible.

Leo de Haan: coordination, preparatory meetings, and sponsor management

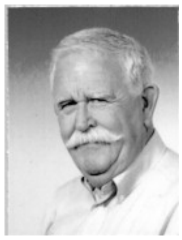


IJzebrand Schuitema: focused on the Exhibition

David Rance (associate member): proof-reading of Proceedings papers and responsibility for the “auction”

Otto van Poelje: contact with the “outside world”, all mailings and final editorship of the Proceedings

Jaap Dekker: owner of all financial matters and other surprises



Nico Smallenburg: arranged the meeting venue, the Ladies Programme and the closing dinner

Frans Vaes: general assistance, preparation of the IM2000 memorial gift and the Babylonian slide rule paper

Thomas van der Zijden: general assistance and the paper on Vlacq

Figure: The Making of IM2000

Others, at various times, worked with the Organising Committee on specific jobs.
Harrie van Dooren and Simon van der Salm produced the first drafts of the Proceedings and –together with Douwe de Haan (Leo's son, a professional graphical designer) who designed the cover and advised on lay out- can be considered the "founding fathers" of this book.
Gijs van Poelje (Otto's son) assisted with the figures, by digital scans and enhancements of original pictures.

A great many suggestions came from members of the Dutch Circle but also from other fellow collectors. The various collectors organisations (see the section on page 71) contributed from their own experience with previous meetings. We are especially grateful to the Oughtred Society for their continued support.

The main contributors to the Proceedings are of course the authors of the papers. They have provided new and in-depth insights from their respective backgrounds - see the "Summaries" chapter on page 5 for more details.

At the bottom line there is always the financial accountability. For the funding of IM2000 and the Proceedings, we are grateful to our sponsors who are listed below.

To the participants falls the greatest acknowledgement of all, because they have the last and most critical job: making the IM2000 a roaring success!

List of Sponsors for IM2000

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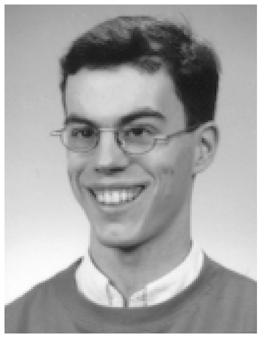
The Editor

Summaries (English, Nederlands, Deutsch)

Thomas van der Zijden



Dutch Work on Logarithmic Tables by Adriaan Vlacq

This Dutchman lived in the early 17^{th} century and has devoted himself to construct logarithmic tables for those numbers that had not been calculated by Napier or Briggs. Although Vlacq is known for the first Dutch logarithmic tables, an intriguing history appears to have taken place, involving cooperation, but also enmity, with other persons.
The youngest member of our Circle, Thomas van der Zijden, student in chemical engineering at the Delft Technical University, has researched this subject and will tell us about the Vlacq story.

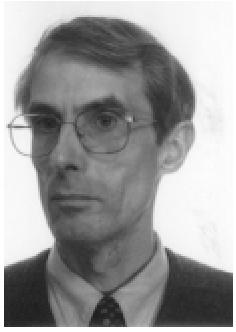
Nederlandse Activiteiten aan Logaritmentabellen door Adriaan Vlacq

Deze Nederlander leefde in het begin van de 17e eeuw en heeft zich beijverd logaritmetabellen op te stellen voor al die logaritmen die niet door Napier en Briggs waren berekend. Hoewel Vlacq's naam verbonden is aan de eerste Nederlandse logaritmetabellen, blijkt dat zich destijds een intrigerende spel van samenwerking en tegenwerking met anderen heeft afgespeeld.
Het jongste lid van onze Kring, Thomas van der Zijden, student scheikundige technologie aan de Technische Universiteit Delft, heeft zich in dit onderwerp verdiept en zal het een en ander over Vlacq vertellen.

Niederländische Arbeit an Logarithmustabellen von Adriaan Vlacq

Dieser Niederländer lebte Anfang des 17. Jahrhunderts und war bestrebt Logarithmentabellen auf zu stellen für all die Logarithmen, die nicht von Napier und Briggs berechnet worden waren.
Obwohl Vlacqs Name verbunden ist mit den ersten niederländischen Logarithmentabellen, zeigt es sich, dass sich damals ein fesselndes Spiel von Zusammenarbeit und Widerstand mit anderen abgespielt hat.
Das jüngste Mitglied unseres Kreises, Thomas van der Zijden, Student der Chemischen Technologie an der Technischen Universität Delft, hat sich in dieses Thema vertieft und wird einiges über Vlacq erzählen.

Pierre Vander Meulen



Slide Rules: from Similarities to Copies

Pierre Vander Meulen, a civil building engineer from Belgium, has made many business trips to the Far East for his employer, an international engineering company. During these trips, especially in China, his attention was drawn by the striking similarity between local chinese slide rules and their western examples.
This article addresses the results of the ensuing study by Pierre.

Rekenlinialen: van Gelijkenissen tot Kopieën

Pierre Vander Meulen, een civiel bouwkundig ingenieur uit Belgie, heeft voor zijn werkgever, een internationaal engineering bedrijf, vele reizen naar het verre Oosten gemaakt. Tijdens zijn verblijf, vooral in China, werd zijn aandacht gevangen door de grote gelijkenis van chinese rekenlinialen met westerse voorbeelden.
Dit artikel geeft het resultaat van Pierre’s bredere studie welke hieruit voortkwam.

Rechenschieber: von Ähnlichkeiten bis zu Kopien

Pierre Vander Meulen, ein bautechnischer Ingenieur aus Belgien, hat für seinen Arbeitgeber, einen internationalen Engineeringbetrieb, viele Reisen nach Fernost gemacht. Während seines Aufenthaltes in China erweckte die grosse Ähnlichkeit zwischen chinesischen Rechenschiebern und Vorbildern aus dem Westen seine Aufmerksamkeit.
Dieser Artikel stellt das Ergebnis von Pierres breiter Studie zu dieser Thematik dar.

Han Wanders

Production at the Dutch ALRO-Company

Most collectors know that ALRO was the name of a Dutch firm that produced slide rule discs.
One of the members of our Circle, Han Wanders, has retired as director from ALRO, some years ago. Han has worked for ALRO since boyhood, has seen all departments in the company and eventually reached the position of general director. This makes him especially suited to tell us about his life-long experience at post-war ALRO. It is not often that information like this can be delivered from first hand.

Productie bij het Nederlandse ALRO-Bedrijf

De meeste verzamelaars zullen weten dat ALRO de naam is van een Nederlandse firma van rekenschijven. Een van de leden van de Nederlandse Kring, Han Wanders, is enkele jaren geleden gepensioneerd als directeur van ALRO. Han heeft bij ALRO vanaf zeer jonge leeftijd gewerkt, in alle afdelingen van de firma ervaring opgedaan en is uiteindelijk opgeklommen tot directeur. Dit feit maakt hem bij uitstek geschikt om ons over zijn lange ervaring bij ALRO na de tweede wereldoorlog te vertellen. Het komt maar weinig voor dat informatie als deze uit de eerste hand wordt verkregen.

Produktion in dem Niederländischen Betrieb ALRO

Die meisten Sammler mögen wissen, dass ALRO der Name einer niederländischen Firma ist, die Rechnscheiben herstellte.
Einer der Mitglieder des niederländischen Kreises, Han Wanders, ist vor einigen Jahren als Direktor von ALRO in den Ruhestand getreten.
Han hat bei ALRO als ganz junger Mann zu arbeiten angefangen, hat in allen Abteilungen der Firma Erfahrungen gesammelt und ist letzten Endes Direktor geworden. Durch diese Tatsache ist er ausserordentlich geeignet, uns über seine langjährige Erfahrung bei ALRO nach dem zweiten Weltkrieg zu erzählen. Es kommt nur selten vor, dass man Information wie diese aus erster Hand bekommt.

Simon A.M. van der Salm

Frans J. Vaes

Number Systems and the Babylonian Slide Rule

Number systems will be presented by Simon van der Salm who is teaching mathematics at the Electrotechnical Institute of Rens & Rens in Hilversum.
Positional number notations -the sexagesimal notation in particular- will be addressed, linked to the slide rule by example of a hypothetical Babylonian slide rule by Frans Vaes, who worked as metallurgical engineer until his retirement.

Getalsystemen en de Babylonische Rekenliniaal

Getalsystemen worden belicht door Simon van der Salm, die wiskunde doceert aan de Hogeschool voor elektronica en informatica Rens & Rens te Hilversum.
Positionele getalnotaties -in het bijzonder de sexagesimale- worden behandeld, waarna op de relatie met rekenlinialen wordt ingegaan, met als voorbeeld een hypothetische Babylonische rekenliniaal door Frans Vaes die voor zijn pensionering werkzaam was als metallurgisch ingenieur.

Zahlensysteme und der Babylonische Rechenschieber

Simon van der Salm, Dozent der Mathematik an der Hochschule für Elektronik und Informatik Rens & Rens in Hilversum, hält einen Vortrag über Zahlensysteme.
Er behandelt positionelle Zahlennotierungen, vor allem das Sexagesimalsystem.
Danach präsentiert Frans Vaes den Zusammenhang dieser Systeme mit Rechenschiebern, an einem hypothetischen babylonischen Rechenschieber als Beispiel.
Frans Vaes war vor seiner Pensionierung als metallurgischer Ingenieur tätig.

Captain Jan F. Schipper

Mercator Graphic Slide Computers in Aviation

Mercator was a firm in Alkmaar which produced, amongst others, flightcomputers. The company was established soon after the second world war, using the specific knowledge and experience of the founders who were pilots. Later Mr. Schipper joined the firm, who again was a pilot himself. He will be able to tell us, again from first hand experience as former director of Mercator, how these very collectable flightcomputers were designed, produced and marketed. Mr. Schipper has been pilot with KLM until his retirement, and is currently Boeing 747-400 captain at Cargolux.

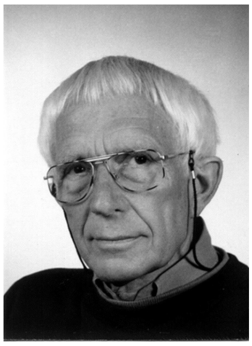
Mercator Grafische Flight-Computers

Mercator was een zaak in Alkmaar die onder andere flightcomputers heeft gemaakt. De firma is kort na de tweede wereldoorlog hiermee gestart, waarbij gebruik werd gemaakt van de specifieke kennis en ervaring van de oprichters, die zelf piloot waren. Later is de heer Schipper aangetreden, ook weer van beroep piloot. Hij kan als voormalig directeur van de firma Mercator vertellen, ook weer uit de eerste hand, wat er zoal komt kijken bij het ontwerpen, produceren en op de markt brengen van deze -in verzamelaarskringen meestal hooggewaardeerde- rekenhulpmiddelen voor de luchtvaart. De heer Schipper is tot aan zijn pensionering piloot geweest bij KLM, en is momenteel Boeing 747-400 gezagvoerder bij Cargolux.

Mercator Flug-Computoren

Mercator war eine Firma in Alkmaar, die unter anderem Flug-Computoren hergestellt hat. Die Firma hat kurz nach dem zweiten Weltkrieg hiermit angefangen, wobei man die spezifischen Kenntnisse und Erfahrung der Gründer, die selber Pilot waren, benutzte.
Später erschien auch Herr Schipper auf der Bühne, auch er war Pilot.
Er kann als ehemaliger Direktor der Firma Mercator erzählen, auch wieder aus erster Hand, was alles zum Entwerfen, Produzieren und auf den Markt bringen von diesen -in Sammlerkreisen meistens hochgeschätzten- Rechenhilfsmitteln für die Luftfahrt gehört. Herr Schipper war bis zu seiner Pensionierung Pilot bei KLM und ist im Moment Boeing 747-400 Flugkapitän bei Cargolux.

IJzebrand Schuitema



Special Slide Rule Exhibition

IJzebrand Schuitema can be considered as Nestor of the Dutch slide rule collectors. His collection which he started already during his work as civil engineer, is the largest and most diverse within the Netherlands. He has always pursued publicity by expositions, interviews and publications, to increase the interest in history and technology of the slide rule. His very activities have led to the establishment of the Dutch Circle, the first one in Europe.
IJzebrand has prepared a special exhibition for the last part of IM2000. Divided over 17 themes, selected slide rules from The Netherlands, and some from abroad, will be shown.
In a dedicated book ("2 x 3 … approximately 6"), that is published separately from the IM2000 Proceedings, IJzebrand has documented the research on the exhibition themes, with fine pictures on CD-ROM.
In a special session, IJzebrand will conduct interviews with some of the former manufacturers of Dutch rules in person.

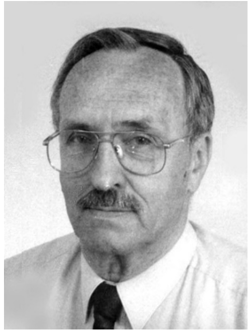
Speciale Expositie van Rekenlinialen

IJzebrand Schuitema kan worden beschouwd als de Nestor der nederlandse rekenlinialen verzamelaars. Zijn verzameling, waarmee hij al tijdens zijn werk als civiel ingenieur is begonnen, is de grootste en de meest bijzondere binnen Nederland, terwijl hij altijd de openbaarheid heeft gezocht -in exposities, interviews en publikaties- om de de aandacht voor historie en techniek van de rekenliniaal te vergroten. Zijn aktiviteiten hebben geleid tot het ontstaan van de Nederlandse Kring, de eerste in Europa.
IJzebrand heeft een speciale tentoonstelling voorbereid voor het laatste dagdeel van IM2000.
In 17 verschillende thema's zullen speciale Nederlandse en enkele buitenlandse rekenlinialen worden getoond.
In een apart boek ("2 x 3 … ongeveer 6"), dat naast de Proceedings van IM2000 wordt uitgegeven, heeft IJzebrand de studie van de onderwerpen van deze expositie vastgelegd, ook met fraaie foto's op CD-ROM.
Een speciale attractie zal bestaan uit een vraag- en antwoord sessie, waarbij hoofdrolspelers uit de fabrikage van Nederlandse linialen zelf de gelegenheid krijgen in te gaan op vragen van IJzebrand en de deelnemers van de conferentie.

Sonderausstellung von Rechenschiebern

IJzebrand Schuitema kann man betrachten als den Nestor der niederländischen Sammler von Rechenschiebern. Seine Sammlung, womit er schon während seiner Arbeit als bautechnischer Ingenieur angefangen hat, ist die grösste und die einzigartigste innerhalb der Niederlande, wo er immer die Öffentlichkeit gesucht hat -in Ausstellungen, Interviews und Veröffentlichungen- um die Aufmerksamkeit für Geschichte und Technik des Rechenschiebers zu vergrössern.
Seine Aktivitäten haben zum Entstehen des niederländischen Kreises, des ersten in Europa, geführt.
IJzebrand hat eine Sonderausstellung für den letzten Teil des Tages von IM2000 vorbereitet.
In 17 verschiedenen Themen werden besondere niederländische und einige ausländische Rechenschieber ausgestellt.
In einem Sonderbuch ("2 x 3 .... ungefähr 6"), das neben den Proceedings von IM2000 herausgegeben wird, hat IJzebrand die Studie der Themen dieser Ausstellung festgelegt, auch mit schönen Fotos auf CD-ROM.
Eine besondere Attraktion wird die Frage- und Antwortsitzung sein, wobei die Hauptfiguren aus der Herstellung von niederländischen Rechenschiebern selber die Gelegenheit bekommen auf Fragen von IJzebrand und den Teilnehmern an dieser Konferenz einzugehen.

Herman van Herwijnen



Slide Rule Catalogue on CD-ROM

Herman van Herwijnen is a born collector and started, during and following his international career at Shell, a number of collections, of which stamps, old camera's and calculating instruments are the main examples.
He has brought into the Dutch Circle much of his experience as collector and as president of the large and active "Fotografica" club.
For more than ten years Herman is active with design and construction of the Catalogue, identifying and describing the slide rules known in the Dutch Circle. In the first phase this Catalogue, also known as Blue Book, was restricted to pure text. During the last few years Herman has added digital photos of more than half of the total 3000 slide rules in the Catalogue (now published on CD-ROM), making it a very informative and attractive reference work.
Herman will tell us about his recent work on the Catalogue and its current status.

Rekenlinialen Catalogus op CD-ROM

Herman van Herwijnen is een geboren verzamelaar en heeft tijdens en na zijn internationale loopbaan bij Shell een aantal verzamelingen aangelegd, waarvan postzegels, oude camera's en rekeninstrumenten de voornaamste voorbeelden zijn. Veel van zijn ervaringen als verzamelaar en voorzitter van de grote en bloeiende "Fotografica" club heeft hij ook kunnen toepassen in de Nederlandse Kring.
Hij is reeds meer dan tien jaar bezig met de Catalogus, waarin hij de rekenlinialen, die bekend zijn bij de Nederlandsche Kring, identificeert en beschrijft. In het begin bestond deze Catalogus, ook wel Blauwe Boek genoemd, puur uit tekst. De laatste jaren heeft hij echter van meer dan de helft van de ruim 3000 linialen in de Catalogus een digitale foto toegevoegd, waardoor de Catalogus (nu op CD-ROM uitgegeven) een bijzonder informatief en boeiend naslagwerk is geworden.
Herman zal vertellen van zijn recente werk aan de Catalogus, en de huidige status ervan.

Rechenschieberkatalog auf CD-ROM

Herman van Herwijnen ist ein geborener Sammler, und er hat während und nach seiner internationalen Laufbahn bei Shell eine Anzahl von Sammlungen angelegt, von denen Briefmarken, alte Kameras und Recheninstrumente die wichtigsten Beispiele sind. Viele von seinen Erfahrungen als Sammler und Vorsitzender des grossen und blühenden "Fotografica"-Klubs hat er auch im niederländischen Kreis anwenden können.
Er beschäftigt sich schon mehr als zehn Jahre mit dem Katalog, in dem er die Rechenschieber, die bei dem niederländischen Kreis bekannt sind, identifiziert und beschreibt. Anfangs bestand dieser Katalog, auch "Blaues Buch" genannt, ausschliesslich aus Text. Die letzten Jahre hat er mehr als der Hälfte der gut 3000 Schieber ein digitales Foto zugefügt, wodurch der Katalog (jetzt auf CD-ROM herausgegeben) ein ausserordentlich informatives und fesselndes Nachschlagewerk geworden ist.
Herman wird von seiner neuesten Arbeit am Katalog und dessen heutigem Status vortragen.

Thomas van der Zijden

Dutch Work on Logarithmic Tables by Adriaen Vlacq

The first complete logarithmic table
Produced by the Dutchmen Adriaen Vlacq and Ezechiël de Decker

Abstract
The first table with Briggs's logarithms was produced by Henry Briggs in 1624. Since he only calculated the logarithms from 1 to 20 000 and from 90 000 to 100 000 there was a demand for a complete table.
The arithmetician, translator and businessman Adriaen Vlacq and his mathematical friend Ezechiël de Decker decided it was up to them to make such a table. The table was finished in 1627. De Decker was the main author, making him the creator of the very first complete logarithmic table. Nevertheless, for many years Adriaen Vlacq received the honours. He claimed "part two" of Briggs's table in 1628, without giving credit to and even mentioning de Decker. In 1920, de Decker's table was rediscovered.

Introduction

Mathematicians and technicians have always strived to simplify their calculations. Simple arithmetic was a way of life.
The Dutchman Van Ceulen, for example, devoted his life to calculate as many decimal positions of π as possible. At the end of his life, he had calculated it to 35 decimal positions. They are engraved on his tombstone at the St. Petrus's Church, Leiden. Many systems have been invented to speed-up calculation times. For example, tables of square roots. The logarithmic table increased the speed of calculations enormously and it was very clear for any businessman the continent was in need of logarithms.

In 1614, John Napier, Baron of Merchiston, published his logarithms. These logarithms are not the natural logarithms as we know them. They are a transformation of our ln(x) mathematical function. The title is *Mirifici Logarithmorum Canonis Descriptio*. In 1619 the Englishman, John Speidell, produces the first "real" table of natural logarithms.
Working on Napier's advice, Henry Briggs, a tutor at Oxford, simplified the calculations greatly by taking the number 10 as the base number. Briggs would have preferred 0.1 as his base. In 1617 he produced a small logarithmic table but his famous table, *Arithmetica Logarithmica*, came later in 1624. Meanwhile, William Oughtred had already invented his slide rule. We do not know for sure but it must have been around 1620. While Great Britain adopted the new logarithms, the rest of the continent did not follow.

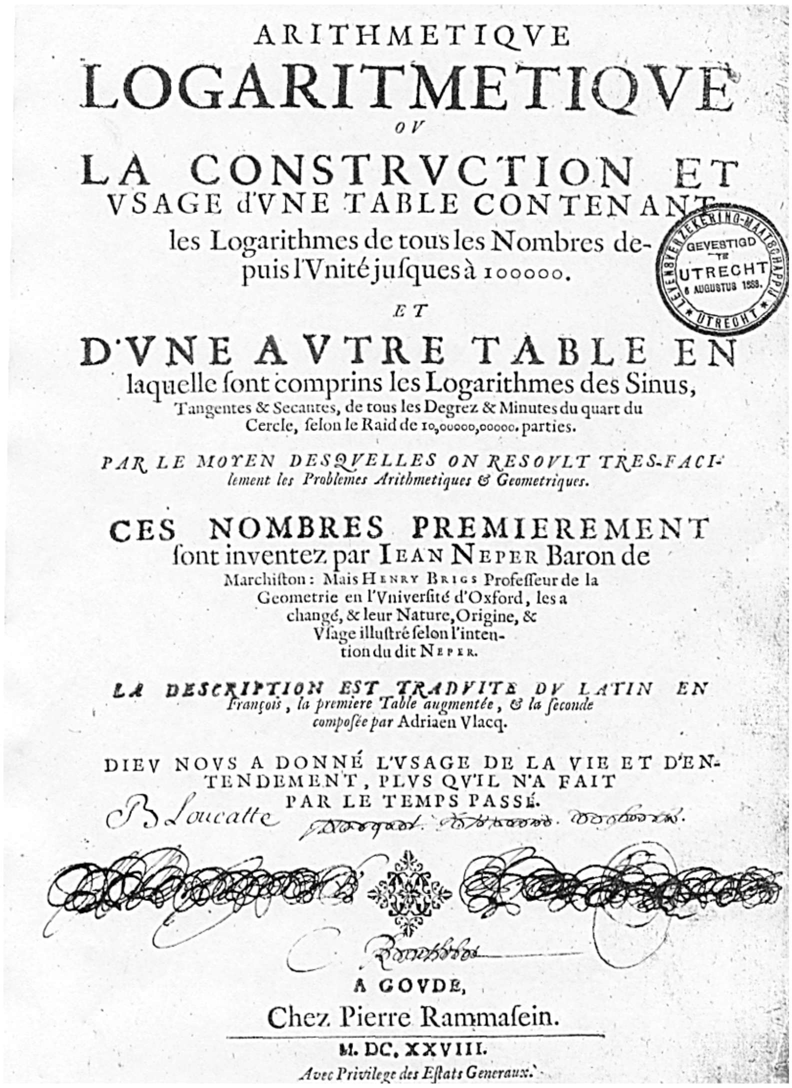

ARITHMETIQVE
LOGARITMETIQVE
OV
LA CONSTRVCTION ET VSAGE d'VNE TABLE CONTENANT les Logarithmes de tous les Nombres depuis l'Vnité jusques à 100000.
ET
D'VNE AVTRE TABLE EN laquelle sont comprins les Logarithmes des Sinus, Tangentes & Secantes, de tous les Degrez & Minutes du quart du Cercle, selon le Raid de 10,00000,00000. parties.
PAR LE MOYEN DESQVELLES ON RESOVLT TRES-FACILement les Problemes Arithmetiques & Geometriques.
CES NOMBRES PREMIEREMENT sont inventez par IEAN NEPER Baron de Marchiston: Mais HENRY BRIGS Professeur de la Geometrie en l'Vniversité d'Oxford, les a changé, & leur Nature, Origine, & Vsage illustré selon l'intention du dit NEPER.
LA DESCRIPTION EST TRADVITE DV LATIN EN François, la premiere Table augmentée, & la seconde composée par Adriaen Vlacq.
DIEV NOVS A DONNÉ L'VSAGE DE LA VIE ET D'ENTENDEMENT, PLVS QV'IL N'A FAIT PAR LE TEMPS PASSÉ.
A GOVDE,
Chez Pierre Rammasein.
M. DC. XXVIII.
Avec Privilege des Estats Generaux.

