

“Wrong Way Up!” (i)

*Give a man a fish and you feed him for a day;
teach a man to fish and you feed him for a lifetime. (ii)*

Surprisingly right up to the 1960s “*how to use a slide rule*” sessions were not formally taught in secondary schools [1]. In fact in most countries no course on calculating with a slide rule ever became part of their national school curriculum [2] [3].

In the beginning

This teaching conundrum cannot be explained by any lack of teaching aids. By the start of the 20th century large **Demonstration slide rules** were already part of the product range of many slide rule manufacturers and some retailers of slide rules[4].

The main manufacturers recognised the importance of being taught at a young age how a slide rule could be used. So they offered 1 to 2 metre long replicas of their popular models for hanging over a classroom blackboard. However, such versions did not match the quality of their standard length models. This is because until the photochemical process arrived in the



Figure 1: Scene out of a 1930s High School classroom

1960s, the most common production method for incising the scale divisions was a “dividing engine”. However, apart from the machines developed by the German maker *Nestler*, most dividing engines could only handle a maximum stock length of 60cm [5]. Therefore many demonstration slide rules were made by a local carpenter using one of the cheaper hardwoods such as poplar. Most would have failed the Soole **27 x 37** accuracy test [6]. However, this shortcoming was not a problem as the purpose of any demonstration slide rule was to show to an audience the settings and steps needed to perform example calculations.

Of course the demonstration slide rule was not the first teaching aid. Apart from the ubiquitous instruction folder that came with any slide rule, how-to-use books pre-empted demonstration slide rules by a decade or more. Such "*Teach Yourself*" books or guides were often published or sponsored by slide rule manufacturers. Other like-minded books were published by educators. However, the demonstration slide rule was the first teaching aid for the masses. They were available from slide rule makers worldwide. For example, from *ARISTO*, *Faber-Castell* (F-C), *Graphoplex*, *Loga* and *Nestler* in Europe, from *Dietzgen*, *Keuffel & Esser* (K&E), *Pickett & Eckel* (P&E), *POST* and *Welch* in the United States and from *Sun Hemmi* in Asia. Impressively the slide on the demonstration slide rules from German maker *Faber-Castell* was lockable for transport and uniquely their duplex models had a sophisticated metal swivel hinge. This made it possible to switch between the front and the back without awkwardly having to reverse and rehang a large slide rule back onto a blackboard or hanging brackets. Given their oversized/non-standard nature and limited sales potential, demonstration slide rules were expensive to produce; thus many manufacturers consciously priced them as "loss-leaders". Even so demonstration models retailed for three or more times than the cost of the equivalent standard sized model. But for a large and valuable enough order of conventional slide rules, makers or resellers would often include a promotional demonstration model as a "gift".



Figure 2: Swivel hinge on a 100cm F-C 334/83 Novo-Duplex

"Modern" aids

Especially the German maker *ARISTO* realised that promoting their slide rules in schools and with teachers was an astute way of fostering brand loyalty from the next generation of engineers and technicians. In the early 1950s they published the "*ARISTO Bulletin*" [7]. These serialised specialist journals in German, English, French and Spanish were for teachers – specific editions for secondary schools and others for various forms of higher education. But as teaching slide rule proficiency was never part of standard secondary school curriculums, it was left to technical colleges and company training centres to plug the educational gap. So for year's large demonstration slide rules did good service in such institutions.

Apart from plastic replacing wood, nothing new came along to usurp the venerable demonstration slide rule until the 1960s. The catalyst was the introduction of overhead projectors (OHP) as a modern presentation aid. Using a powerful light source to project an enlarged image onto a screen or a suitable flat surface was a 19th century invention. But once cheap page-size transparent sheets became available for OHPs it revolutionised presentation techniques in business and education. The slide rule had its heyday in the 1950s. So many makers used the OHP to renew lagging interest in slide rules by marketing two types of static **Projection slide rules**.

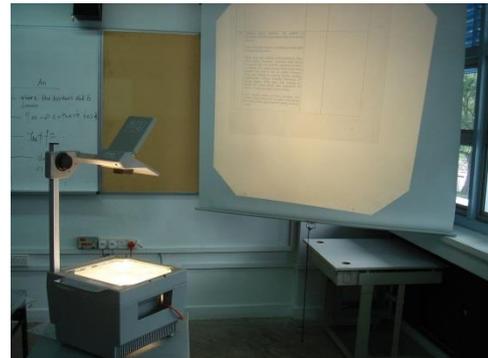


Figure 3: Overhead projector during a classroom lesson

The basic version was always a simplex replica of a fully working slide rule but made from transparent plastic. UK maker *Blundell Harling* (BH) marketed several models made from Perspex. These replicas had the same model number as the original but suffixed with the letter "P".

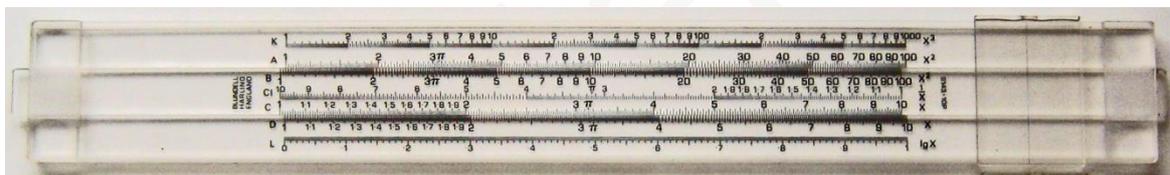
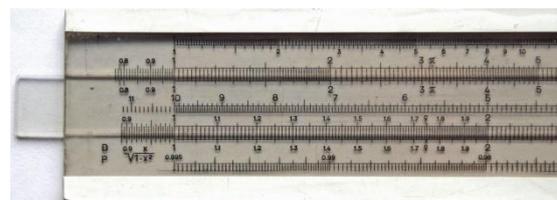


Figure 4: Blundell Harling Rietz-like S143-10P basic projection slide rule

Other known basic projection examples are from *Beseler* and *P&E*. For some reason F-C only got as far as producing a simplex prototype of their highly popular Darmstadt model 1/54.

Figure 5: Faber-Castell basic projection prototype



For use such basic models merely had to be laid flat onto the glass projection surface – a simple but effective innovation. Then possibly driven by the success of the basic version, several slide rule makers decided in the late 1960s to create the "next generation". The advanced version was specifically designed for OHPs. This time a facsimile of an existing model of a slide rule was built into a frame of similar size and oblong shape as the flat OHP glass projection plate.