Figure: Lord Napier's book on logarithms

There was a small problem: Briggs only calculated the logarithms for 1 to 20,000 and from 90,000 to 100,000 (in some versions to 101,000). He kindly requested "the rest of the world" to complete the rest. The two Dutchmen, de Decker and Vlacq, took up this challenge.

The "Eerste deel van de nieuwe Telkonst"

Ezechiël de Decker discovered a dislike of arithmetic[1]: "While having a job of Geometry and Arithmetic in the famous city of Gouda, I found that many pupils were scared of and disliked the Arts, because of the large and tedious calculations to be found in these Arts. I found that they held them in contempt, instead of loving them and that I myself spent many hours solving a few problems that I had to calculate every day. I was very eager to find any solution to this."
Ezechiël de Decker was born in Leiden in 1603 or 1604. An exact date of birth is unknown because in those days, the archives of Leiden were not kept up-to-date. However, he made a statement on 15th

[1] In Dutch: "Terwijl ick inde Vermaerde Stadt Gouda Professie doende vande Meetkonst ende Rekenkonst bevondt, dat vele Leerlingen grooten schrick ende afkeericheydt hadden vande Konsten, door de groote ende verdrietighe Rekeninghen, die inde selfde voorkomen, alsoo dat de selfde by haer in verachtinghe zijn in plaets van die te beminnen, ende ooc bevondt, dat ick selfs veel tijds moste besteden int solveren van eenighe questien die my daghelijcx voorquamen, ben ick seer begheerich geweest om eenighe remedie daer toe te konnen vinden."

September 1636 that he was 32 years old. On 12th October 1621, he became a 'poorter' (freeman, civilian, inhabitant) of the city Goude (Gouda). On 4th September 1622, he married the Flemish Jerijntgen Blavoets. He remained a schoolteacher in Gouda until approximately 1624 or 1625. After that he became a surveyor. He was also a “wine gauger”. He died between 19th November 1646 and 4th April 1647. His sons, Joris and Pieter, also became “wine gaugers”.
De Decker decided to produce "Het eerste deel van de nieuwe Telkonst" (the first part of the new arithmetic).


EERSTE DEEL
VANDE NIEUVWE
TELKONST,
INHOVDENDE VERSCHEYDE
MANIEREN VAN REKENEN, WAER
door ſeer licht connen volbracht worden de Geo-
metriſche ende Arithmetiſche queſtien.
Eerſt ghevonden van IOANNE NEPERO Heer
van Merchiſtoun, ende uyt het Latijn overgheſet door
ADRIANVM VLACK.
Waer achter bygevoegt zijn eenige ſeer lichte manieren van Rekenen
tot den Coophandel dienſtigh, leerende alle ghemeene Rekeninghen
ſonder ghebrokens af veerdighen. Mitſgaders Nieuwe Tafels
van Intereſten, noyt voor deſen int licht ghegeven.
Door EZECHIEL DE DECKER, Rekenm^r.
Lantmeter, ende Lief hebber der Mathematiſche
kunſt, reſiderende ter Goude.
Noch is hier achter byghevoeght de Thiende *van*
Symon Stevin *van Brugghe.*
ACAD. LUGD.BAT. BIBL.
TER GOVDE,
By *Pieter Rammaſeyn*, Boeck-verkooper inde corte
Groenendal, int Vergult A B C. 1626.
Met Previlegie voor thien Iaren.

Figure: de Decker's Part One

This book contained:

- "Vande Telling door Roetjes" (On the counting with rods), a translation of Napier's Rabdologia
- Appendices for this article, named "Veerdigh-Ghereetschap van de Menighvuldiging" (useful tools for multiplication) and "Van de Plaetselicke Telkunst" (On the local arithmetic)
- An article he wrote on calculating interest, "Van Coopmans Rekeninghen" (on the calculations for businessmen)
- A reprint of "De Thiende" (The Tenth), by Simon Stevin, dealing with decimal fractions

Napier also wrote about decimal fractions and used them in Rabdologia. "De Thiende" was printed in 1585 and translated into English in 1608.

In Rabdologia, Napier describes only the use of Napier's bones. So in de Decker's book, logarithms are not mentioned. His book was published on 4th September, 1626. De Decker mentioned his friend Adriaan Vlacq[2]:
"But as I was inexperienced in the Latin tongue, I begged the art loving gentleman, Adriaen Vlac (who was then devoting himself with great zeal to Geometry) to do the translation into Dutch. Which he did to my great satisfaction...".
At the same time, the book "Nieuwe Telkonst" (New Arithmetic) was published. It contains the logarithms from 1 to 10 000. These logarithms were truncated from 14 to 10 decimal positions but were taken from Briggs's "Arithmetica Logarithmica".
Ezechiël de Decker declared there would be a "Tweede deel van de Nieuwe Telkonst" (part two of his new arithmetic) containing the works of Briggs, translated into Dutch. Adriaen Vlacq was to have provided the missing numbers.

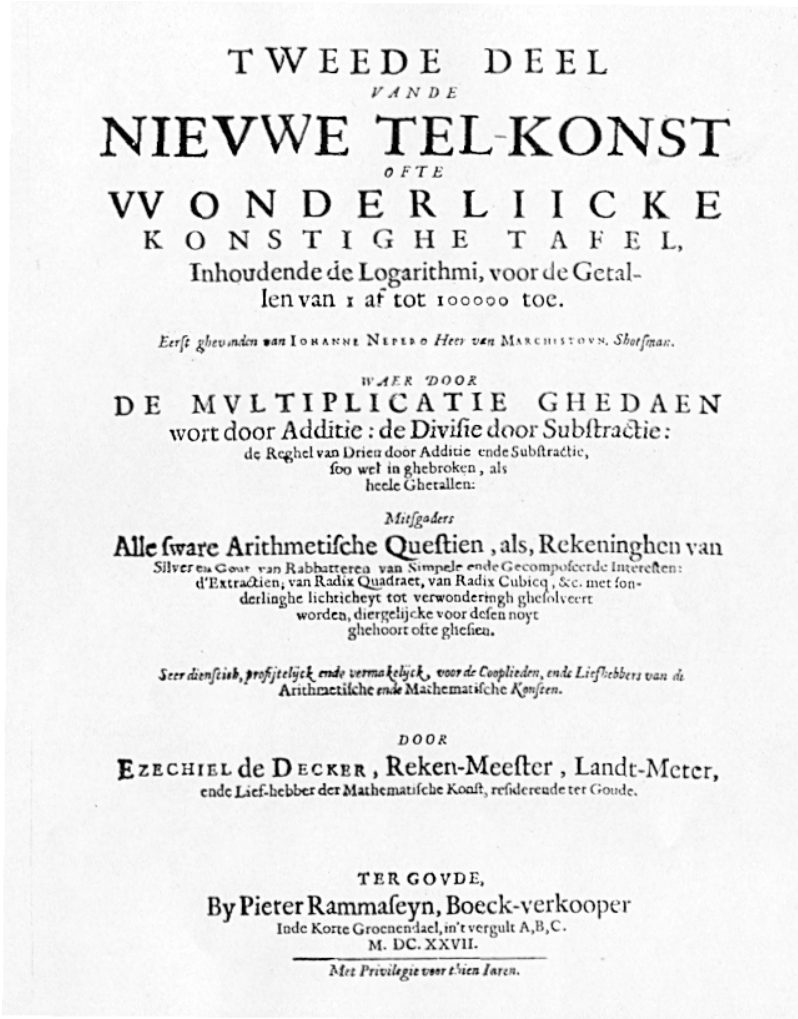
Adriaen Vlacq

The books of Ezechiël de Decker could not have been written without the help of Adriaen Vlacq. Adriaen Vlacq, Vlac, Vlacque or Ulacque was born about 1600 in Gouda. He was a member of a "magistrates family" in the city of Gouda. He received a humanistic upbringing; meaning he could translate Latin. On 20th December 1633 he married Claesge Tonis. On 27th December 1625 he decided to publish the book, "Nieuwe Telconst" (new arithmetic). He wanted to collaborate with Ezechiël de Decker and Lourens Borreman. Mr. Borreman would have taken de Decker's place had he fallen ill or died. As this did not happen, Borreman had nothing to do with the first complete Dutch logarithmic table. All this was recorded in a deed by the public notary, Dominicus Douw. But this plan was too difficult so the book was split into three earlier mentioned books (the First and Second part and the small "New Arithmetic"). Adriaen Vlacq was a businessman. He foresaw there was a need for the new English invention called "logarithm". On 24th December 1625 he had asked for and received a privilegie (copyright) from the States General of the Kingdom of the Netherlands. Vlacq took all financial risks. For his contribution Vlacq, according to the deed, promised de Decker he would receive sixty guilders and forty copies of the new book. However, as the book was published in three separate parts, it is unclear what payment de Decker received. Forty copies of each book? We do not know but 120 books would have represented an enormous value. Furthermore, Vlacq had closed a deal with Pieter Rammaseijn, a printer in Gouda. This deal states Vlacq would supply the paper. This sounds strange but Rammaseijn had problems with his Rotterdam paper supplier, Willem Kockartz. Rammaseijn had not paid for the paper used for printing his "Augustijn Bibles". Apparently, Rammaseijn was not very good at paying up. Vlacq would not let Rammaseijn endanger his plans. So he supplied the paper himself.
After his time in Gouda, Vlacq moved to London in 1633. Here, as a result of a dispute with competitors, he was stopped from exporting any more books to Holland. Vlacq had a talent for getting embroiled in political matters. This is why he left for Paris in 1642. He got into a row with the booksellers of Rue St. Jacques. This dispute was even debated in the French parliament! He had to leave Paris for a year but then returned. He remained there until 1648. After that, he left for The Hague. Here he had premises in the Halstraat, a busy street in those days, that doubled as a printers' and a bookshop. Once again he succeeded in getting mixed up in political disputes and printed an illegal magazine. He died in 1667.
In The Hague he was a printer but never as a member of Pieter Rammaseijn's firm. He merely did business with him. He has been accused by several writers of copying other people's work and infringing their copyrights. In response, he wrote "Typographus pro se ipso" to defend his action.

[2] In Dutch: "Doch also ick inde Latijnsche sprake onvervaren was, badt ic den Konstlievenden Ionghman Adrian Vlac, (die hem doenmale met grooten yver inde Meetkonst oeffende), dat hy 'tselfde wilde in Nederduyts overschrijven, 'twelck hy tot mijn groot contentement dede,..."

The "Tweede deel van de Nieuwe Telkonst"

De Decker had signed a deal with Vlacq to write "Het Tweede deel van de Nieuwe Telkonst" (the second part of the New Arithmetic") following a commitment he made in the "First part".


TWEEDE DEEL
VANDE
NIEVWE TEL-KONST
OFTE
VV ONDERLIICKE
KONSTIGHE TAFEL,
Inhoudende de Logarithmi, voor de Getal-
len van 1 af tot 100000 toe.

Eerst ghevonden van IOHANNE NEPERO Heer van MARCHISTOVN, Schotsman.

WAER DOOR
DE MVLTIPLICATIE GHEDAEN
wort door Additie: de Divisie door Substractie:
de Reghel van Drien door Additie ende Substractie,
soo wel in ghebroken, als
heele Ghetallen:

Mitsgaders
Alle sware Arithmetische Questien, als, Rekeninghen van
Silver en Gout van Rabbatteren van Simpele ende Gecomposeerde Interesten:
d'Extractien; van Radix Quadraet, van Radix Cubicq, &c. met son-
derlinghe lichticheyt tot verwonderingh ghesolveert
worden, diergelijcke voor desen noyt
ghehoort ofte ghesien.

Seer dienstich, profijtelijck ende vermakelijck, voor de Cooplieden, ende Liefhebbers van de
Arithmetische ende Mathematische Konsten.

DOOR
EZECHIEL de DECKER, Reken-Meester, Landt-Meter,
ende Lief-hebber der Mathematische Konst, residerende ter Goude.

TER GOVDE,
By Pieter Rammaseyn, Boeck-verkooper
Inde Korte Groenendael, in't vergult A,B,C.
M. DC. XXVII.

Met Privilegie voor thien Iaren.

Figure: de Decker's Part Two

The preface is dated 2nd October 1627. This means Ezechiël de Decker and not Adriaen Vlacq was the author of the first logarithmic table. De Decker mentions Vlacq's help but he, and only he, is mentioned on the title page as the author. I think Vlacq did not mind because he had the copyright and he received the money. There is only one known copy of this book, in the library of Fortis NV in Utrecht. Why is there only one copy left? In 1628 Vlacq published, in Latin and French, a newly edited and supplemented version of Briggs' "Arithmetica Logarithmica". It was later translated into English. It seems, that this book was much more popular. For many years the scarcity of the "Second Part" meant there were doubts if it had ever been published. The original plan of writing one big book had failed and de Decker probably did know that Vlacq had plans to write a complete logarithmic table by himself. Even worse, Vlacq set the bailiff on de Decker to demand he hurried up with the second part of the book. De Decker requested eight days grace to respond. What he response was, has been lost. Therefore, for a long time it was thought de Decker had no interest in writing the "Second part". Yet he did. I have had this book in my hands. One of the illustrations in this article is its title page. The misunderstanding, that Vlacq rather than de Decker wrote the first complete logarithmic table, is still quite common.

Vlacq's "Arithmetica Logarithmica"

Adriaen Vlacq felt the need for yet another complete logarithmic table. Most likely, he was not amused by his friend's slow behaviour. It is very remarkable, that he used the exact same tables in his logarithmic table. I have had both books in my hands. In both of them the printing plates used resulted in the same blemishes. If part of a line faded away in de Decker's book, it is also missing in Vlacq's version. Vlacq made two embarrassing errors with this book. While de Decker gives credit to Vlacq as the numerator and translator in his book, Vlacq never mentions de Decker. This is serious. I believe that Vlacq and de Decker became enemies after this affair but this is disputed. Prof. David Bierens De Haan says, de Decker printed a book at Rammaseijn's shop in 1631. According to Bierens De Haan, Vlacq is the owner of this shop and so still friends with de Decker. But Vlacq is not the owner of the shop. So this is no proof. Vlacq was accused of infringing copyrights multiple times. He did not see any harm in these infringements but it was certainly “ungentlemanly” behaviour. Formally, Vlacq was also the owner of de Decker's copyrights.

On top of this, Vlacq knew that Briggs was completing, with the help of friends, his original work. Therefore Vlacq was in a hurry to finish his book. First, he tried chivvying up de Decker through a bailiff. After that, he wrote his own. He writes in the Latin version: "*Editio Secunda, auxta per ADRIANUM VLACQ Goudanum*" (second edition, written by Adriaen Vlacq, Gouda). This is impolite. He is implying that Briggs can no longer write a second part because Vlacq has written it. Some authors think this is very modest of Vlacq. He is merely stating he only created the second part and did not write Briggs's book. Yet he copyrighted the second part. So Briggs did all his hard labour for nothing! He also truncated Briggs's numbers from 14 to 10 decimal positions. It is a fair assumption that Briggs was not amused about this. However, Briggs was a very calm man. He wrote: "*My desire was to have those Chiliades that are wantinge betwixt 20 and 90 calculated and printed, and I had done them all almost by my selfe, and by some frendes, whom my rules had sufficiently informed, and by agreement the business was conveniently parted amongst us; but I am eased of that charge and care by one Adrian Vlacque, an Hollander, who hathe done all the whole hundred chiliades, and printed them in Latin, Dutche (!) and Frenche, 1000 bookes in these 3 languages and hathe sould them almost all. But he hathe cutt of 4 of my figures throughout; and hathe left out my Dedication and To the reader, and two chapters the 12 and 13, in the rest he hathe not varied from me at all...*". Yet, he was not offended because he also wrote about the Dutchman: "*I ever rest a lover of all tham love the Mathematickes*."

History repeats itself

For centuries it was unknown that Ezechiël de Decker had written the first complete logarithmic table. Prof. Bierens De Haan proved in 1842 that the first complete logarithmic table has been produced by a Dutchman and not the Frenchman D. Henrion or the Dutchman Johannes Maire. He thought Adriaen Vlacq was the winner because he believed the "Second part" was never published. Bierens De Haan thought Vlacq and de Decker had lost interest in publishing the Second part because Vlacq already had plans to translate "Arithmetica Logarithmica". Bierens De Haan supported his claim with:

Vlacq never mentioned de Decker's Second part in his "Arithmetica Logarithmica".
If the Second part had existed, then de Decker and Vlacq would not have been friends afterwards.
In 1631, de Decker printed a book about ships at Rammaseijn's shop.
Vlacq owns this shop. So they are still friends and the Second part does not exist.

Bierens De Haan is in error. Vlacq did not own Rammaseijn's shop. So his reasoning is flawed.

It was only in 1920 that the "Second part" was discovered in the library of "La compagnie d'assurances sur la vie Utrecht". Here is how it happened. Prof. M. Van Haaften wanted to verify if the verb "to interpolate" was used in 1656 for the first time in a book. Therefore he needed to research some old logarithmic tables. He knew the library in Utrecht had Napier's table (1614) and a French version of Vlacq (1628). He asked for any other old logarithmic tables not mentioned in the catalogue of 1916.

To his astonishment he received from the librarian, J.W. Hommes, the "Second part". The library had bought the book in 1918 for a reasonable price from a second-hand bookseller. The Utrecht library does not only have books about insurance but also various other subjects, like all kinds of diseases. Its owner was interested in many subjects. Van Haaften wrote about this important discovery in "De verzekeringsbode" (The Assurance Courier") from 4th September, 1920. Of course, De Verzekeringsbode was not widely known by mathematicians. In contrast, Bierens De Haan's articles were very well known. So many mathematical encyclopaedias perpetuated his error.

By the way, there still is a facsimile copy available of the title-pages and the introduction of the "Second part of the new Arithmatic". This has an English introduction by A.J.E.M. Smeur. It is a reprint from 1964 but can still be ordered from De Graaf Publishers BV, Nieuwkoop (ISBN 90 6004 037 6).

I was asked by the Dutch Circle of Slide Rule Collectors to write an article about Vlacq, the very first author of a complete logarithmic table. Fortunately, I had a friend, Mr. H.N. Pot, who had a wide-ranging interest in mathematical subjects. I asked him to look out for articles concerning Vlacq. He easily found the articles from Bierens De Haan. At the same time, he did some research on old Dutch arithmetic books. He got a tip from the Dutch Central Catalogue electronic library system to try the library of AMEV/Fortis in Utrecht. It contained a publication in De Verzekeringsbode. During his first telephone contact the very helpful librarian, Mr. Van der Bijl, told him that his library not only contained the books on arithmetic but also a collection of very rare tables of logarithms. Mr. Pot has asked me to join him on a visit to the library. Mr. Van der Bijl, presented to me the only known copy in existence of the "Second part". I was just as astonished as Mr. Van Haaften was 79 years ago. Mr. Van der Bijl knew that Van Haaften had discovered this unique book in his library. He could also show me the articles in "De Verzekeringsbode" as well as some other magazines. That is how this article came to be written. It arrives at the surprising conclusion: **Ezechiël de Decker** and not Adriaen Vlacq wrote the first complete logarithmic table.

The spelling of words

In the seventeenth century a standard spelling for the Dutch language did not exist. Especially names of people could be spelled in many ways. I have tried to quote all phrases as I found them. That does result in a wide variation of names. In fact, I found that in some sources original quotes are spelled differently than in other sources. For your information, I have included the original Dutch quotations as well.

Conclusion

It is remarkable, that several publications credit Adriaen Vlacq as the author of the first complete logarithmic table. This is only partially true. He was an arithmetician, translator and financier for his friend Ezechiël de Decker. However, it is de Decker who has put his name on the title page of this first table. Vlacq's table was a larger commercial success. That is why de Decker's table is now very rare. It is without dispute that Vlacq did much for modern mathematics. He has been partially knocked off his pedestal because he failed to mention de Decker in his publication. Moreover and even worse, he copyrighted something which should have belonged to Henry Briggs. Fortunately, Briggs did not mind. The Dutch collectors of slide rules can be very proud the very first complete logarithmic table was made by a Dutchman. It is thanks to the logarithm that we now share a common interest: collecting slide rules.

Pierre Vander Meulen

Slide Rules: from Similarities to Copies

ABSTRACT:
"nothing happens by chance!" This paper tries to show that in the field of the slide rule many items, the whole slide rule, or only parts of it, are similar. The degree of similarity could, in some cases, be considered a copy.

INTRODUCTION

The word “clone” is actually very often used for the Personal Computers as "one that appears to be a copy of an original form".
Someone buying a computer may no longer bother to distinguish between a major brand computer from one made in Taiwan. Furthermore many parts, even from the majors, are subcontracted to others and finally come from ....: ”Taiwan”. A brand has its own characteristics but generally speaking, one PC looks a lot like another PC.
What is true for PCs is true for one if its ancestors: the slide rule.
Consider your own collection, you must have been struck by the similarity between some pieces or parts and, comparing them more in detail, you could find some very close likeness.
This paper deals only with slide rules from the 20th century.

WORDING

The verb "to copy" is defined by the WEBSTER'S dictionary as "to make something so that it resembles an existing thing".
"Copy" suggests *duplicating an original as nearly as possible* but its synonym "imitate" suggests "*following a model or a pattern but may allow for some variation"*.
Some other words exist like "replica", "counterfeit" … and "fake".
This last word means "*a worthless imitation passed off as genuine*".
All of these synonyms lead finally to the same idea of similarity.

PRESENT TOPIC

The purpose of this topic is to try to get an idea of the differences between the above mentioned words in the specific field of slide rules.
When we get an impression of similar, does it mean "copy" or simply a comparable object with its own specific attributes?

TWO EXTREMES

THE WORST: "A FAKE"

When hunting for slide rules, all of us come into contact with other objects like types of sextants, telescopes, surveying equipment, compasses, levels and other 19th century based optical and measuring devices. If authentic, average items of this type retail for about $100 - $750. The reproductions retail for $45 - $125. Many of them are appealing to the non-specialists because they look like the genuine object or even better. Many pieces are marked with European City names such as "London". Some pieces are also marked with what appear to be a makers' names such as the prestigious "Stanley" and carry a four-digit number such as "1912" suggesting the year of production. It is important to understand in this context "London" is no different to "Bombay", "Stanley" is no different to "xyz workshop" and "1912" is no different to "1998".
That kind of object is a true "fake". It is "worthless" and "intentionally produced to be passed off as genuine".
A good question is "what is the risk of finding such a "fake" in the field of slide rules?"
If the answer is "YES", some basic conditions should be met in order to make from the production of a fake slide rule a realistic business.

- the object should appeal to the buyer
  - *do slide rules, with their obscure scales, appeal to the man in the street?*
- there should exist a market for such items
  - *does the rather small number of collectors justify the production of fakes in that field? Collecting slide rules is certainly not a popular hobby!*
- the items should pass off as genuine
  - *are the collectors stupid enough to buy a fake?*
- the manufacturing process should be effective
  - *how to get fair logarithmic scales without a dividing engine or at least a very good master?*

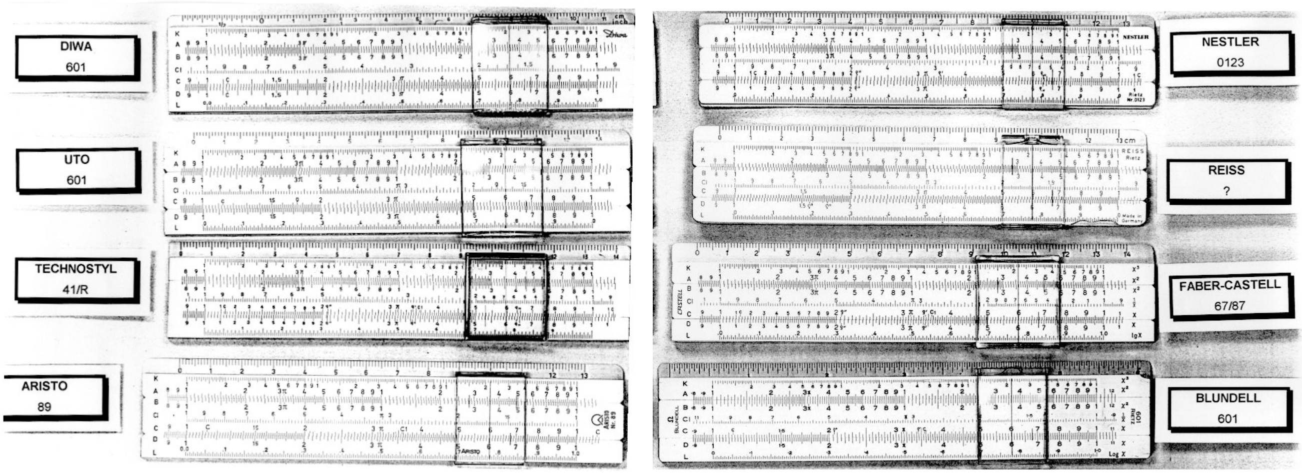
As far as I know, the one and only very productive field of fakes in relationship with slide rules, is the "BREITLING Navitimer" wristwatch where the brand name does not appear on the fake but where the deliberate copy is obvious.

Watches have always been a fantastic world-wide field for the forgers.
The "Navitimer" case is not due to its slide rule nature but to the "BREITLING" name.
It is hard to believe, but it is not unusual to find some fakes *with* the bezel scale, however *without* the fixed counterpart scale.

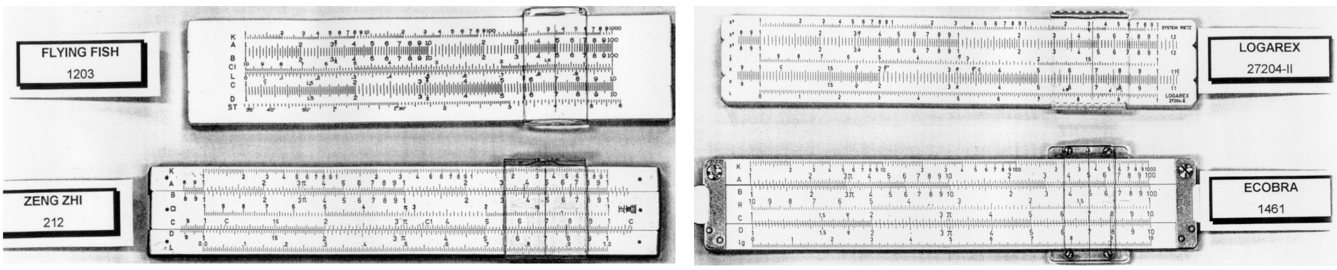
In my opinion, the only other possible field where fakes could appear is items like ivory or boxwood sectors, 18th century slide rules, Gunter scales and the likes. However this has yet to be proven.

Pure similarity but not copies

Let's look at one of, if not "the", most popular and common slide rule types: the Rietz 12.5 cm pocket slide rule (the one resident, 30 years ago, in almost all engineer's jacket pockets). All of them are made of plastic and with a solid frame.
This model is an elementary one with K, A = B, CI, C = D, L scales on front and S, ST, T scales on the back of the slide.
There is apparently not too much room for innovation or inventing something very specific and original. Indeed when checking any collection, the so called "pocket Rietz", the degree of similarity in the so called "pocket Rietz" should not be surprising. Many of them are in fact built on a common model.
An illustration of what is said is found here:



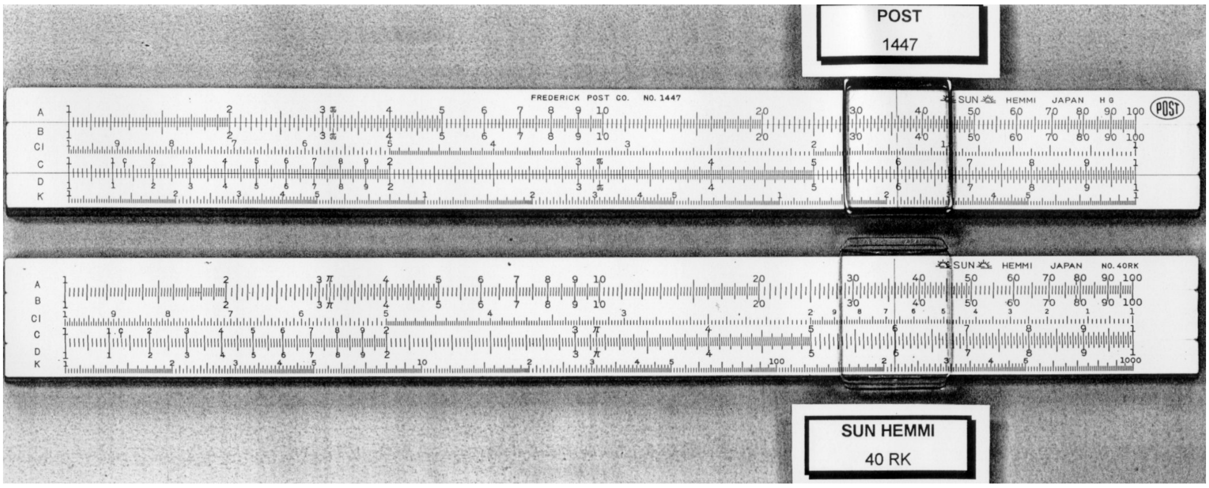
This figure represents something like 8 different manufacturers.
The question is who, among the various manufacturers mentioned in this figure, first introduced this typical model on the market and why are all of them very similar? Does it mean that most of them are copies of a "master"? Or should it be considered a "*generic type",* most probably dictated by a good model, sanctioned by several years of loyal and efficient use, with *some very minor variations?* The word "clone" is really appropriate in this particular case: "*one that appears to be a copy of an original form*".
Nevertheless, it is amazing to note that three different manufacturers are using the type number "601" for this particular model!!!
But possible variations exist. The next figure brings together similar slide rules where more distinctive variations can be noted like the colour of the slide (green, yellow), no lateral cm scale, aluminium body, etc. In this case the similarities are small with each model bearing its own characteristics.



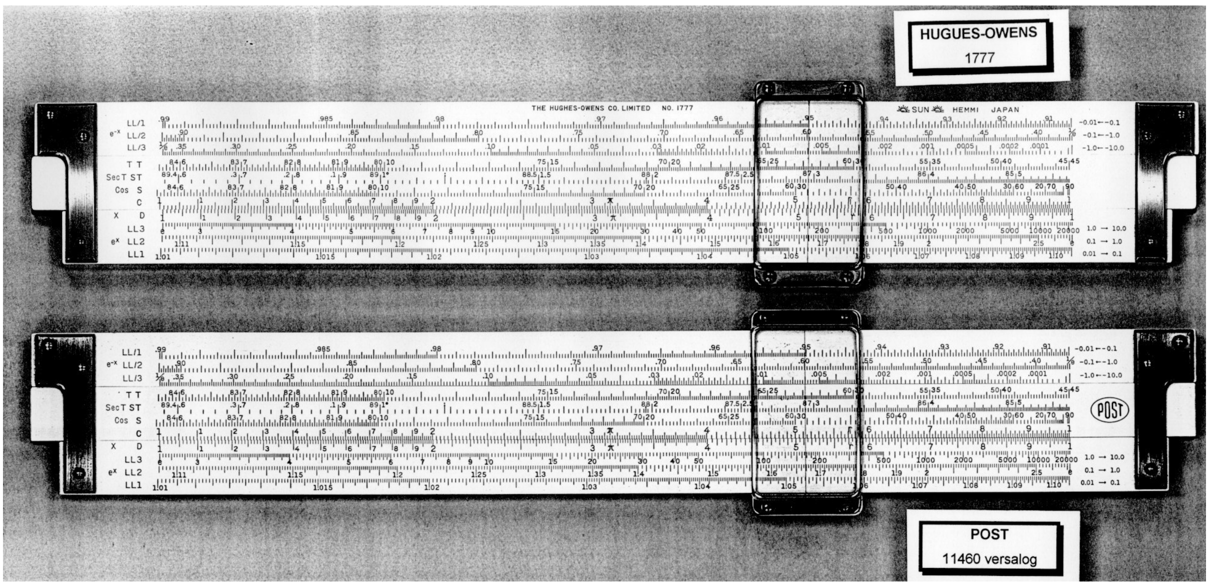
One SUPPLIER ..... ANOTHER MAKER

Any collector will know a certain number of manufacturers or supply houses had to offer a full and competitive range of products. This meant offering rules for sale made by other companies. Very often they were imprinted with the trademark of the wholesaler although they were made by someone else. Some cases are obvious and quite familiar to most collectors. Among them the following relationships (slide rules nearly the same) stand out:

SUN-HEMMI 40 RK ⇔ POST 1447 (USA)



POST 1460 Versalog ⇔ HUGUES-OWENS 1777 (both by Sun Hemmi)



Many other cases exist like:

Charvoz (USA)	⇔	Aristo (Germany)
Dietzgen (USA)	⇔	K&E (USA), Fuji (Japan), ...
Hardtmuth (GB)	⇔	Logarex (Czechoslovakia)
Koh-I-Noor (?)	⇔	Graphoplex (France)
Koh-I-Noor (?)	⇔	Logarex (Czechoslovakia)
Micronta(USA)	⇔	Nestler (Germany)
Post (USA)	⇔	A.W. Faber, D&P, Sun Hemmi (Japan), ...
Scientific Instruments (USA)	⇔	Concise (Japan)
Staedler (Germany)	⇔	Fuji (Japan)
Sama & Etani (USA)	⇔	Concise (Japan)

In most of those particular cases, the original manufacturer is clearly identified and the parent selling company is generally clear about the relationship.

Sub-brands, names or trademark modification

Some confusion may exist by the trademarks and ownership evolution.
For example, below are some known variants:

A.W. Faber (Germany)	⇔	Faber-Castell
Blundell (GB)	⇔	Harling
Carbic (G.B.)	⇔	Otis King
Dennert & Pape (Germany)	⇔	Dupa, Aristo
Engineering Instruments (USA)	⇔	Lawrence
Loga (Switzerland)	⇔	Daemen-Schmid
P.I.C. (G.B.).	⇔	Thornton
Shanghai Slide Rule Factory (China)	⇔	Flying-Fish, Sida, ...

SOME INTRIGUING CONNECTIONS

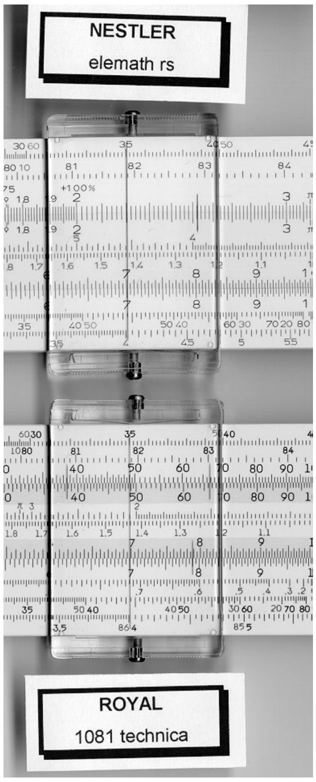
When examining slide rules which do not fall into one of the earlier mentioned categories, the similarities can be astounding.

ANALOGY THROUGH SOME PARTS

The following slide rules show some exactly identical parts.

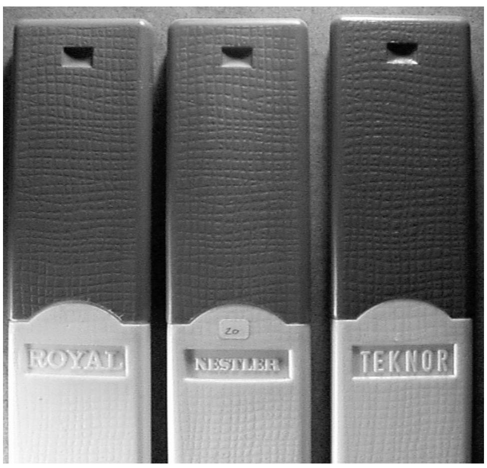
same cursor

NESTLER elemath standard	⇔	KENT 7153 LL (Japan)
NESTLER elemath rs	⇔	ROYAL 1081 technica (Japan)
DIETZGEN 1768-P	⇔	FUJI student log 129 (Japan)



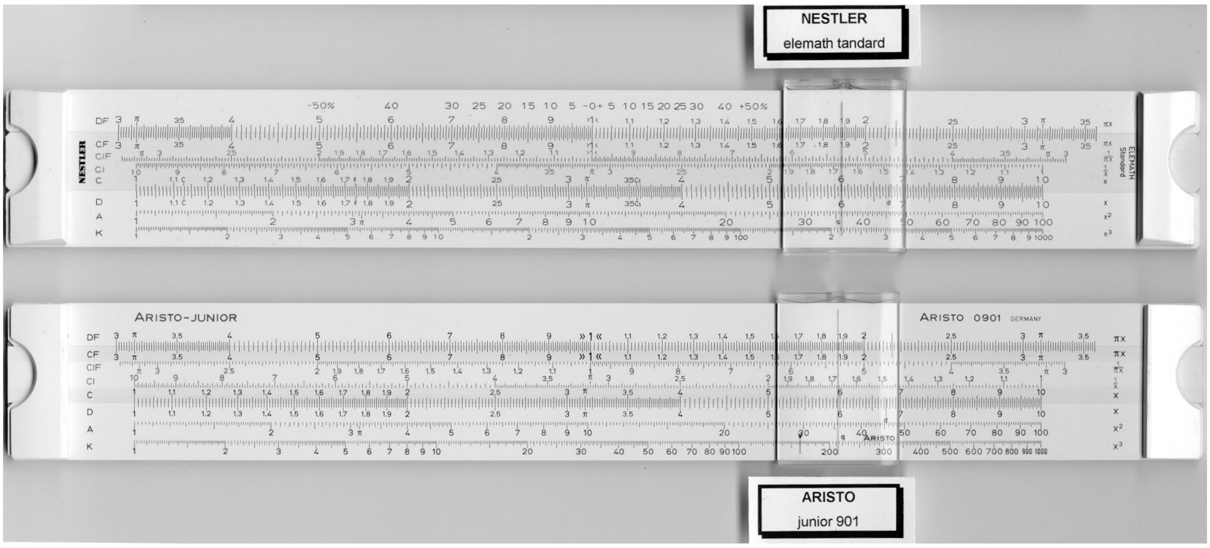
same box

STAEDLER Mars 544 A	⇔	FUJI student log 129 (Japan)
NESTLER elemath standard	⇔	ROYAL 1081 technica (Japan), or TEKNOR

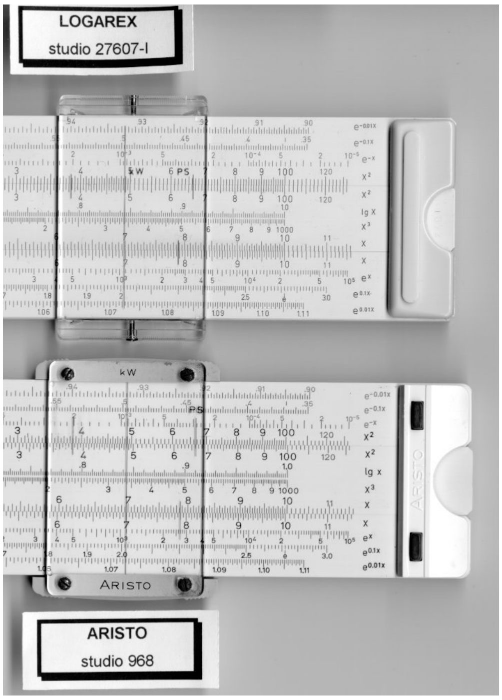


ANALOGY THROUGH A (TOO?) SIMILAR DESIGN

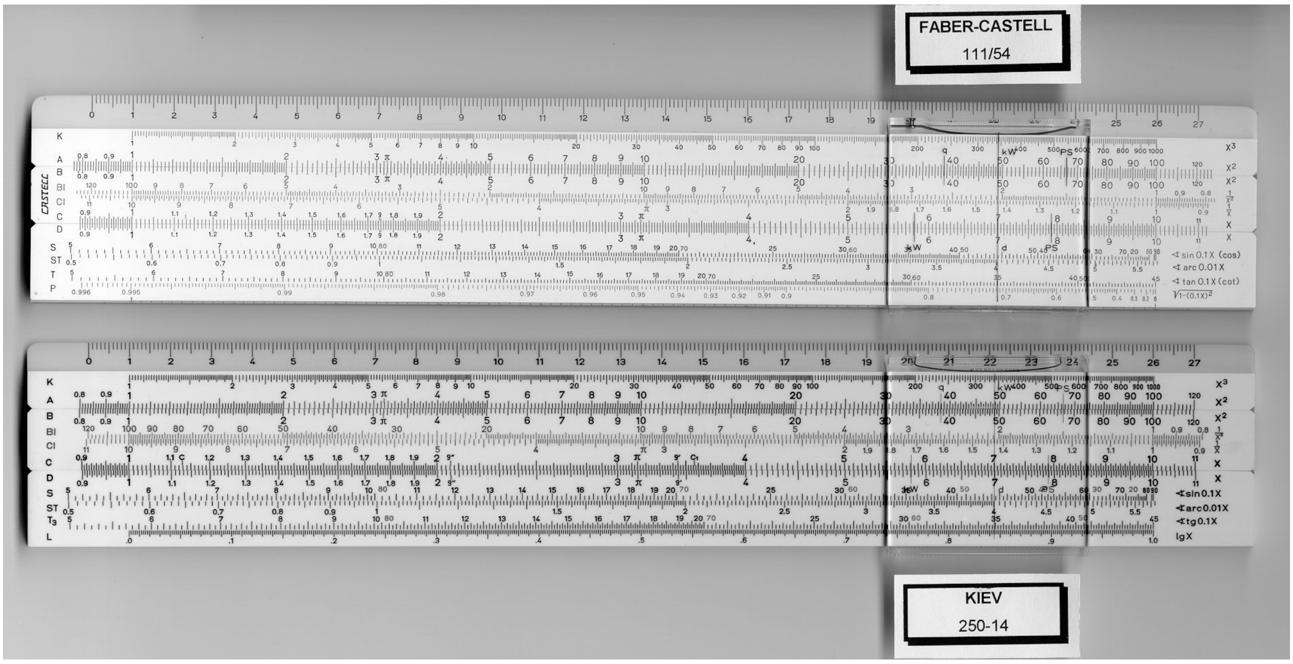
NESTLER elemath standard ⇔ ARISTO junior 901



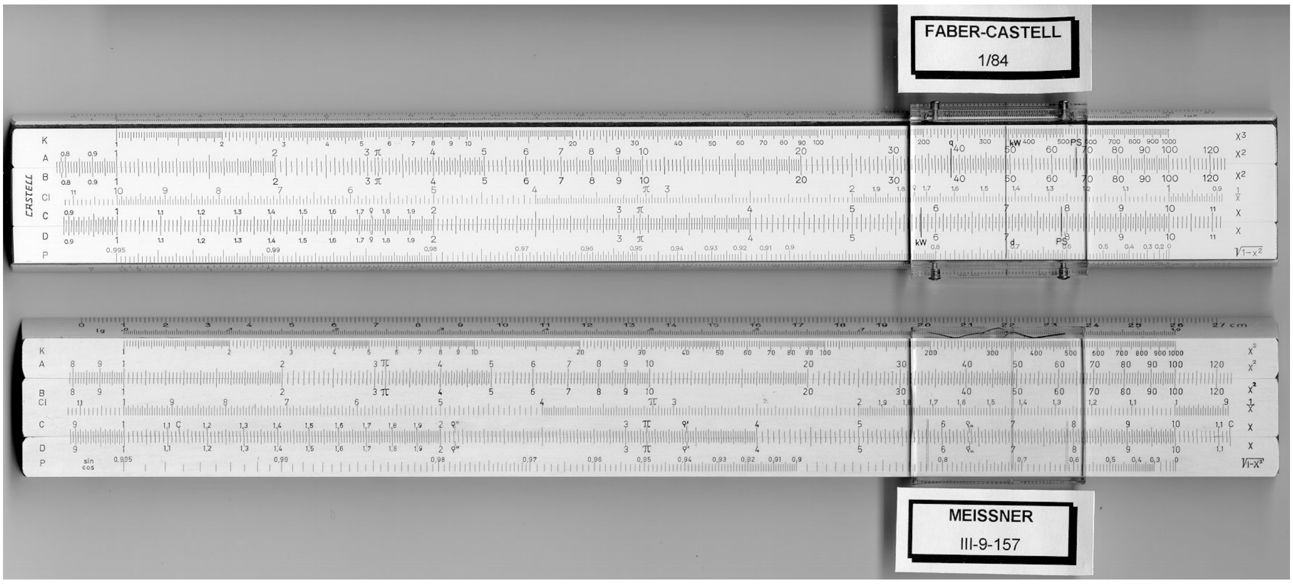
LOGAREX studio 27607-I ⇔ ARISTO studio 0968



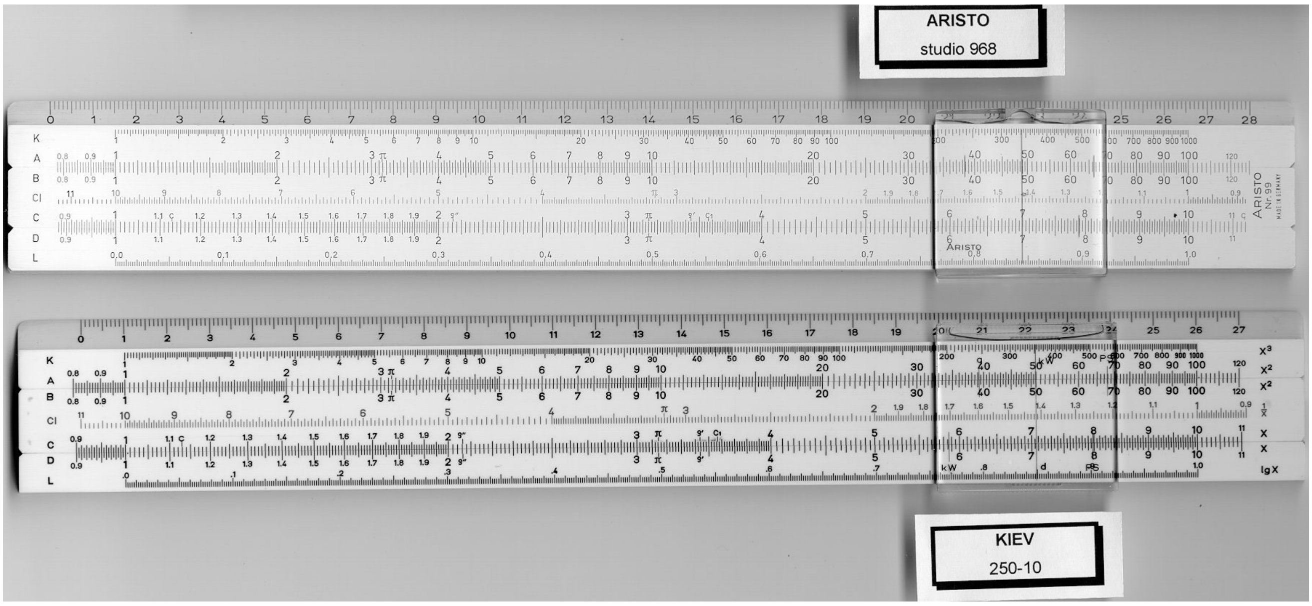
KIEV 250-14 (Russia) ⇔ FABER-CASTELL 111/54



MEISSNER III-9-157 (ex DDR) ⇔ FABER-CASTELL 1/84



KIEV 250-10 (Russia) ⇔ ARISTO 99

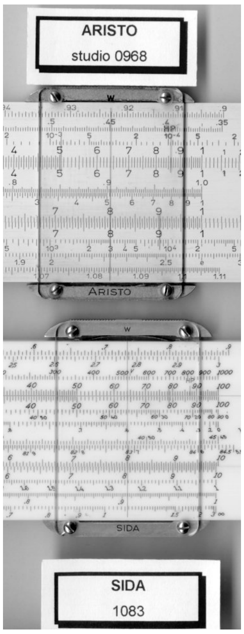


PURE COPIES

Except where demonstrated, it seems that the following examples were produced with the clear intention to copy a part, or replicate an existing model already produced by another manufacturer.
Here it is a clear case of copies.

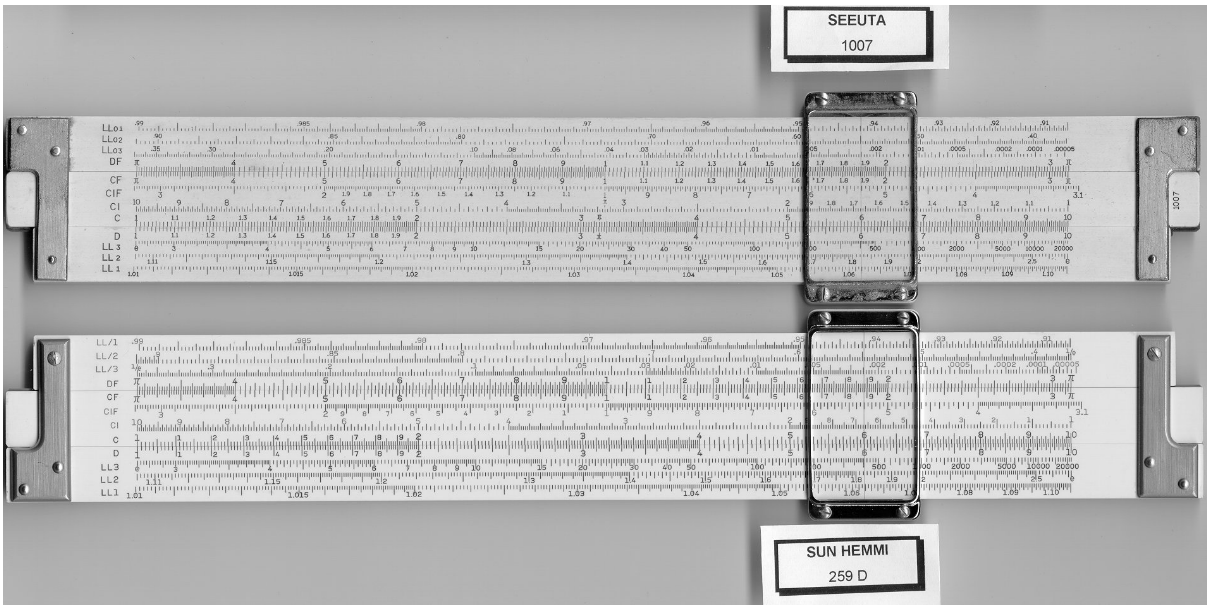
SIDA 1002 (China)

This slide rule comes with a cursor which is a 100% copy of the ARISTO studio 968 cursor



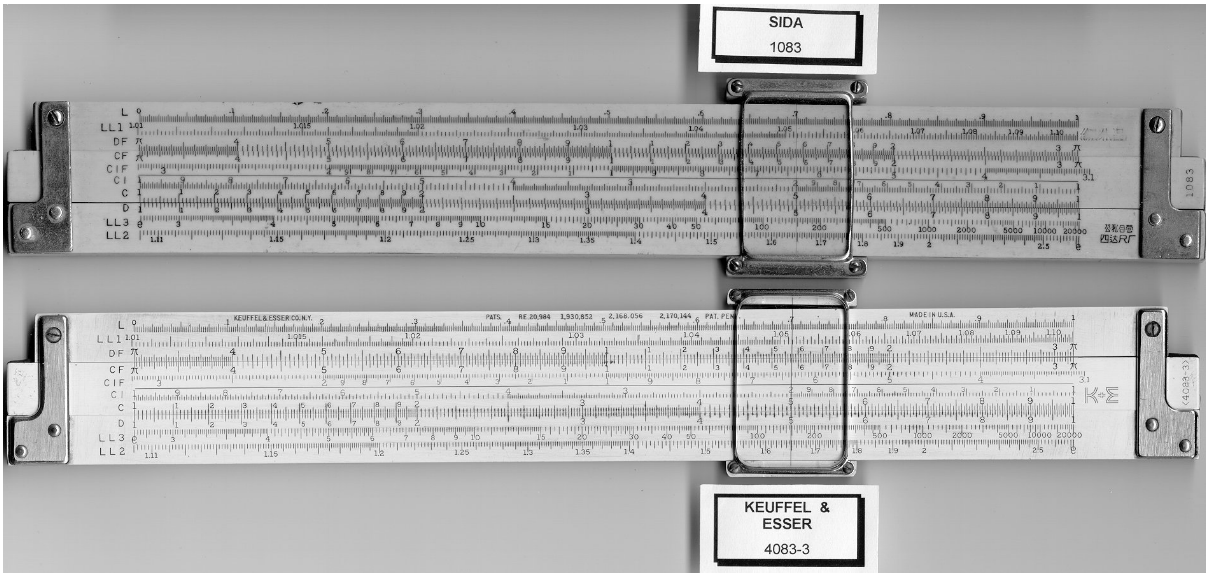
SEEUTA 1007 (China)

This slide rule is a quasi-true copy of the SUN-HEMMI 259D



SIDA 1083 (China)

This slide rule is a true copy of the K&E 4083-3



CONCLUSION

Slide rule collectors may find food for thought and investigation, in such a wide range of similarities. It is not the author's intention to judge anyone on mere intent but simply to highlight some personal findings from observations of his own collection.

Han Wanders

Production at the Dutch ALRO-Company

Post-war History of A L R O

Contact with the collectors world

In the late 80's, I met IJzebrand Schuitema who, at the time, was investigating how ALRO calculating discs were produced. This acquaintance led me to join the Dutch Circle of Slide Rule Collectors and now, to relate my experiences at ALRO.

A lifetime of employment with ALRO

On August 25th 1952, one day after my birthday, I started work at ALRO. At the time I was a 15-year old boy, still in short trousers. Some years later, I discovered that the Dutch patent for the ALRO calculating disc had been awarded on exactly the day I was born in 1937.
More than 40 years later, as General Manager, I left the company. Over this time-span I was exposed to all facets of the company and I had been given many jobs.
Starting when the calculating disc was still the main product and finishing when the emphasis was mainly on producing CREDIT CARDS and the like. One can imagine the impact of this evolution.

From calculating disc to credit card

Forty years is a long period in which many things happened. The transition from producing calculating discs to other, totally different products, went swiftly. I am unaware of many companies achieving such a turn around.
However it must be said, ALRO reintroduced special-purpose calculating discs around 1962. The new laminated or "alrodated/alroised" form (as introduced by Mr. De Ruyter) came about after improvements in the quality of PVC, the "alroisation" process and increased accuracy of the centre point positioning.

"Alroisation"

The so-called "alroisation" process was already under development when I joined the company. Initially only pre-printed paper was laminated between hard layers of PVC. Hydraulic presses were used with high pressure (about 100 kg/cm²) and high temperature (about 120 °C). No glue or similar bonding material was used.
De Ruyter introduced this process to the Netherlands in 1950, when searching for materials suitable for producing slide rules. He first saw it in use at the Dynamit-Nobel works in Germany (Astralon).
The name "alroisation" was adopted (and even registered as trade mark) but sometimes the more common term, "plastification", was used. The use of the latter within the confines of the ALRO works was absolutely forbidden by de Ruyter. He considered the term an insult to the product.
The first application was to produce the scales in the metal stand/lid of the ALRO calculating disc.

Moisture in the printed-paper, which was released by the high pressure and temperature, was a major problem. It caused a blue haze to appear all over the PVC surface. After we discovered the cause of the haze, the solution found was to dry the paper at least 24 hours in specially designed drying chambers. Later we also tightened the quality requirements for paper and ink.
After much time and effort and largely by trial and error, we succeeded in refining this process. We even alrodated photographic prints and films but for urgent deliveries, the customer did not always appreciate the more than seven days of drying needed.
The process required a small transparent border to be left around the print to prevent splitting of ageing paper.
To resolve these problems we decided to print directly on the PVC layer as printable PVC became available. This could lead to troublesome commercial negotiations. Especially when I was quoting to customers a lower price for "alrodating" including printing than for "alrodating" without printing!
The major advantage of integrating the printing process was that the format, alignment and separate paper handling problems were eliminated, allowing higher degrees of automation.
Today, a complete PVC format is handled without human intervention and with great precision by one machine, including inspection and discarding of rejected products.
The explosive increase of credit cards brought with it massive automation as many machine-tool suppliers seized the opportunities in this new market.

Product transition from calculating discs to "alroisation"

Early 1959 our General Manager placed a high priority on "alroisation". So as soon as I returned from Dutch military service as a hussar, I was given the task of reorganising the production process. This included: phasing out production of calculating discs, spring rules, dentists grinding drills, pen and pencil engraving and mixing odoriferous oils. Afterwards I concentrated on improving all aspects of the "alroisation" process.
These steps were taken because the intended innovation of calculating disc production by "alroisation" failed catastrophically. The scales lost accuracy because:

a) the PVC was not perfectly flat
b) the print image was distorted by "alroisation"
c) the high cost of accurate moulds.

However, it was the announcement that electronic calculators were soon expected on the market that brought down the final curtain on ALRO calculating discs.

Where have the calculating discs been produced?

When I arrived at ALRO in 1952, the firm was located in Balistraat 75 – 81, The Hague. It was a stately double-fronted town house with two sets of four floors. One of the floors contained office and the main calculating disc production facilities. In the centre at the front, a main gate gave access to three former stables at the back of the premises. The stables were used for all the "alroisation" processes and for producing

transparent discs with hairlines for the calculating discs.
Mr. De Ruyter and his wife lived on two of the floors. After the firm acquired the premises, ALRO employees gradually occupied all floors.
In 1962, another adjacent building was acquired and in 1972 a large garage was added to the property. A room over the stables, in use as archive, has always kept the name: “the loft”. In 1952, the ground floor surrounding the gate was in use by a greengrocer, Voormeulen. On the three floors over the actual greengrocers shop, lived the family Bronsveld with their tailor’s workshop.
Through lawsuits, ALRO later claimed occupancy of all these properties.
All these details illustrate the initial limitations of the premises and the post-war room space problems encountered later.

Figure: Horse's head ornament over stable entrance (used in ALRO logo)

Lawsuits

Other than the above-mentioned lawsuits, ALRO also initiated more legal actions.
IJzebrand Schuitema has documented one lawsuit, regarding the usage of rejected slide rule material for artificial snow, in a publication.
Another lawsuit was brought against the company Wed. Ahrend & Zn. This firm had ordered a large number of various types of calculating discs. Ahrend rejected the delivered discs for reasons unknown to me. The court however ruled in favour of ALRO.
After eventually being paid for by Ahrend and legal statute of limitation passed, the rejected calculating discs were, until ALRO was taken over, brought back onto the market or given away as presents.
One more lawsuit involved a 5-year cooperation agreement with the firm Johan Enschede & Zn, in Haarlem. In 1974, after only 3 years, Johan Enschede terminated the contract without reason. It caused much agitation at ALRO because of the impact on the total turnover of the company. Fortunately this lawsuit was also won and Johan Enschede was forced to pay a substantial sum for consequential damage.
The relationship with Johan Enschede was later re-established when banks required distributed production to secure producer-independence and back-up possibilities in case of calamities.

The full name of the firm, being: “ALRO Maatschappij tot Exploitatie van Octrooien N.V.”

or translated: “ALRO Company for the Exploitation of Patents Ltd”

has been misinterpreted by some (as I learned later) and certainly by Enschede who thought “alroisation” to be patented; which it never has been!

Printing press

In the account by IJzebrand Schuitema, the press used to imprint the circular calculating discs was described. The machine was still in use when I joined ALRO. I was surprised that printing was still done in such a primitive way.
The process was largely manual. The machine consisted of a vertical fixed plate. A kind of hinge at the bottom connected to a movable counter-plate of the same dimensions, about 40 x 30 cm. When open it was possible to move up and down, by a transmission mechanism, a set of ink rolls. The ink was fed from a disc over the fixed plate to allow fast distribution of the ink over the template, which was mounted on the fixed plate. It was important for the ink to be uniformly distributed on the disc in order

to obtain an even ink layer on the template. Otherwise the fine lines of the scales did not come out sharp enough.
Distribution of ink was done in the following way. With a putty-knife, ink was applied to the disc. Then with the right-hand moving the ink rolls over the disc whilst simultaneously rotating the disc with the left-hand. When printing had started, the ink disc was rotated one step by a rack-and-pinion mechanism every time the ink rolls moved over the template.

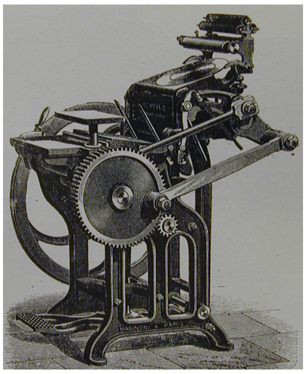


Figure: Degel Press

Compare this with current presses where for every colour at least 20 ink rolls, moving radially and axially, to achieve optimal ink distribution.
First the template had to be mounted very accurately on the fixed plate, which in turn had to be aligned with a 5 mm pin on the movable plate.
When the printer was satisfied with the alignment set-up, he made two prints to test the essential alignment (without yet bothering about other quality factors). One of the prints was cut as a circle and by joining the two prints on one pin; the resulting “calculating disc” could be used to determine the alignment precision. The slightest misalignment could be seen immediately.
Because the angle between the 1 and the 2 is equal to the angle between the 2 and the 5 and again between the 5 and the 1 (closing the circle by 3 times 120 degrees) these were used as gauge points for inspection by press operator and quality controller.
The pin itself was mounted on a small plate containing some slots and bolts for mounting on the movable plate. By choosing this trial-and-error method, the alignment was a gamble and sometimes it took two days to get the required precision.
Every time the alignment was rejected, the process had to start all over again. Mr. De Ruyter always managed the final acceptance. This created real stress between the press operator and Mr. De Ruyter if their precision assessments did not agree.
Looking back, it is an admirable feat for ALRO to have delivered a quality product with these very basic production methods. For this very reason I have elaborated this section. One can only appreciate these details after having actually worked with such a machine.

Figure: Production of scales for ALRO slide rule discs

Future of ALRO

ALRO would not have survived if the product range had remained limited to calculating discs.
In 1959 the decision was taken to redefine the business and to concentrate on applications of the "alroisation" process. In 1955 a branch office, ALRO GmbH, had already been established in Germany and its local management was also focused on a more modern business approach. Production of plastic cards, like bank and credit cards, looked promising. ALRO could have profited hugely if expert personnel and funding capital would have been acquired in time. In that case, ALRO could have played a larger role in the plastic card business leading to better cooperation with Enschede & Zn.

Unfortunately, the former director, Mr. De Ruyter, did not have this insight and did not invest enough in research. His motto used to be:

> "ALRO only invests if a customer orders a substantial amount
> and we consider it could create future prosperity for the company"

I have never understood this business approach.
The result was that the company was not well known in the business world, either in the Netherlands or abroad. Some companies I know would have taken different decisions if they had known of ALRO's existence.
In 1961 an American company started up a subsidiary in England with a similar process to ALRO. In 1975 they approached ALRO to become a subcontractor because they could not deliver on time. They made it clear to me they would not have started up if they had known about ALRO's existence.
The same situation occurred in 1970 when a new company started up in the North of the Netherlands. The director of that company told me later he had only learned of ALRO's existence after being in business for a year.
When the first bankcards were issued in 1966, de Ruyter was outraged that we were not even asked to quote! Two years later, the tide changed somewhat when ALRO Germany became better known by producing bankcards for German banks. This was due to the fact that Dynamit Nobel had been approached first but they referred to us, knowing we were better equipped to supply these types of cards. From that time, the future looked more promising. Orders increased, as ALRO became better known. As explained earlier, this led to an increase in research.
The most striking example was the Paper Signature Strip on the plastic cards. This was introduced by ALRO and it still is considered a key security feature. Of course many other security measures have been introduced over the years to prevent counterfeits.
Two years later, in 1968, our card in Germany was used as the example for the Eurocheque card. From that moment ALRO played a large role in the Netherlands in producing credit cards in general. When the Postbank, in 1970, wanted to start issuing bankcards they, after hearing by telephone of our experience with German banks, placed the order with ALRO.
A special aspect of the early Eurocheque and Postbank cards was that the printed-paper had to be "personalised" before lamination. The goal was to minimise the rejects and to return the finished cards (with signature and magnetic strip) in the same order as received.
Since about 1980, all cards were produced in pure plastic and without paper inserts. This not only improved quality but it also allowed a greater degree of automation in their production. Since at that time the cards were personalised in a later phase of production, special machines in a security zone with surveillance cameras, were used for the embossing and coding.
Today this would never have been possible in the Balistraat premises because the rules of the VISA/MASTERCARD organisation do not allow buildings adjacent to the credit card production plant. Security measures would have become very costly in the old building.

Looking back

When I look back on my time with ALRO, two periods can be distinguished:

1. the period of calculating disc production
2. the period after complete transition to card production

My first seven years with ALRO took place in that first period. I remember the following changes and improvements to the calculating discs:

- brass bearings were replaced by self-lubricating bronze
- the casing was made of aluminium
- Yellow was added to the set of scale background colours
- The brass turning pin was chromium-plated
- Larger variation of scales was introduced in the lid
- The nut at the back was chromium-plated
- The gauge of the movable disc with hairline was increased from 0.2 to 1.0 mm

In the first period, ALRO spent little effort on promoting its products. The only yearly event it featured in was the commerce exhibition in the Utrecht Jaarbeurs: a modest $1m^2$ stand within the area of the Rijksnijverheidsdienst (Dutch government department for industry). Later advertisements in professional journals were scarce and did not address slide rules specifically.
The second period covers a multitude of products with a mixed degree of success. Many products were developed for educational purposes, especially Montessori schools. The initial costs were occasionally funded by ALRO. Some initially loss making but many products from such investments, especially in education, stayed in production for tens of years.
Some examples of calculating equipment, using the scales of the calculating disc from the first period, are:

- Music discs for lyrical or Phrygian keys in religious music
- Birth control discs
- Discs for calculations in electronics
- Discs for calculating oilfield yields

A special product was a medical instrument to measure the area of a skin affliction, allowing a physician to determine the amount of salve needed for treatment. The colloquial name of this device was the “Hoechst’s sores meter”.
For the Thorax centre in Rotterdam, a calculator has been designed to determine the probability of heart attacks.

Some parts of this paper have gone into details because I feel such details can bring a product to life. In an objective treatment such anecdotes and details are usually lost.
I derive most pleasure from the fact that after all these years I can commit this information to paper, knowing every product and every order has its own story.

Employee care

In my opinion, Mr. De Ruyter was always very progressive regarding employee care.
I would like to mention some examples in this paper.
When I started at ALRO, I negotiated finishing half an hour early for two days a week. This was educational leave to advance my technical education during evening hours. After my graduation in 1954, ALRO offered me the opportunity to follow higher technical education (Dutch HTS) at the company's expense. I chose mechanical engineering and graduated after 6 years of evening study. Followed by a course on Higher Business Management at ISW, again at company expense.
This was my own experience of ALRO's interest in employee education. I still have in my possession a letter from my father, thanking the company for this gesture.
These opportunities were made available to all ALRO employees. I remember that de Ruyter did not really care about the nature of the study chosen. Because he was a fanatical piano player himself, some employees even chose music lessons.
De Ruyter was also one of the first to promote an employee company stock ownership scheme. He persuaded current stockholders to sell some stock at the going price. A notary oversaw a lottery to determine the buyers.
I was able to buy seven shares at nominal value from Mr. De Ruyter himself. To be honest, he also wanted to diminish his own stockholding for tax reasons.
From spring 1959, ALRO was the first company, as far as I am aware, to introduce a 5-day working week. At least at that time, none of my acquaintances had the pleasure of a work-free Saturday.

The end of ALRO and the financial closure

All these experiences served me well during the negotiations to sell ALRO in 1988.
I was able to secure a good social and financial package for all employees. The negotiations resulted in a price of NLG 36,000.- per share, ample house moving expenses for employees living in ALRO-owned houses and the creation of a fund to reward employees for their positive contribution to the acquisition process by the new owner, the English firm DeLaRue (comparable to Johan Enschede & Zn).
To be honest, for the sake of these negotiations, I somewhat pressured the major stockholder (the heir of Mr. and Mrs. de Ruyter) who was very cooperative considering their substantial stockholding.
Eventually and according to an agreed key, more than NLG 400.000,- was distributed among all the employees.

Conclusion

Much remains unwritten. I hope my story and this paper have shed some light on some of the topics.
Again, a piece of history goes with each product and each order and there were many of both.

Simon A.M. van der Salm, Frans J. Vaes

Number Systems and the Babylonian Slide Rule

Introduction

During a lecture about the famous historian of mathematics Otto Neugebauer and the Babylonian sexagesimal system, somebody mentioned that Neugebauer had made a slide rule based on that number representation system. It would have been stated in one of his books but without mentioning further details concerning the construction and the look of the slide rule.

To understand the principles of a slide rule working with another system of representing numbers a little knowledge of positional number systems is necessary. That's why first a summary of the basics of number systems is given.

Because the old sexagesimal system of the Babylonians is mentioned here in stead of the more modern number systems, interested readers could best consult a book about the history of mathematics. There are many good books written for relatively non-specialist mathematicians about the early history of mathematics, that is to say, the mathematics of the Egyptians, Sumerians, Babylonians and other people that lived in fertile Mesopotamia in the period from about 2000 BC to 100 BC.
A very recommendable book is "Mathematics in Civilisation" by H.L. Resnikoff and R.O. Wells [**1**]. In this book the interested reader finds a very clear chapter about the Babylonian number notation and Babylonian algebra. At the end of this article some more relevant books and articles are listed as references.

Positional number systems

Till the fifties of the last century almost nobody, except probably mathematicians with a special interest in numerical mathematics and analysis, thought about the way we represent numbers. The decimal system for representing numbers was accepted without much reflection. Children instead learned to calculate by heart and knowing how to do the calculations was far more important than understanding the mathematical principles under the algorithms.
Only children with a special aptitude for numbers cracked their brains in trying to understand something more of numbers than the tedious algorithms for doing calculations.

It became necessary for a larger group of people to understand something of numbers systems and the underlying mathematics when computers became a product not only used by the specialist technician or mathematician, but also by the layman. Nowadays an educated person has to know something about the binary number system, about bits, bytes, kilo-, mega- and giga-bytes. Because of this development, it is more generally known that the decimal number system is just one of the possible ways we can represent numbers.

Simon about his son learning the decimal numbers

Which central idea is the basis of a number system?
A mathematics teacher who is also a proud father of a 4 years old son watches his child going through a process of a remarkable historical evolution in a period of less than one year. When he sees his son learning the numbers and their symbolic notation he watches a process for which mankind took thousands of years.

Firstly the child learns to count, beginning with 1, 2, 3. Important to recognise is the following: children don't begin counting with the number zero!

It is amazing to watch how fast a child grasps the idea of number as an entity in itself. After a short while the number 3, for instance, doesn't have the meaning of three cats or three toys any longer, but has become a abstract entity in the child's mind. Hence the child has formed the idea of a number, detached from any particular object. And that very powerful idea receives a name like so many other objects in his environment.
Secondly the child learns the symbols for those numbers. Nowadays there are beautiful books of counting (and good computer software) by means of which it is rather easy to connect the process of counting and the symbolic notations for the numbers. He is able to learn those symbols much earlier than the symbols of our language, i.e. the alphabet.

In my son's learning of the notation of numbers, I saw something that must have perplexed the greatest minds of the late European mediaeval civilisation. Something that was the result of a millennial thinking process, a result found by unknown Hindu scholars in India during the 5^{th}, 6^{th} and 7^{th} century AD.
Learning the notations of the numbers 1 up to 9 is quite easy, even for a 4 year old boy. Those symbols are not more than notations that can be substituted for the names that were given to the numbers.
But the notation for the number 10 puzzled him for a relatively long time. Why do we use two symbols for one number? And why is one of those ciphers a symbol that we use also for the number 1? After some time my son accepted the new notation and said: "Oh I understand, one and zero make together ten". Mathematically not quite correct, but nevertheless a sound conclusion.

Learning the numbers 11 up to 19 is not that difficult, as one can see by watching the children's programme Sesame Street on television. A child understands that he has to repeat the numbers 1 up to 9, after the numeral 1 at the left side. But that amazing number ten? What is it?
After short time children get the right feeling. They understand that the symbol 1, followed by for instance the symbol for 2, means something like "one unit of ten plus two elementary units".
Then it is only a matter of some time to realise that the numeral 1 followed by the numeral 0 means: "one unit of ten plus null elementary units". Initially children understand the concept of zero as means of notation for something that isn't there. Hence a notation for an empty place. But after doing arithmetic for some time (subtracting equal numbers) they have formed the impressive idea of zero as a number in their minds.

Of course nowadays children learn to count in the decimal number system. (Base-10-system). In that system the number ten has a specific meaning: it is the radix or base of the numeral body by which we represent numbers. From the above we can conclude that in this notational system 0, 1, …, 9 are the most elementary numbers. The number ten indeed is used as radix but isn't, remarkably enough, represented by a new symbol. The number ten is instead represented by a combination of two numerals that represent more elementary numbers. To make this invention possible it is necessary to understand the symbol for an empty place as a number in its own right.

The decimal positional notation

Although the principles of the decimal positional system for representing numbers can be clear to young children, we get a better understanding of such systems when we use some mathematics.
The decimal system is one of the many positional systems. But many characteristics of the decimal system can easily be translated to other notational systems.

In the decimal system there are only ten symbols needed in order to represent every number. These ten symbols are of course the numerals 0, 1, …., 9.
One can use a specific symbol for the base (or radix); we shall use the symbol X.

If N is a positive integer, represented by an array of n numerals, then we may write in modern mathematical notation:

$$N = c_{n-1}X^{n-1} + c_{n-2}X^{n-2} + ... + c_0 X^0$$

The coefficients c_i denote any of the numerals 0, 1, …., 9, except the left most coefficient, that always has a non-zero value.

From this follows:

$$X = 1X^1 + 0X^0$$

Hence the radix ten of the decimal number system can be expressed as 10. Indeed there is no reason why we should use a specific symbol for the radix.
The use of a specific symbol for the radix also leads to cumbersome calculations, so there is one reason more to use the combination 10 (one followed by zero) to represent the number ten.

It is not difficult to see that by using powers of the radix with negative exponents every real number between 0 and 1 can be expressed in an array of decimal coefficients.
Together with the decimal notation of integers we see that every real number can be, at least in principle, represented by an array of decimal coefficients.

Binary representation of numbers

Because of the birth of the digital computer we got more aware of the way by which we represent numbers. In a modern digital computer every number is expressed in binary form. Only the numbers 0 and 1 are used to represent every number. The radix of the binary system is of course 2, but as before this radix is not represented by a different symbol, but by the combination 10, like the radix ten in the decimal way of representing numbers.
It is quite easy to determine the binary representation (or the representation in a positional system with a different radix) of an integer:

Decimal	Binary	
0	0	= 0 x 1
1	1	= 1 x 1
2	10	= 1 x 2 + 0 x 1
3	11	= 1 x 2 + 1 x 1
4	100	= 1 x 4 + 0 x 2 + 0 x 1

It is easy to see how to get the representation for the radices 3, 4, …., 9.
But if the radix is greater than 10, more symbols or unusual combinations of symbols already in use are necessary to represent numbers in the new radix-system.

We see this in the often used hexadecimal system, a positional system with the radix 16, which can be written, like any other radix, as 10 in the system itself.
One uses the letters A, B, C, D, E, and F to represent the numbers 10 to 15 respectively. So a hexa-decimal notation of an integer can contain letters and ciphers. An example is A5 (for decimal 165 = 10 x 16 + 5 x 1).

A placeholder to mark an empty place, i.e. a symbol for nothing, is a corner stone of positional representations. Even whether this symbol represents an integer or is merely a mark for an empty place. When we want to make calculations with numbers written in a positional system, it is necessary to see that symbol not just as a clever notation, but also as a number in its own right.

The sexagesimal system

When one studies the history of numbers systems, one gets perplexed by the time it took mankind to develop such a beautiful, effective and efficient idea as the principle of a number system with a radix. Although there have been independent developments of number systems in other parts of the world (Egypt, China, India and also Central and Southern America), the most remarkable and oldest results we find in Mesopotamia, the fertile area between the rivers Euphrates and Tigris.

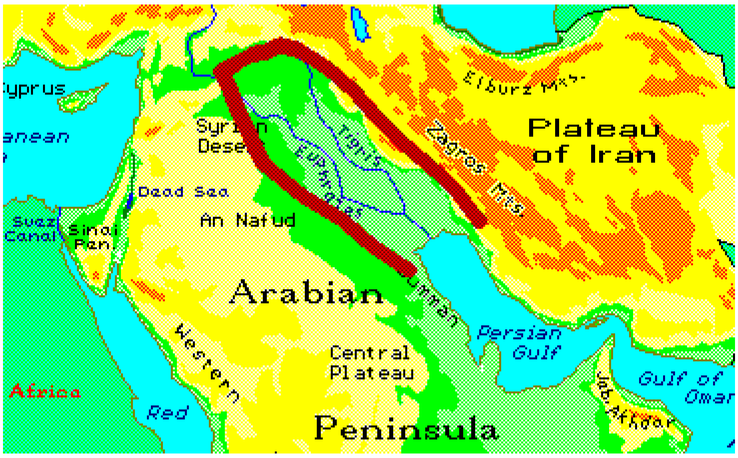


Figure: Map of Mesopotamia

Early ancient civilisations more than 5000 years ago used number systems based on tally marks. A number of those tally marks would be replaced by a single symbol the value of which represented the number of tallies in the group. A number of those symbols of higher value could be grouped in a new symbol of even higher value, etc. In some of the Egyptian number systems a zero appeared to indicate an empty place, but there is no evidence that the Egyptians understood their zero as a number in its own right.
The origins of our decimal system can be traced to ancient Egypt. The Egyptians used a base-10-system but didn't know a consistent positional notation.

The Sumerians (3000 BC) and later the Babylonians used a grouping system that after more than 2500 years evolved to a positional system with a zero to indicate an empty place.
The grouping was base-10-grouping in combination with base-60-grouping. So the Sumerian-Babylonian civilisation developed a positional notation but didn't use the necessary 60 symbols for the non-negative integer numbers below 60, but only symbols for the numbers one and ten. Indeed, that using new symbols for powers of the radix 60 makes the number notations within the system difficult to manipulate.
Remember what we wrote about the binary and hexa-decimal positional systems: the radix can always be represented by the two symbols 1 and 0, i.e. by the array 10.

But the major drawback of their initial positional system was the lack of the zero. As a consequence the same symbol could have a different value depending on the context (this is very familiar to the slide rule user who also needs the context of a calculation to determine number of zeroes or position of the decimal point).
Only 500 BC the Babylonians created a symbol as a placeholder to indicate the omission of a "power" of 60. The Babylonians of 500 BC may have used a symbol for an empty place in their positional system, they never overcame the seeming paradox that you can count "nothing" and that you can think "nothing" as an entity like the positive integers with which one considered to be elementary. So according to the Babylonians, zero was a convenient way to denote an empty place in a positional representation of a whole number, but it was not a specific number itself.

Our use of 60 minutes in an hour, 60 minutes in a circular degree, 60 seconds in a minute, do remind us how important the Babylonian sexagesimal positional system has been for the development of arithmetic, mathematics and applied sciences like astronomy and agriculture.

Babylonian cuneiform number notation

The word cuneiform (Pronunciation: `kyu-'nE-&-"form)` stems from the Latin word *cunĕus* which means "wedge". The name directs to the wedge-shaped characters that were printed in clay tablets.

As we said before, the Babylonians didn't use 60 different characters for the first 60 natural numbers 0, 1, …., 59. The use of 60 different symbols would have been an enormous burden on the memory of the (human) calculator and would have been led to an almost incomprehensible notation of larger numbers. So, although the Babylonians used a number system with the radix 60, they could represent every number by a combination of just two symbols. This remarkable fact does make one think about the binary system for number notations in our modern digital computers.

With only two symbols, two different impressions of a wedge-shaped rod on a clay tablet, the vertical one being

(which we shall call: "wedge"),
and the horizontal one being

(which we shall call: "hook"), corresponding to the numbers "one" and "ten" respectively of the well-known decimal system, the numbers 1 to 60 (these notations being the notations in the decimal system) can now easily be formed.

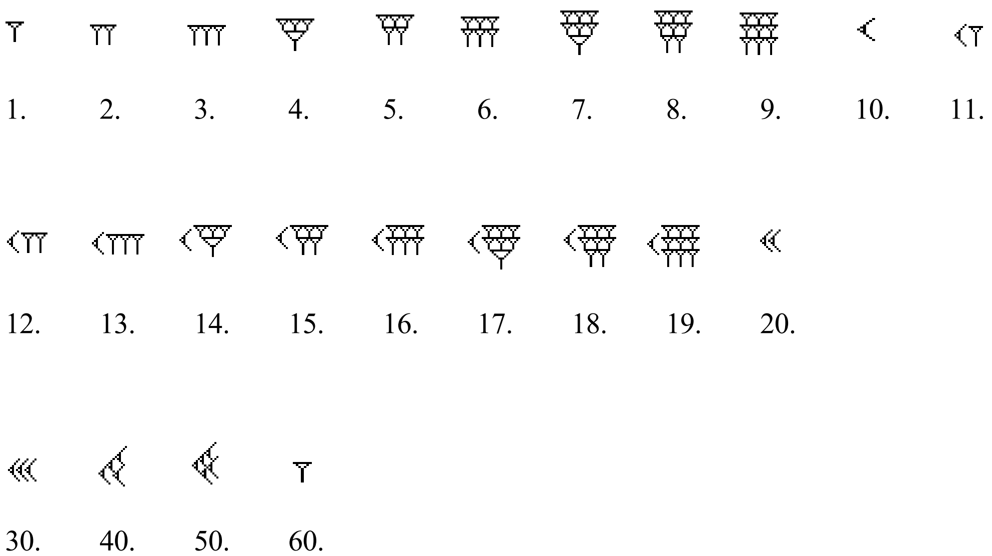


Figure: Some cuneiform numbers

Interested readers are recommended to visit the web site about Old Babylonian Mathematics of the St. Lawrence University (New York). The URL of this site is mentioned in reference [**2**].

In the previous figure we can see that the number 3 is represented by: 

and the number 23 by: 

When the number exceeds 3, the following three wedges will be put under the first set. When a number exceeds 6, a new row of wedges is started under the second row.
So wedges are collected in clearly distinct groups. As a result the numbers 1 to 9 can easily be read.
The same principle is used for the hook symbols. The hooks of the numbers 40 and 50 are placed above each other. Hence the reader can see the right number in one eye's blink.

Important to mention is that the number 60 is not formed by a new symbol or by a combination of 6 hooks, but that it is represented by the same symbol as the number 1, thus by a single wedge.
Of course we should keep in mind that at the right of this single wedge a zero-sign must be thought.
Think about our number ten, the radix of the decimal number system. This radix is also represented by the same symbol as the number one, with the zero added at the right side of it, i.e. 10.
We have now the first 60 numbers of the sexagesimal system.

If we put a new wedge before the number 23: 

this will represent 60 + 23 = 83.

The sexagesimal number: 

is the notation for 2 * 60 + 23 = 143.

This process can also be done for the second exponent of 60:

By which is meant:

$1 * 60^2 + 1 * 60 + 3 = 3663$.

From this example we can see that it is in the Babylonian system very important to recognise the various "columns" and which cipher belongs to which column.
If one reads the above-mentioned number in a wrong way, one gets 60 + 60 + 3 = 123.

Hence the single wedge  can represent every power of the radix 60.
The wedge may be 1 or 60 or 3600 etc. but also 1/60 or 1/3600 etc.
The hook may represent 10 or 600 or 36000 etc. but also 1/6 or 1/360 etc.
This difficulty is caused by lack of a decimal point in the Babylonian way of writing numbers.
Hence the context had to give an answer to which value had to be chosen.

Neugebauer introduced the semicolon (;) to denote the sexagesimal point. So the semicolon denotes the place in the number where negative powers of 60 begin.
Neugebauer also introduced the tradition to use the decimal numbers 1 to 59 as a translation of the concerning Babylonian figures.

The row of decimal numbers 12,20;21 thus means 12 *60 + 20 + 21 * 1/60 = 740 7/20
He also introduced the zero in his translation notation.
For instance 12,0; = 12 * 60 = 720.

Figure: Cuneiform multiplication table for 18

The Babylonian sexagesimal system could represent arbitrarily small numbers by using powers of 1/60 or in our modern terms, by applying powers of 60 with negative exponents.
Further examples of clay tablets are the YBC 7289 tablet, involving the irrational number $\sqrt{2}$, and Plimpton 322, giving examples of Pythagorean ratios in a triangle.

The fundamental scales of a sexagesimal slide rule
The construction of the most fundamental scales of a sexagesimal slide rule is quite straightforward. Take for instance the A and B lines (the x^2-lines) of a 50-cm slide rule and remove all values above 60. We prefer to take the A and B scales because these scales have two decades and one decade isn't enough to reach the number 60. Of course one can come to the same result when one takes two C-scales of 25-cm length and places them one after the other.

Subsequently translate the numbers 1 to 9 into the corresponding cuneiform numbers by using the wedge symbol for the number one:

𒁹

(in the slide rule photograph on the next page depicted as “T”),
and using the hook symbol:

𒌋

(in the slide rule photograph depicted as “<”)
for the number ten to translate the decimal numbers 10, 20, 30, 40 and 50 into the corresponding cuneiform notation.
Be aware of the fact that the number 60 is represented by a single wedge, hence by the same symbol as the number 1.

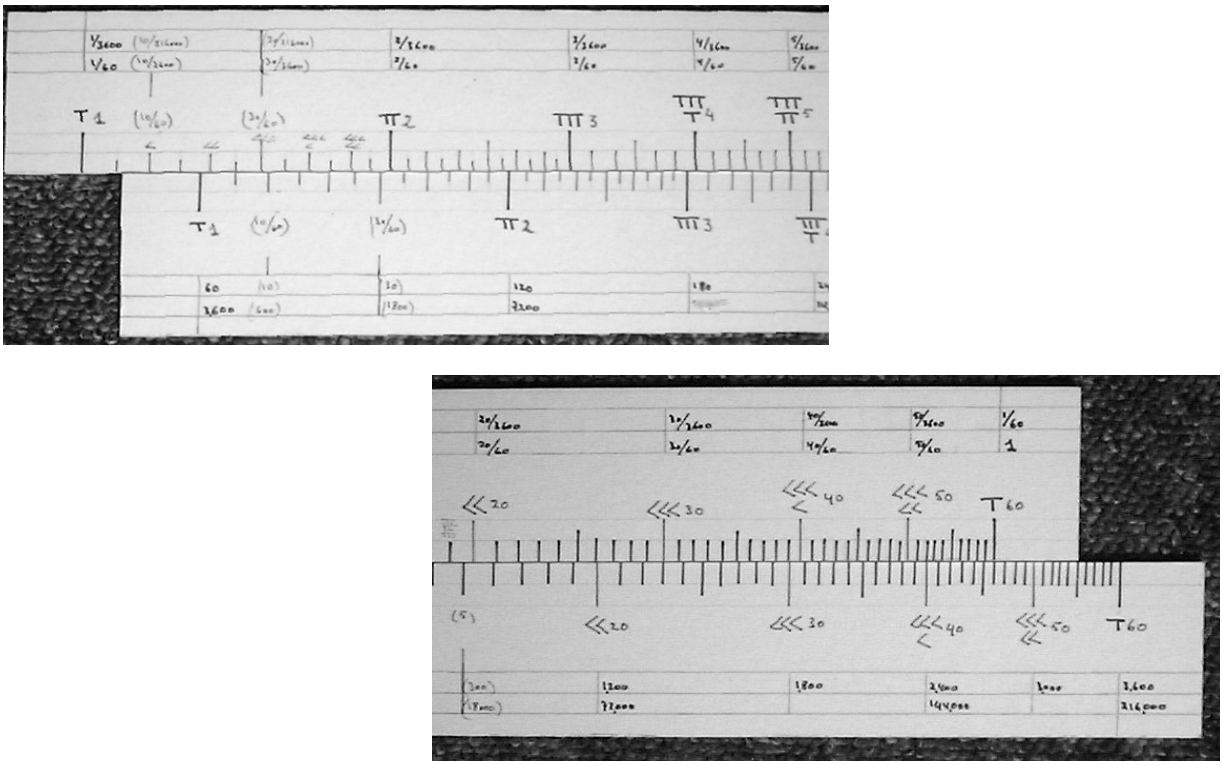


Figure: Sexagesimal slide rule, constructed by Frans Vaes

Interesting also is the finer scale division between the numbers 10 (one hook) and 20 (two hooks). Here we see the numbers 1 to 9 in cuneiform again, meaning of course the numbers 11 to 19.

The scale between 1 (one wedge) and 2 (two wedges) should be divided in 5 parts (10/60, 20/60, ... , 50/60), and the scale between those values again in 9 parts (e.g. 11/60, ... , 19/60).

The exact places of these marks can easily be determined:
First we evaluate the numbers log (1 + 10/60) = 0,0669; log (1 + 20/60) = 0,1249 etc.
Secondly we multiply these logarithmic values by the length of the original scales, i.e. 25 cm in our case.
We find for the correct places of the larger marks:

1.67, 3.12, 4.40, 5.55 and 6.58 cm.
For the 10 division: log (1 + 11/60) etc.....

That these sexagesimal scales are correct indeed can be proven by applying the sexagesimal cuneiform multiplication table of 18 on the previous page.

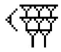
As an example we shall multiply 18 and 3,
so:

 and 

The number: 

of the higher scale is placed above the number 

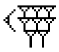
of the lower scale.

On the higher scale we search for the number: 

and then we find on the lower scale:

This number (54) is indeed the number we should be expecting to find as the result of the multiplication. Note that the technical manipulations for doing a multiplication on the sexagesimal slide rule are the same as the technical manipulations for doing a multiplication on a decimal slide rule.

This is illustrated again when we try to multiply two numbers for which the product is larger than 60. Let us try to multiply 18 and 4, so the sexagesimal numbers:

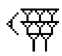
 and 

In Neugebauer's transliteration this multiplication will yield: 1,12, but this number is too large (or the scales are not long enough) to find on the scales.
So we manipulate the scales in the same manner as we do in case the result of a multiplication of decimal numbers is too large.

We put the rightmost number on the higher scale: 

above the sexagesimal number for value 60: 

on the lower scale.

On the higher scale we search again for the number 18: 

Beneath the number 18 on the higher scale we find the number:

on the lower scale, so in decimal the number 12, to be interpreted in this context as 60 + 12 = 72.

Neugebauer's story

Let us imagine the following story. Maybe it isn't a really true story, but it could be a true story.
Young Otto Neugebauer, sitting in the shadow of a lonely tree, somewhere in Mesopotamia. In his hands an original Rietz slide rule from about 1930 and no logarithm tables at hand, remembering the awful sexagesimal calculations with degrees, minutes and seconds during his school days.
He looks at the S-ST-T scale lines at the back of his slide rule. By putting the 1° degree of the S&T scale above the number 1 of the D line, he sees that the degrees 1° to 5° at the S&T scale almost exactly correspond with the numbers 1 to 5 on the D-scale. So the sexagesimal division of the S&T scale can be mapped onto the segment between 1 and 2 on the D-scale. This is exactly what we see in figure on page 48, in which the sexagesimal slide rule has been shown.

Of course the S&T line on the Rietz slide rule pass into two different scales: the S-scale (sinus) and the T-scale (tangent), for angle values over 5°, 30'.
When we try to correspond the numbers 6 to 10 on the S-scale with the same numbers on the D-scale, we see that the distance between two successive numbers on the S-scale is somewhat smaller than the distance between two corresponding numbers on the D-scale.
Contrary we see on the T-scale a somewhat larger distance between two consecutive numbers than between the two corresponding numbers on the D-scale.
Otto thinks that a sort of average between the sexagesimal divisions of the S-line and T-line could easily be transported to the D-scale and at the same time to the C-scale of a regular slide rule.

In the mean time the sun sets to the horizon, and young Otto hurries to his tent to start the construction of a "Babylonian Slide Rule". Finding a piece of cardboard of about 50 * 10 centimetres large he draws a line dividing the cardboard in the length in two equal parts.
Over this line, using his Rietz slide rule, he marks with a stretch over the line the integer numbers, 1 up to 10, of the D line. Between two consecutive numbers he uses the sexagesimal division of the S&T, and some average of the divisions of S- and T-lines.

By sliding his Rietz along the cardboard to the right, he adds a D line with the numbers 1 to 6, now with its usual decimal division. This part of the new scales consists of the interval from 10 up to 60.

Then he cuts the piece of cardboard along the middle line into two equal pieces.
He marks the numbers 1 to 9 on his scale with their corresponding wedges and the numbers 10 to 50 with their corresponding hook symbols. He marks the number 60 at the right end of the scale with the single wedge, thus showing that the radix 60 is in fact being represented by the same symbol as the number 1
Very satisfied with his work, he goes to bed and dreams about patents and production.

The next morning, missing his bacon and eggs, he starts worrying.
What happens if I multiply 40 with 40?
I do not have this figure 1600 on my scales!
Having room enough on the 5 cm broad strips, he adds new scales with the following figures:
60 up to 3600; 3600 up to 216000 and on the other half 1 down to 1/60; 1/60 down to 1/3600. These are probably the most used powers of 60.

On his first scales he places wedges (symbols for the numbers 1 to 9) in the intervals that are terminated by hooks (symbols for the numbers 10, 20, 30, 40 and 50) and he places hooks in the intervals between two symbols with wedges.
The multiplication 40 * 40 yields the decimal number 1600, which is represented by 26,40 in Neugebauer's notation.
Now 1600 = 20 * 60 + 6 * 60 + 40.

The two hook symbols for 20 on Neugebauer's D-scale stand for the number 1200 while the (three hooks) number 30 stand for the number 1800. Because the number 1600 must be found in a higher base scale all the numbers of the D-scale must be multiplied by 60.

When we actually perform the multiplication we find the product on the D-scale of Neugebauer's slide rule a number right of two hook symbols and six marks for wedge-symbols. The product must therefore be somewhat larger than 26 times the unit 60.
When we look carefully at the place where we find the product we see that about 2/3 of the distance between wedge symbols remains. The interval between two such symbol must be thought to be divided into 60 pieces from which follows that the remains has the value 2/3 of 60 equals 40.
Like Neugebauer we easily find the value of large numbers, even when these numbers are not mentioned on the scales.

All you have to do when you start with a new scale, say 3600 up to 216000, is interpreting the wedge as a specific power of 60, for instance the value 3600. All the values on the scale must be multiplied by the same power of 60 to get the appropriate value the symbols represent. That's why in the given example two hook symbols (normally representing 20) do actually represent the value 20 times 60 or 1200.

Realising that the interest in this very special slide rule will be small, not many individuals having basic knowledge of sexagesimal calculations, Otto abandons the idea to patent it.

We have to remember that the division of the intervals between two symbols that contain wedges is done by the symbols that contain hooks, and that division of the interval between two hook symbols is done by the symbols that contain wedges. Besides we have to remember that the true value of the single wedge is a power of the radix 60, the exponent of this power depending on the context.

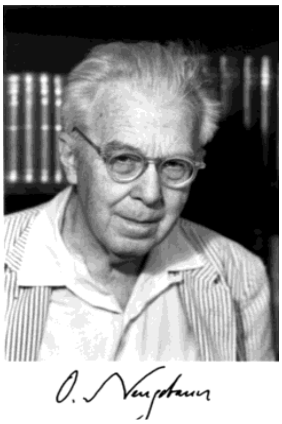


Figure: Otto Neugebauer

Who was Otto Neugebauer?

Although Neugebauer was not very well known in the mathematical community, a large number of texts about his work and life can be easily found. We mention here some sources that can be traced without much difficulty.
A first biographical sketch of the life of Otto Neugebauer can be found on a site of the Scotch St. Andrew's University [**5**].
An excellent biography of Neugebauer by N.M. Swerdlow can be found on a site of the National Academy Press [**6**].
In 1994 P.J. Davis wrote an interesting article about Neugebauer in American *Mathematical Monthly* **101** [**7**]. Some years earlier R.P. Boas wrote an article about Neugebauer when he received the Award for Distinguished Service to Mathematics [**8**].

Otto Neugebauer was born 26 May 1899 in Innsbruck (Austria) and died 19 February 1990 in the USA. He studied mathematics in Göttingen but was also an expert in languages. He studied for instance old Egyptian and Akkadian. He received his doctorate on the history of Egyptian unit fractions from David Hilbert in 1926.

In the mid-1930’s he published a 3-volume collection on mathematical clay tablets and hence showed the world the great richness of Babylonian mathematics. Because of his contributions we nowadays know that much of the Babylonian mathematics exceeds the level of Greek mathematics. Indeed, much of the Greek mathematics is rooted in Babylonian sources.

When the nazi's came to power Neugebauer left Göttingen and started doing mathematical research at the Copenhagen University. After less than a year he left Europe to work at Brown University, Providence in Rhode Island, USA. Here he was appointed professor of the History of Mathematics in 1947.

People were terribly afraid of his bad temper. At first sight he was a man of soft outward appearance and low-decibel manner. But he had, and didn't conceal it, a "low tolerance for stupidity" [**8**].
He would occasionally burst out in anger and irritation. He perceived the human world as "consisting largely of fools, knaves and dupes" [**7**].

Conclusion

Is the sexagesimal slide rule that we constructed, a replica of Neugebauer's slide rule as mentioned in the introduction?

It could be….

References

[1] Resnikoff, H.L. and Wells, R.O. *Mathematics in Civilisation.*
[2] http://it.stlawu.edu/~dmelvill/mesomath/Numbers.html
[3] Cajori, Florian. *A History of Mathematical Notations.* 2 volumes. Lasalle, Illinois: The Open Court Publishing Co., 1928-1929.
[4] G. Ifrah. *Histoire Universelle des Chiffres.* Bougains 1994.
[5] http://www-history.mcs.st-and.ac.uk/~history/Mathematicians/Neugebauer.html
[6] http://www.nap.edu/openbook/0309062950/html/215.html
[7] P J Davis, Otto E Neugebauer: Reminiscences and Appreciation, *American Mathematical Monthly* **101** (1994), 129-131.
[8] R P Boas, Award for distinguished service to Otto Neugebauer, *American Mathematical Monthly* **86** (2) (1979), 77-78.

Captain Jan F. Schipper

Mercator Graphic Slide Computers in Aviation

Mercator Company History

The reason I'm recording this history is a mere coincidence. One day I happened to run into Mr. Schuitema, an expert in this specific field.
As it happened my involvement in "graphic computers" actually started in 1961 when, during my pilot training in Eelde, I got to work with the Aristo slide graphic computer during the navigation classes. The very same Aristo I have here with me, a historic item. It proved to be a handy tool for any pilot but only **after** becoming fully familiarised with it and all its "ins and outs".
As a matter of fact without it was not possible to make a so-called flight plan. Having said that, I did have some previous experience using a slide rule. In the 50's, during my high schooldays, I used a Nestler but I must confess I only ever played with it.
However, in the early sixties, just after finishing my pilot training, I met Mr. Han Blein. Together we strove to get the airfield of Bergen (NH) reopened. This airfield was in use to the last days of World War II but was then thoroughly bombed. In 1964 it was being used as farmland and was owned by the government. During the intensive lobbying period, with activities to promote and get support for the idea, it turned out that Mr. Blein owned (with others) a company called Mercator Computer. The company produced only two products: a **Protractor** and a **Graphic Computer** called Mercator Computer (named after Gerard Mercator who developed the Mercator Parallel Navigational Maps).

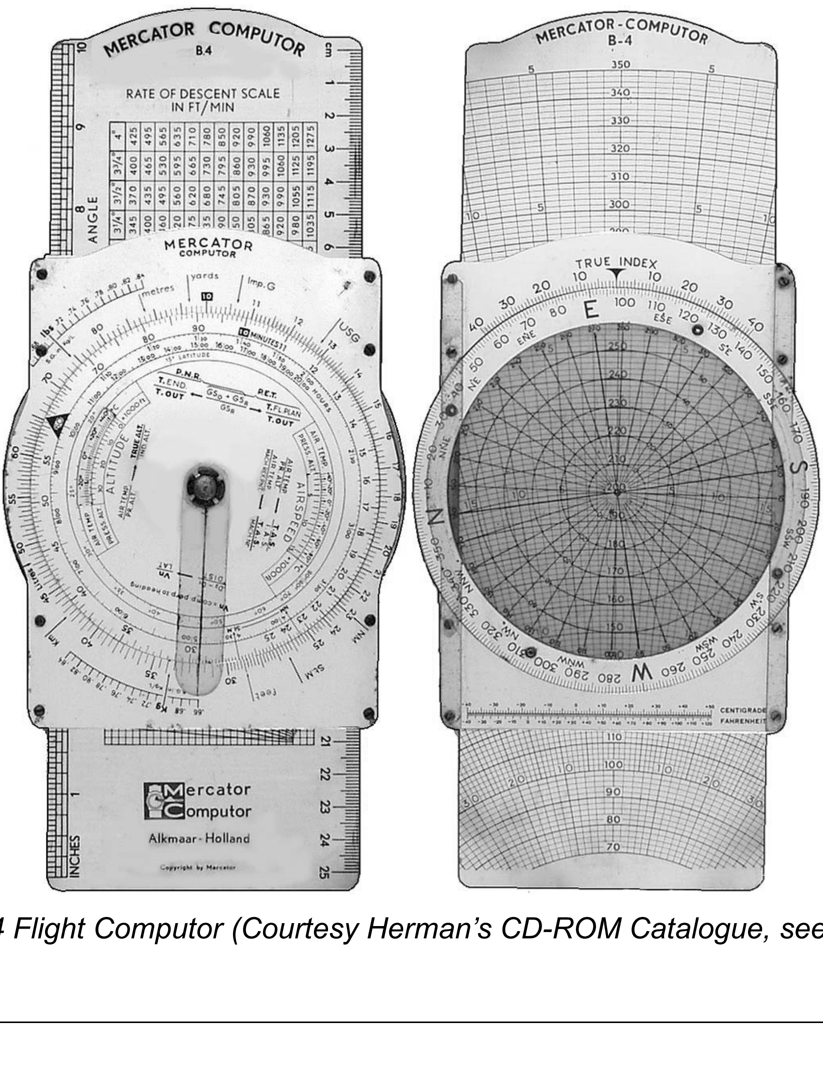
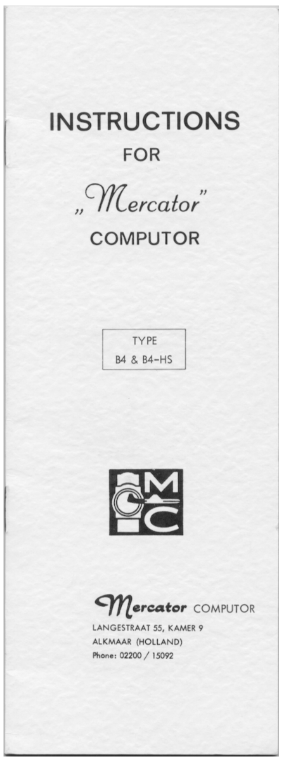


Figure: B4 Flight Computor (Courtesy Herman's CD-ROM Catalogue, see page 69)

The company was founded in 1946. During the wartime Mr. Blein was active in the resistance and there he met Mr. Ton van Ulsen, a captain for KLM. With his assistance, the Mercator Computer was developed into the final form and subsequently put on the market. Due to his many business contacts, Mr. Blein was able to sell in volume to many of the Airforces around the world. This business enterprise continued till the early seventies when it became apparent a similar graphic computer from America, the Jeppesen CSG9, was going to become a competitor one way or another.
Jeppesen was a firm in the USA, primarily in the business of aviation charts but, as a “sideline”, produced products like the slide computers in different forms and sizes. It seemed prudent to start talks with Jeppesen (who had a European head office in Frankfurt) about becoming their representative in the Benelux with a view to stopping production of our own Mercator Computer (which was becoming an expensive operation as sales were falling). The talks worked out fine and from then on, we became Jeppesen’s representative.
An added advantage was of course their wider range of products. I have a copy of the *old* Jeppesen catalogue as well as a recent one with me, to show how it has changed over the last 25 years.
In 1980 Mr. Blein died and shortly after, I took over the business. I continued till 1996 (our 50th anniversary). It was taken over by Mr. Peter Mundy who was also involved in the sale of supplies for pilots. The business now operates out of Lelystad airfield.



Principles of Graphical Flight Computers

Now some of the practical features of the slide graphic computer which, by the way, hardly differ from one another. Mostly it was a matter of size, colour or a different wind scale.
In the “old days” of aviation, the one steady factor had been the (relative) accuracy of maps. This meant the distances between two points could be pretty well established. The variable was the weather or more to the point, the prevailing winds along the intended route. More than 50 years ago, such considerations were much more intuitive and “rough”. You knew approximately how long it would take and off you went.
The wish to work somewhat more accurately became evident, also when related to maximum take-off weights and economy factors.
So around the time graphic computers became available they were used in the following manner:
The front side of the computer to calculate/convert

- distance and ground speed into time intervals
- indicated speed into true air speed, depending on flown altitude
- fuel flow into fuel used per stretch/interval

The reverse side of the computer to find out the effect of the wind on the air speed flown as well as on the ground course to be maintained. Such calculations made it possible to determine two important figures: the heading to fly and the ground speed.

Recent developments

It requires little imagination to predict over the years, electronic replacements have come onto the market.
Jeppesen brought its first, the AVSTAR, onto the market in the early eighties. It proved a big success but in the meantime the slide computer remained because authorities still require pilots to be proficient with the non-electronic versions (no flat batteries on a slide computer!).
Only a little later a more sophisticated electronic computer, the PROSTAR, came onto the market This could also calculate distances between points from just their respective coordinates.
In the following panel interviews (see also page 63), I will elaborate on the sophisticated equipment on board today’s modern airliners.

INSTRUCTIONS FOR MERCATOR B-4 COMPUTOR

CIRCULAR SLIDE RULE SIDE.

The circular slide rule scales provide an easy means for multiplying and dividing. For calculations involving speeds, fuel flows or flying times the "60" is specially marked on the innerscale while for other purely mathematical problems the "10" is clearly marked on inner- and outerscale.

THE "60" MARK, SHOULD ALWAYS BE SET AGAINST SPEEDS FUEL FLOWS OR OTHER HOURLY VALUES.

NOTE :

In the various problems presented below cumputations will be expressed in the form of formulae like:

G.S. / (60) → Dist. (H) / Time   (outerscale) / (innerscale)

This indicates that "60" (innerscale) is placed opposite groundspeed (outer) and then by placing the hairline (H) on the (outerscale) distance, the time is read under the hairline on the innerscale.

1. TIME, DISTANCE, FUEL PROBLEMS

PROBLEM 1^a

Given: Zonedistance to fly 250 N.M.
G.S. 200 knots and fuel flow 1800 lbs/hr.

Find: Time and Fuel required.

Solution:

200 / (60) → 250 (H) / 1:15 ; Flying time 1^h15^m.

The hairline was placed on 250 knots (outer) and the time read on the innerscale. THE HAIRLINE SHOULD REMAIN FIXED ON 1^h15^m WHEN MOVING INNER SCALE TO:

1800 / (60) → 2250 / 1:15 (H) ;

Fuel consumed 2250 lbs.

PROBLEM 1^b

Given: Totalfuel 23000 lbs and average fuelflow 1500 lbs/hr.

Find : Endurance.

Solution:

1500 / (60) → 23000 (H) / 15:20 ; Endurance 15^h20^m.

- 2 -

2. ALTITUDE CORRECTION.

Since the altimeter is only calibrated for standard atmospheric conditions, any deviation of actual temperatures from standard will cause an error in the altimeter reading. A simple method for correction, however, is given on the computor. (ALTITUDE correction scale).

PROBLEM 2^a

Given: With its subscale set tot 29.92 inches of mercury an altimeter reads a pressure altitude of 20000 ft. When set to the actual ground pressure, 19300 ft. above ground is read. Outside air temperature at flying level is 0^o C.

Find: True altitude above ground.

Solution:

0^o / 20000 → 21.200 / 19.300 ; Answer: 21.200 ft.

In the above example, no ground or intermediate level temperature deviations from the standard lapse rate are catered for.

Note: The standard lapse rate is given in the temperature portal against relative altitudes.

PROBLEM 2^b

Given: Same data as in 2^a, plus sealevel temperature of 30^o C.

Find : True altitude above ground.

Solution: Again, placing 20000 ft. press. altitude opposite 0^oC in the portal, 44^oC can be read opposite sealevel or 0 pressure altitude. However the actual temperature is 30^oC. If the sea level or 0 altitude point is set halfway between 44^o and 30^o (viz. 37^o), the average temperature between 0 and 20000 ft. (15^oC) will appear opposite the average altitude (10000 ft.). True altitude can then be read on the main outer scale opposite the indicated altitude on the main inner scale. Answer 20750 ft.

3. AIRSPEED CONVERSION.

The airspeed indicator is calibrated for standard sealevel density and therefore must be corrected at higher levels (= lower pressures) and for temperatures differing from standard, as these variables determine the density at flight level.

To achieve this, the outside air temperature

Figure: First pages of instructions for Mercator B-4 Computor

IJzebrand Schuitema

Special Slide Rule Exhibition

EXHIBITION - staged by IJzebrand Schuitema

The Saturday afternoon programme includes a visit to a slide rule exhibition, comprising 17 different themes. A short description of each theme accompanies each of the tables and display boards. Exhibited are: slide rules, discs, photographs, documents, books, and letters related to each theme.
A specially prepared “volume” of 17 articles is a feature of the exhibition. The articles examine in more detail the themes depicted in the exhibition and puts them into a historical context. They also highlight the person and/or the firm behind a particular design, manufacture or use.

The volume includes many illustrations of documents referenced in the text. The respective slide rules and discs have been digitally photographed in colour and captured on a computer CD-ROM. Each volume comes with a CD-ROM. This way the volume and CD-ROM can be used as a reference work for further study at home (and on the computer), after the exhibition. Another reason for capturing the illustrations electronically was that it enabled an “unlimited” number of items to be included for each article. Also colour printing of so many illustrations would have been cost prohibitive.

All except a few of the items featured, belong to my private collection. The publication, over 200 pages, was specially compiled for the 6th International Slide Rule Meeting. Some articles were published earlier but many were specially written to accompany the exhibition.

Herman van Herwijnen designed the lay-out and produced the CD-ROM insert. This was only possible after he painstakingly photographed, in colour, hundreds of items. They appear on the CD-ROM in the same order as the 17 articles. Many will understand just how many hours must have gone into this work. On behalf of everyone, I thank him.

To get an impression of the illustrations digitally captured, a print-out will hang on the wall of the exhibition room. I am sure the quality will speak for itself. The volume will be printed in Dutch and English. Copies will go on sale Saturday afternoon. The price of the volume, with CD-ROM, depends largely on how much (as yet unknown) sponsorship money the exhibition attracts.

Part 1 of the volume covers an analysis of slide rule collecting as a hobby, how it started after the slide rule was replaced by the electronic calculator and how historical research provides knowledge and information on their design and manufacture. The data for the analysis came from a questionnaire sent to 150 known European slide rule collectors. Of which, a healthy ±6O responded.
Part 2 covers the 17 themes in the exhibition.

I hope that all visitors to the exhibition will see many items of interest and that the accompanying volume will provide many hours of further study and a new rich source of information on our mutual hobby.

Summaries of all 17 Exhibition themes

1. **Ir. F.J. Vaes: July 15, 1867 - November 10, 1943**

A patent was granted to Vaes in 1903. It describes a series of slide rule bars kept together by their swallow shaped form. Each bar has its own scale. The number of scales is unlimited i.e. the more bars the more scales. Manufacture of this slide rule construction never got any further than a prototype.

Vaes was an expert on problems of railway traction. He designed many slide rule scales for this speciality. These designs are published in many books and articles he wrote. He also designed slide rules in straight and circular shape for manufacturing milling cutters and gearwheels.
He finished his career as teacher. He gave lectures at the Delft Technical University and several other technical institutes. His style of educating students was considered very advanced.
He wrote the first slide rule Instruction Manual in the Dutch language.
His grandson is member of our "Kring". Ask him to tell you about his grandfather!

2. **R.E.P. Wolthekker: Born 1933**

Wolthekker worked as a technician for the Department of Public Works in the Dutch region of Friesland. It was his task to design provincial motorway routes. The calculating methods of those days, the early 1960's, relied on using tables. He designed a slide rule to replace these tables and speed up the calculating time.

He tried, without success, to introduce his slide rule into other governmental departments with similar working practices. This was because of the short-sightedness of his superiors in the Ministry of Traffic and Public Works. Their reluctance to invest in Wolthekker's slide rule meant manufacture never started.
Wolthekker designed and produced his own slide rule and used with considerable success during his career. This unique slide rule is part of the exhibition.

3. **K. Kasper: Born December 5, 1911**

In the early 1940's Kasper was a technician for the Municipal Works in the region of Enschede. His assignment was to recalculate the existing sewerage culvert system and design a new one for a new city development. In those days tables, diagrams and nomograms were used to solve the problems of correctly sizing sewage culverts. A very time-consuming process.

Kasper designed a slide rule, based on formulas for sewage culverts. He put his slide rule on sale in a kit-form, which included the scale print and the cursor film. The meant the buyer had to construct the slide rule and cursor. An accompanying manual explained how to go about making the rule and how to use it. The cost of the kit was 4,- Dutch guilders or about $.2,-.
30 kits were sold. Customers wanting a ready-made slide rule could order one for 18,- Dutch guilders. Kasper subcontracted the construction work to a willing carpenter.

4. **Mercator Firm: 1946 – 1996**

The Mercator firm, based in the Dutch town of Alkmaar, existed from 1946 to1996. It was founded by Mr. A. van Ulsen, a KLM pilot, and Mr. J.H. Blein, a businessman. In the first years after the 2nd World War there was a shortage of navigation aids for the growing air navigation. This resulted in Holland producing a highly appreciated "flight computor".
The name "Mercator" was chosen after the Flemish cartographer Gerhard Kremer, calling himself Mercator, the designer of a new map measuring system in the 15th century. His map-grid system consisted of parallel lines on a spherical surface, the Universal Transverse Mercator (UTM) grid,

has since been used in shipping, by the army and later, air navigation. It is still in use today. The Mercator firm also produced air navigation favourites; protractors. The original owners because of other interests, being keen private pilots and flying advertising planes, were only involved in the management aspects of production. Mr. J.F. Schipper, another KLM pilot, succeeded van Ulsen.

Mr. Schipper will present his former activities for the firm of Mercator and take part in the Saturday morning interviews.

5. J. Van Strien: Born 1930

Brewing beer is a very special activity in the world of alcohol. Circular slide rules are designed to do all kinds of calculations for the brewing process. Companion straight slide rules were designed to calculate, based on data from laboratory tests, the CO_2 content in beer. These CO_2 percentages for weight and volume are what gives beer its quality and taste.

Van Strien, when head of Heineken Breweries Physical Laboratory, designed scientific formulas from which slide rules could be manufactured. With such slide rules replacing earlier empirical methods, came better quality control and interpretation of laboratory tests.
Mr. Van Strien will take part in the Saturday morning interviews.

6. G. Diefenbach: June 2, 1907 - April 10, 1979

Diefenbach spent most of his career as a specialist in designing main drinking water conduits and supplies. He educational background had a wide and varied technical flavour. Starting as supervisor and carpenter but finishing his career as registered engineer and successful technician at the Utrecht Water Supply Company (UWM).

He worked for most of his active technical career for UWM; in those days part of the Belgium "Compagnie Generale des Conduites d'Eau". During this time he designed a slide rule for water supply systems and conduits. In the past such calculations were derived from tables and nomograms and "Mulder’s formula”, an invention of his Belgium superior. His slide rule made it possible to calculate water supply systems on a scientific based analysis of the problem. Using a slide rule also meant, for the first time, the roughness and resulting friction on the inside walls of conduits could be taken in account in flow calculations.
His design was manufactured commercially and found widespread use in his specialist field.
Diefenbach combined an inventive mind with an artistic interest and application. He liked drawing and painting, with many examples surviving him. He was a much-appreciated colleague and technician at UWM.

7. P. Matthijssen: May 20, 1880 - Aug 30, 1968

The firm Matthijssen was founded in 1926. Its aim was to manufacture specialist slide rules. Matthijssen qualified as a mathematician through a self-study course. His hobby was designing slide rule scales based on complicated formulas.

He started his career as an administrator in several firms. When applying for an other administrative function he mentioned his hobby. He was advised to start a firm manufacturing slide rules. The resulting firm lasted until the 2nd World War. During his years in business he concentrated on designing and manufacturing made-to-order special slide rules, usually in small volumes and not offered for sale in shops. His client base came from several industries and state and governmental institutes.
An original company brochure names and references a little over 30 customers. Despite this, only 10 Matthijssen slide rules are known still to exist. Three of the 10 can be found in my collection.

8. P. Rijnja Firm - Amsterdam: Founded 1892

In 1892, P. Rijnja founded the first Dutch firm for making blueprints. This was a copying process developed in1880 by Prof. Eder in Vienna. The firm concentrated on paper and drawing accessories for architects, technical schools, advisory firms, contractors, etc.
The firm started manufacturing slide rules during the early 1930's. Their first rule, for calculating the size of wooden floor and ceiling joists, was based on scales designed by J.Th. van Gerven. Later they produced more types e.g. for iron girders and columns. Rijnja also produced a slide rule designed by J.LH. Strackee for re-enforced concrete.
Rijnja used the patent granted to Dr. Ing. Hans Seehase from Berlin for manufacturing their slide rules. Seehase delivered the slide rules as subassemblies, leaving Rijnja to print and add the scales etc.

9. M.C.M. Van Maarschalkerwaart: Born 1928

Re-enforced concrete constructions were calculated by the elasticity method until the early 1960's. Many different slide rules were designed by many different firms. In essence they were all the same, only differing in the tensions used for concrete and reinforcement. They were mostly named after the designer of the scales and/or scale sequences.

In the 1960's the concrete calculating basis changed from elasticity to the plasticity method. Subsequently all pre 1960 slide rules, became obsolete.
Van Maarschalkerwaart designed new scales for the plasticity method and a new universal slide rule for concrete constructions was born. It was designed in such a way that it remained applicable for all future changes in the calculating base and safety factors.
Nestler started production of the 0440 -System Maarschalk- slide rule. Aristo followed with their type 940.
Mr. van Maarschalkerwaart will take part in the Saturday morning interviews.

10. H.I. De Wolde: Born 1932

The European Economic Communion (EEC - now known as the EU) was founded in 1958. Part of it was an organisation called *Euratom*. The organisation was set-up to undertake research on availability of raw material within the EEC for generating nuclear energy. The research work involved many calculations by the geological specialists. It was done on computers. To do field research effectively, the geologists had to perform there calculations literally in the field and the computers of the day could not be used in such a manner.

Euratom decided to design a special slide rule. De Wolde, as a mathematician, was invited to come up with a design. He created mathematical formulas for these geological problems and designed, in close co-operation with geologist Johan Brinck, a slide rule. It was used by geologists for many years until the EEC decided to stop developing nuclear energy.
The scientific background to the calculation method was published in some Euratom reports but only 5 de Wolde slide rules were ever made. One of them can be found in my collection.

11. ALRO Firm: Founded 1935

The ALRO firm was founded in 1935 by Dussel and Pasveer. The first and most important product of this firm was a circular slide rule mounted in a metal box that doubled as a stand. The axle construction of the disc was patented. The working position was an opened box under 45°. It could be operated by one hand, leaving the other hand free to write down the results. Dussel designed many special scales for many specialities. ALRO also produced circular slide rules without these metal boxes; small pocket-size ones and larger versions for use on writing tables.

Jelier and De Ruyter have continued the ALRO firm after Dussel stopped. They continued Dussel's manufacturing success with ALRO products.

These two Managing Directors were part of the resistance movement during the 2nd World War, as was the ALRO firm itself.
In the early 1950's the manufacturing output changed from metal boxed mounted discs to discs and other items made of plastic.
Eventually the ALRO firm was acquired by an English firm; currently the remaining activities are owned by an American firm, "Data Card".

12. G. Von Below: Born September 11, 1904

Von Below is descendant of an old family that lived for many generations in East Prussia. The family belonged to the dynasty of German landowners and landed nobility. The young Gerd received a top-notch education at home from private teachers, supplemented with practical work in several concerns run by large landowners. He went on to study agricultural sciences at the universities of Bonn and Kiel, getting his Doctor's degree in 1929.
His practical experience, with his scientific education, made him a respected authority on all kinds of breeding cattle. He became renowned in setting up food rations for cattle that resulted in optimum output of fat content in milk, weight of meat, etc. He put his knowledge to practice on a 1600 hectare estate in Pommern he inherited, as sole heir, from an uncle.

At the end of the 2nd World War he was banished by the Russian army and lost his estate and everything that went with it. He built a new existence, acting as an agricultural adviser, in Kassel. During this period he designed and produced a slide rule for calculating the optimum food rations for livestock. There was shortage of food for livestock in the first years after the war. His slide rule ensured the scarce food that was available, was put to its best use.

His slide rule was used and appreciated by farmers, agricultural institutes and agricultural schools for many years. All "Futterrechenschiebers" were assembled by Von Below, from supplied components. He displayed and sold his slide rules at agricultural fairs. Aristo started manufacturing similar slide rules some years later. These had many extra scales to solve the other organisational, financial and management problems of the agricultural concerns.

13. LOGOMAT Firm: ±1970-1983

The firm Logomat was founded to produce circular slide rules as publicity or advertising items. It had to be a calculation aid associated with the product it was advertising. The discs could be made in any size or colour and carry any desired company or product logo.
They were made in metal or plastic. Sometimes a special order was given by a particular client for a unique use. For such orders any publicity aspect was secondary. All Logomat products were manufactured to a high degree of accuracy and quality.
But over time production costs became too high. Consequently the owner stopped manufacturing in the early 1980's.

14. Alex E.S. Green: Born 1919

Green, a physicist, was born in 1919. He designed several slide rules for the American Airforce in the last year of the 2nd World War. One of these slide rules was used for calculating the dimensions of warships, replacing complicated books of tables. Another slide rule was used for working out bombing adjustments. It was quicker to use and more accurate than the than the bombing tables it replaced.
In total Green produced more than 30 different slide rule designs. Thanks to his designs, the Japanese fleet could be traced and the size of the warships determined. With such valuable data the enemy fleet could be effectively bombed, bringing an end to the Japanese navy in the Pacific.
Green was awarded the Medal of Freedom for his contribution to war effort and in particular, the success of air raids in the Pacific.

15. IWA: Founded 1926

IWA is one of the few firms that still exist and produce slide rules and slide charts. IWA's method of slide rule construction differs radically from what was done in the past. The designs are directly related to the intended use of the objects. Each type of construction has its own name.
The IWA coding system exists since their founding year, 1926. Consisting of 15, later extended to 16 categories. The first two digits of the code number indicate the specialist category to which it belongs. The second part of the code number refers to the client who placed the order.

16. Load adjusters

Load adjusters are slide rules to calculate weight distribution from the centre of gravity when loading freight, etc onto an aircraft. In the past this was to avoid problems at take off, during flight and on landing. Each type of aircraft had its own margins related to its particular centre of gravity. Consequently each type of aircraft has its own unique load adjuster. Interchanging slide rules between different types of aircraft is not possible.

There are as many load adjusters as there are types of aircraft. For smaller aircraft, either lost or broken up, their accompanying slide rules have mostly vanished. The small number saved make them rare collectors items. The sequence of scales and indicating margins are differently shaped on American and British based slide rules. These differences can be seen in the examples exhibited.

17. Artillery

Many different calculation aids were designed and manufactured to solve artillery calculation problems. They are all different, largely dependent on the firing problem facing the artillerist. Essential differences were: gun and target in the same horizontal level, gun and target on different levels of broken ground, trajectory of projectiles traversing several atmospheric layers of different pressure and wind directions at different altitudes before hitting the target.

Another factor in the calculation is the type of the projectile i.e. fire shell, high explosion shell or light shell. Finally the altitude of explosion: above ground level, at ground level or below ground level needs factoring in. All these facets to the problems resulted in a great variety of calculating aids and slide rules for artillery use.

Interviews

As you have read in the foregoing, both Mr. Van Strien and Mr. Van Maarschalkerwaart designed, long ago, specialist slide rules. The first as an aid to calculating CO^2 concentrations, to monitor and control the beer brewing process. The second to calculate reinforced concrete values based on the plasticity method.

Mr. Schipper managed a firm manufacturing flight computers. He will address this in the Saturday morning programme, and he will explain as professional pilot, how navigation problems were solved after the flight computer fell out of use.

All three gentlemen have agreed to take part in panel interviews during the Saturday. They will be asked to recount the activities that led to the design and use of their products.

We are grateful they all agreed to be interviewed. This way participants can hear first-hand about the problems and the ideas which resulted in new developments and applications of the slide rule. If necessary, they will use items from the exhibition to illustrate points they want to make.

Mr. H.I. de Wolde was also asked to take part and be interviewed on his geochemical slide rule (see theme Nr. 10). However, as he now lives most of the time in Italy, it was not possible for him to join us in Ede. Therefore his interview preceded the meeting. The questions put to him and his answers are published as part of these Proceedings. Thus all participants have the chance to acquaint themselves with De Wolde's activities. Details of the interview follow here.

Interview with H.I. De Wolde

Question 1

Dear Herman. Several years ago we met each other for the first time. Then you told me about your design activities concerning your geochemical slide rule. Afterwards you wrote an article which now is part of my book, presented during the sixth international meeting. I suppose that the participants of that meeting reading your article may have some problems understanding your scientific analyses concerning the formulae resulting into the scales on the slide rule. Therefore I want to put a question to you.

Please give an explanation of the problem the geologist is confronted with and which are the calculations the geologist has to perform. This is at the basis of all scientific analyses as you wrote: analyse the problem and describe the way you try to find the answer. Please, inform us.

Answer 1

Dear IJzebrand, I feel a little bit overwhelmed by the sheer complexity of your first question. I am not a specialist in geology and I don't know anything about the intrinsic motives of these diggers. My role in the development of the geochemical slide rule was one of a humble servant and catalyst to condense the thoughts of the brilliant geologist Dr. Brinck, in a practical form. The term "brilliant" is not my own evaluation but is based on many scientific reactions to his publications.

For most of the field geologists the burning question is: "Can we make money here?"

The second question is frequently how the local situation does fit in generalised theories.

The geologist tries to estimate the enrichment grade and the size of the deposit of the target commodity with a minimum of information. The statistical sample is normally very small. The study concerned the development of methods to approximate the value of the two essential parameters. Those techniques may be compared to the prediction of who will be the next President of the USA, based on a sample of a few thousands of interrogations. During the sixties the global theories were still rather poor. So any effort to find some ways to generalisation was followed with profound interest.

We had the advantage of a very potent computer - far less capable than the most mediocre desktop of today - and a healthy sense of collaboration in different disciplines. It was such a joyful time: it was believed that the computer could solve all the existing problems. Any program was a hit. I remember that I wrote a simple program for least squares approximation with a graphical output. After a brief note in a publication, this elementary tool was requested by more than ten other institutes.

The general attitude was: "Give us any difficult problem and we will solve it in a few days, the impossible challenge might take somewhat longer." Afterwards we became somewhat more modest!

Question 2
Brinck informed you about his problem. Did you know immediately at that moment how you would tackle this problem mathematically? Or did it take much time before you could start your design work?
Answer 2
Mathematicians come in different flavours. The theoretical mathematician is the person who develops the discipline without thinking about the practical applications. The man who is working in the field of applied mathematics is the servant to other disciplines. What he has to do is defined normally by a large number of interviews. A healthy interaction is necessary and frequently some measure of fraud is required to obtain results. Working along the lines of pure mathematics is impossible.
For example, a theoretical statistician first studied the geochemical problems of Brinck. His verdict was "No way to solve the issue". This man was honestly right: a general solution that always gives perfect answers was not possible. However a workable interpretation that supplied most of the time a reasonable result was certainly viable.
The computer was a helpful tool during the development: One could quickly change the formulas and try a new approach. After the establishing of he final set of expressions came the development of the slide rule as it was not yet practical to put the computer in the field. The calculations had to be repeated frequently during the course of the investigations.

Question 3
You will understand this is very interesting for the slide rule collector. He always wonders, seeing a very special slide rule, what have been the successive steps from problem, via mathematical analysis, to design of scales.
After your discussions with Brinck, you made up your mind about the design. But how did you do your analysis. Were you successful at the first moment or did you correct your activities many times?
Answer 3
The result of the theoretical brainstorming was a set of mathematical expressions and a computer program that could calculate the dependent parameters, grade and size. Fortunately, the expressions were simple enough for a slide rule application. The linear slide rule can only be used for functions with two independent variables, per sliding operation. A circular slide rule may solve more complex situations but that becomes then quickly a frightening tool.
A function like a=f1(b,c) is fit for the slide rule. This is especially true if the scale for c is the same as the one for a. For example in the case a=b*c (* is the sign for multiplication). The problem has to be converted in a set of functions a=f1(b,c), d=f2(a,e), g=f3(d,h) etc. in which g is a dependent variable based on the values of the independent parameters b, c, e and h, shortly g=f4(b,c,e,h).
The next step is the calculation of the extremes of the variables to estimate the actual length of the scales. Finally the intermediate points are computed. For this phase of the job we designed a special computer program that was also able to draw the actual scales with the help of a Calcomp plotter.

Question 4
Telling us all this, it looks so easy, but I think it has given to you more puzzles than told. Is that right?
Answer 4
The exercise was just a minor adventure. I think that we dedicated no more than three manweeks on the development of the geochemical slide rule. This included the time spend on generalising the design of slide rules as we saw at that time a large number of application possibilities: quick and dirty approximations for example in nuclear reactor technology.
As I told you before it was a miscarriage from the start. If I had studied the electronic magazines beforehand, I would have omitted this type of tools entirely. The arrival of very compact powerful calculation devices was evident.

Question 5
It is clear to me now. The slide rule had been designed theoretically. But now the realisation of the idea. How did you start. Did you do all manufacturing yourself, or was there a technical assistance workshop?
Answer 5
The Joint Research Center disposed of a design bureau and a competent workshop. However it was a bit difficult to ask a designer who is used to exotic projects like fuel rods for nuclear reactors, to dedicate time to an ordinary slide rule. Additionally, most scientists have an unlimited confidence in their own competence.
So I did the drafting of the hardware myself. The workshop did the realisation. The basic idea was to arrange for a universal gadget that could be used for other application. The scales, actually drawn by the computer, could be replaced at any time.
Unfortunately, I did not think of the tolerance of the moving parts. The final tool required a very strong hand for operation, only muscled scientists could handle this device. It was more useful as a sledgehammer.

Question 6
How much time did it take from putting the question by Brinck until the realisation of the slide rule. Weeks or months?
Answer 6
As far as I can remember, the whole project took about two years for not more than 10% of my time. Dr. Brinck was occupied approximately for 50% of his time. The tail end, the actual slide rule, took about 2 to 4 man-weeks.

Question 7
Did Brinck, in cooperation with you, try out the slide rule in practice. Did you change your first design or was the first design the definite one?
Answer 7
Let us recapitulate: First we had a system of theories on the distribution of minerals in the earth's crust, then we composed a set of computer programs and lastly we developed the geochemical slide rule to substitute the unwieldy large computer. The computer could check the calculations as done by means of the slide rule. That was easy.
The programs were extensively applied to a set of samples from the Oslo environment in Norway. We disposed of about 200 mud samples, carefully taken from the rivers and side streams in this region. Each of these specimens represented a cross sample of a sub-basin. The samples were analysed by the x-ray fluorescence method for about 30 different elements. So we had lots of data to make a computer fanatic happy.
The results of our calculations were in agreement with the well-known geological description of this region. We succeeded also to predict the presence of a deposit of some rare earth metal that was later confirmed.

Question 8
OK, and afterwards Brinck started his implementation in the field. Was he the only one who used this slide rule or were there others as well.
You wrote that only 5 items have been produced. Who were the other users and in which regions or countries have these been used?
Answer 8
Brinck never used the slide rule in the field. The actual geological studies of his department were winded down because of political reasons. This kind of surprises happens when a research centre is directly depending on the politicians.

The applications were limited to the investigations on the Oslo region. There was some interest from national geological services but mostly the reaction was a big silence after supplying the requested documentation. The geologists were not yet used to mathematics in the sixties.
Nevertheless, the approach of Dr. Brinck was praised in later publications.

Question 9
You are mentioning the results of calculations. Was there any contact between the geologists on the usefulness of the slide rule?
Answer 9
The most prominent meeting opportunity of geologists is the geological congress every four years. This is a huge happening where all the colleagues meet each other mostly in an informal way. Tall stories are exchanged and good drinking and dining are as important as the new developments.
Johan Brinck prepared a paper for the conference in Prague in 1968. However, the Russians attacked the country before he could deliver his presentation. All the participants to the conference had to flee the country under frightening conditions. I think that the formal presentation of the theories and the geochemical slide rule occurred at the 1972 conference in Montreal. As far as I remember the reactions were rather timid.

Question 10
You wrote in your article the remark that perhaps all activities related to the slide rule had been unnecessary, because it was used only during a very short period owing to a changing policy concerning nuclear energy and, moreover, because the geologist, if being an experienced field worker, can decide many questions by intuition.
Do you really think that remark is valid. Don't you minimise your own design work too much?
Answer 10
There were two fatal events concerning our research activities. Firstly, the appearance of the Hewlett-Packard 35, a very small computing device with many mathematical functions. This beautiful tool made almost any slide rule immediately obsolete.
Secondly, the dream of unlimited cheap energy by nuclear reactors was doomed. Consequently, the search for uranium became less important and funds for further development became scarce. New techniques for exploration became available.
For example teledetection, first by planes, and afterwards by satellites. My remarks are certainly not a showpiece of modesty. If you would interview me about other projects like first flight collision probabilities of neutrons or my rectangles without a surface, I could prove that boasting about results is also possible.
One must never forget that a scientist has to be happy if one in five of his projects finished positively.

Question 11
I suppose that other geologists in other parts of the world were interested in your slide rule. You wrote it could be used for other applications as well.
Was there any such interest at all. Or did you keep all knowledge for yourself?
Answer 11
As I said before, we received reactions and those theories were discussed in several publications but the general trend was rather timid. I suppose that one of the important effects was the awakening to the idea that geology and mathematics can work together. We have seen that since that time the publications in this discipline have become more and more mathematically oriented.
Of course I don't pretend that this development is only due to the efforts of Brinck and De Wolde. When I said that these theories could be applied to other problems, I was thinking of the distribution of clover in your lawn or the occurrence of crime in big cities.

A frequent problem with applied mathematics is the large number of problems that you could solve with the expressions that you develop. Take for example the wandering of neutrons in a nuclear reactor: people in the big stores seem to behave according to the same formal description.

Closing remarks

Dear Herman. I thank you so very much for all your explanations.
I think all slide rule collectors who have read your article in my volume, now will have a better idea of all problems concerning developing a slide rule for a speciality like this particular one. I had much pleasure talking with you several times on this subject. The added value of all this to the slide rule hobby is not only important but also informative, because it will not be the only circumstance scientists are confronted with such interesting questions to solve.
I feel so sorry that you were not able to come to the sixth international meeting yourself, being in Italy at that moment. Now the participants cannot discuss with you. They are restricted to read this interview.
Once again, many thanks.

Herman van Herwijnen

Slide Rule Catalogue on CD-ROM

History of the Catalogue

When the first slide rule catalogue was issued by the Dutch Circle of Slide Rule Collectors in April 1994, a quality digital camera cost some 20,000 US dollars and was only used by professional photographers. The speed of a personal computer was still rather low. Therefore the 1994 slide rule catalogue did not contain any pictures.
In the 351-page 1998 update of the catalogue, nine pages with pictures were shown as example of how it could look like in the future. Still, the pictures shown were only scanned images, copied onto paper. Therefore the picture quality was limited but in fact with it, the picture catalogue was born.

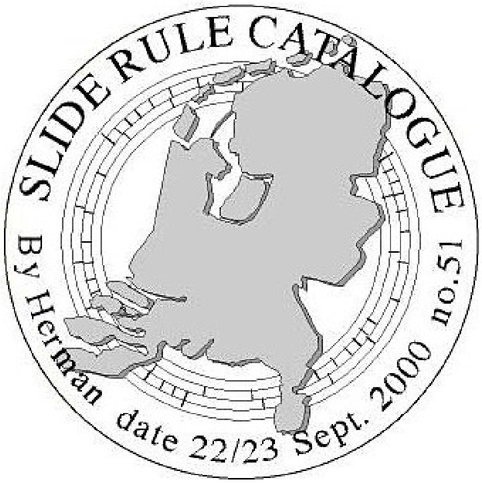


Figure: CD-ROM label

Early 1999, the price of a good digital camera dropped to less than 1,500 US dollars and computers with GigaBytes of memory and high speeds became available to process pictures on a computer screen. At this time the creator of catalogues from the Dutch Circle, Herman van Herwijnen, decided the days of paper catalogues were over and it was time to publish on CD-ROM only. In August 1999, at the International Meeting held in Cambridge, he launched his first CD-ROM version with some 500 slide rules and discs pictures. Since then he has photographed his own extensive collection and the collection of the no.1 slide rule collector in the Netherlands. At the moment this amounts to some 4000 pictures, covering 1600 slide rules and discs. Another 1500 slide rules in possession of the two collectors have still to be photographed. However, this may take some time as, on average, it takes three-quarters of an hour to capture an item to appear as a picture in the catalogue. After completing the outstanding 1500 items, other collectors will be asked to provide pictures of items not appearing in the catalogue.

Structure of the Catalogue CD-ROM

The CD-ROM catalogue can run on all modern computers, needing no special program or database to run it. The catalogue consists of three related files: MASTER, PERSON and PHOTO.
The relation is fixed via a “Match Number” that is unique to each rule or disc featured in the catalogue. The three files have the following functions:

The MASTER file contains descriptions of 3500 rules and discs.
The MASTER file contains all the master reference data but can also show related personal data an individual can choose to store in his own separate PERSON (personal) file. This is pre-programmed with a model or template covering the most important basic data of the rules. With the PERSON file, it is possible to add private numbering schemes, the price paid, the value for insurance, the number of duplicates, its condition, where it is stored, etc. Via the MASTER file, colour pictures can be displayed and printed 1 per page or 24 per page.
The MASTER file opens with a "Main menu". From here you can navigate, by clicking a text or picture, to subsidiary menus to browse through the catalogue, go to other layouts, search for a set or a single slide rule or disc, go to the input layouts or go to the PERSON and PHOTO file.

The PHOTO file is a special file to link the pictures, stored as JPEG files, with the MASTER file. “SCRIPTS”, designed by a very powerful tool, are included as an alternative and supplement to the menu navigation.

The PERSON file, pre-programmed with 10,000 records, shows the most important data from the MASTER file and is ready for importing “personal data”. The MASTER and PHOTO files will be updated about once every two years but the PERSON file, after initial installation, is a file you update with your private data as often as you like. Once installed never replace or overwrite it with the initial PERSON file that will always accompany any update of the MASTER or PHOTO files.

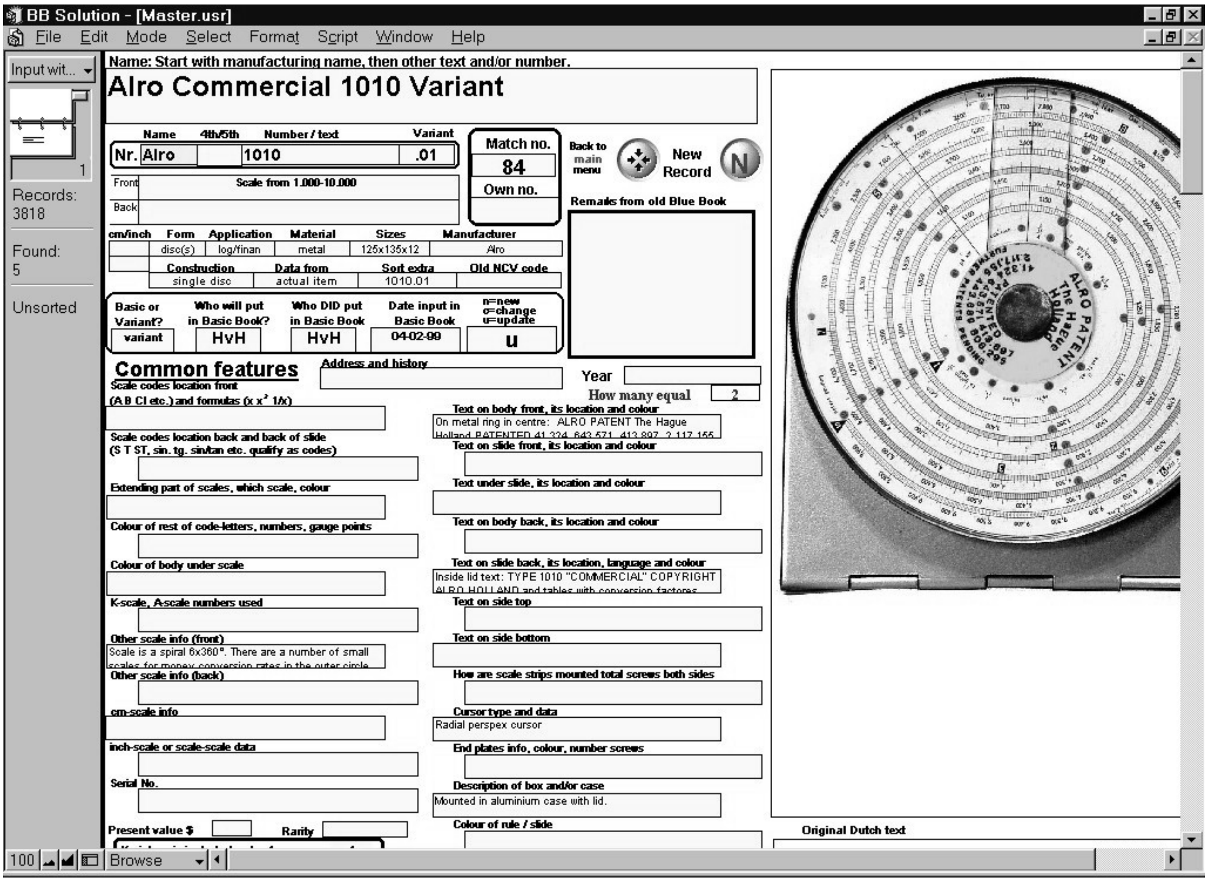


Figure: Example of CD-ROM screen layout[1]

Contact for Catalogue CD-ROM

If you want to catalogue a rule not yet in the MASTER file, then you need a unique Match number. This you can obtain from Herman van Herwijnen, e-mail: hermanrule@compuserve.com
or telephone 0031 715 616 270 from outside the Netherlands
or 071 5616270 when calling from within the Netherlands.

The price of the CD-ROM is the equivalent of 50 Dutch guilders plus postage (5 guilders for Europe and 10 guilders for the USA or the Rest of the World). It can be obtained from H. van Herwijnen at hermanrule@compuserve.com .

[1] Note that this screen supplies many details about the transparent yellow slide rule on the front cover

The Editor

Organisations of Slide Rule Collectors

Slide Rule Collectors usually have wide and intensive communications with fellow collectors. But in most cases they are not -or only loosely- organised.
Therefore we give in this section an overview of the existing organisations, starting with the prestigious “Oughtred Society” (a formal non-profit corporation according to USA law) and followed by a number of more informal national organisations or contact names.
Representatives of European national organisations have regular contacts, for example at International Meetings like IM2000. The main topic is the coordination of the on-going series of International Meetings, in close cooperation with the Oughtred Society.

United States of America

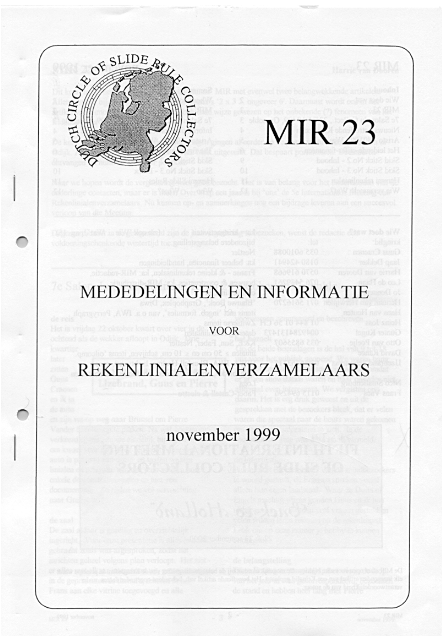
Name of Organisation:	The Oughtred Society (OS)
Membership Fee:	Membership currently is $25 in the US and $30 elsewhere. European members may pay through IJzebrand Schuitema or Otto van Poelje (NLG 60)
Targeted Membership:	Slide Rule Collectors all over the World
Number of Members:	Circa 450, of which over 70 outside the USA (mainly Europe)
Newsletter/Journal:	Journal of the Oughtred Society (JOS) Published twice a year, Spring and Fall
Contact Person:	Wayne Lehnert (Membership, back issues, etc.) P.O. Box 99077 Emeryville, CA 94662 USA Tel: +1 510 754 9337 E-mail: 75770.231@compuserve.com

The Oughtred Society is named after William Oughtred, the inventor of the Slide Rule.
Purpose of the OS is to promote the history and collection of slide rules. Also, to promote numeracy.

The Oughtred Society holds three meetings per year in different regions in the USA, and supports the yearly International Meetings in Europe.
The US meetings cover swapping, trading, estate sales, private displays, and information exchange in general.
The Journal of the Oughtred Society, published since February 1992, is a professional and authoritative publication for the slide rule collector, widely praised for its in-depth articles. The OS also produces swap sheets, membership lists, a bibliography of all known slide rule references, and other "special" pieces of information.

The Netherlands

Name of Organisation	Nederlandse Kring van Verzamelaars van Rekenlinialen (NKVR) or Dutch Circle of Slide Rule Collectors
Membership Fee:	NLG 40,- per year
Targeted Membership:	Slide Rule Collectors in The Netherlands, and Dutch-oriented collectors abroad
Number of Members:	Circa 40
Newsletter/Journal:	MIR (Mededelingen en Informatie voor Rekenlinialenverzamelaars), published about three times a year, with articles in Dutch, and sometimes in English or German language.
Contact Person:	Otto van Poelje Snelliuslaan 25 1222 TB Hilversum The Netherlands Tel: +31 35 685 5607 E-mail: ovpoelje@chello.nl



The Dutch Circle was established February 23, 1991, at a meeting initiated by IJzebrand Schuitema in Odijk. The twelve "founding fathers" agreed on an informal structure of the Circle, and started the newsletter and regular meetings.

The purpose of the Dutch Circle is still unchanged from that first contact:

- Exchanging information between members (own collection lists, literature, manuals etc.)
- Investigating specific subjects of our hobby, like manufacturers history, slide rule coding and age determination, special application slide rules, etc.
- Publishing results of research in MIR, JOS, books and other publications, or by displays at meetings or exhibitions
- Contributing to the Slide Rule catalogue Project of Herman van Herwijnen (now evolved into the CD-ROM Project)
- Market research of slide rule collectibles, pricing, swapping and trading

During the lifetime of the circle we have pursued these goals with pleasure and satisfaction.

The visible results from our efforts are the first and the sixth International Meeting, the CD-ROM Catalogue of Herman van Herwijnen, and the penetrating study of Dutch slide rule makers by IJzebrand Schuitema, to be published during this IM2000.

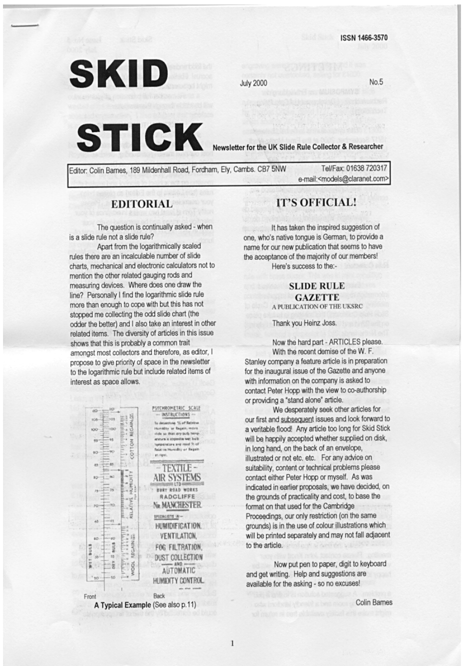
Next year, our member Guus Craenen will publish his book “Albert Nestler, Innovation and Quality” (in German, with English summaries). After extensive research into the history of the Nestler family, factory and links with e.g. Dennert & Pape, Guus has been able to resolve many issues on this mysterious slide rule maker; mysterious as they did not date or identify products consistently, did not keep archives, and lost information over three fires.

The resulting book will give full information about product range, construction, age determination, family history, history of the factory, business successes, and the environment of this former slide rule maker.

United Kingdom

Name of Organisation:	UK Slide Rule Circle (UKSRC)
Membership Fee:	Pounds Sterling 3.50 per year
Targeted Membership:	Slide Rule Collectors in UK, and English-language collectors abroad
Number of Members:	Approximately 40
Newsletter/Journal:	Skid Stick now published 3 times per year. Circulation is mainly in the UK but we have, and welcome, subscribers from mainland Europe and the US.
Contact Person:	Colin Barnes 189 Mildenhall Road Fordham, Ely Cambs. CB7 5NW UK Tel: +44 1638 720 317 E-Mail: models@claranet.com

The UKSRC was formed in 1998 as an informal group of slide rule enthusiasts without any constitution or officers (The position of "Editor" is unofficial and used for practical purposes). The Circle is involved in collecting, researching and recording the history of the slide rule. Membership is open to anyone with an interest in the subject whether in a professional capacity or as an amateur.



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SKID STICK

July 2000 No.5

Newsletter for the UK Slide Rule Collector & Researcher

Editor: Colin Barnes, 189 Mildenhall Road, Fordham, Ely, Cambs. CB7 5NW Tel/Fax: 01638 720317 e-mail:<models@claranet.com>

EDITORIAL

The question is continually asked - when is a slide rule not a slide rule?

Apart from the logarithmically scaled rules there are an incalculable number of slide charts, mechanical and electronic calculators not to mention the other related gauging rods and measuring devices. Where does one draw the line? Personally I find the logarithmic slide rule more than enough to cope with but this has not stopped me collecting the odd slide chart (the odder the better) and I also take an interest in other related items. The diversity of articles in this issue shows that this is probably a common trait amongst most collectors and therefore, as editor, I propose to give priority of space in the newsletter to the logarithmic rule but include related items of interest as space allows.

Front Back

A Typical Example (See also p.11)

IT'S OFFICIAL!

It has taken the inspired suggestion of one, who's native tongue is German, to provide a name for our new publication that seems to have the acceptance of the majority of our members!

Here's success to the:-

SLIDE RULE GAZETTE

A PUBLICATION OF THE UKSRC

Thank you Heinz Joss.

Now the hard part - ARTICLES please.

With the recent demise of the W. F. Stanley company a feature article is in preparation for the inaugural issue of the Gazette and anyone with information on the company is asked to contact Peter Hopp with the view to co-authorship or providing a "stand alone" article.

We desperately seek other articles for our first and subsequent issues and look forward to a veritable flood! Any article too long for Skid Stick will be happily accepted whether supplied on disk, in long hand, on the back of an envelope, illustrated or not etc. etc. For any advice on suitability, content or technical problems please contact either Peter Hopp or myself. As was indicated in earlier proposals, we have decided, on the grounds of practicality and cost, to base the format on that used for the Cambridge Proceedings, our only restriction (on the same grounds) is in the use of colour illustrations which will be printed separately and may not fall adjacent to the article.

Now put pen to paper, digit to keyboard and get writing. Help and suggestions are available for the asking - so no excuses!

Colin Barnes

1

Our aim is to hold meetings in England at least two times per year and other contacts are maintained through the columns of the newsletter. We have been encouraged by the gradual increase in our membership and continue to be surprised at the number of people who appear from nowhere and who have been collecting slide rules on their own, often for many years!

Peter Hopp, one of our very active members, has published last year his comprehensive book "Slide Rules, Their History, Models, and Makers" which is widely used by collectors as reference work.

With the growth and development of the Circle we have decided to attempt the production of a more ambitious "Slide Rule Gazette" to be published initially approximately every twelve months. The inaugural issue is scheduled for October/November. Production costs will require us to charge for the Gazette but it will be available to all, whether Circle members or not, and it is hoped that it will cost no more than Pounds Sterling 10.00.

We have a small web site operated by Ron Manley at:
http://www.sliderules.clara.net/

Germany

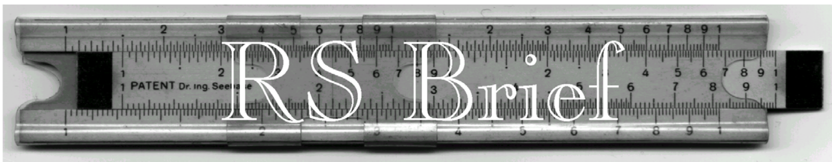
Name of Organisation: RechenschieberSammlerTreffen (RST)

Membership Fee: so far voluntary contributions

Targeted Membership: Slide Rule Collectors in Germany, Switzerland, Austria and German-speaking collectors anywhere

Number of Members: 40 (20 active)

Newsletter/Journal: RST Newsletter changing to RS Brief (2 issues p.a.)



Contact Person: Klaus Kühn
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Germany
Tel: +49 8142 52741
E-mail: info@IM2001.de

The RST – founded in 1998 – meets twice per year (spring and fall) for sharing information, ideas, and expertise on slide rules and related topics. Our members do follow the same ideas as are stated for the other international organisations.
One of our members, Dieter von Jezierski, has published a beautiful book on slide rules in 1997, in German: "Rechenschieber – eine Dokumentation".
We are proud to organise the 7th International Meeting for Slide Rule- *and* Calculating Machine Collectors (IM 2001). It is the first of this type and will take place at the Deutsches Museum in München from September 14 – 16, 2001.
A preliminary program will be available in Ede and via our homepage: www.IM2001.de

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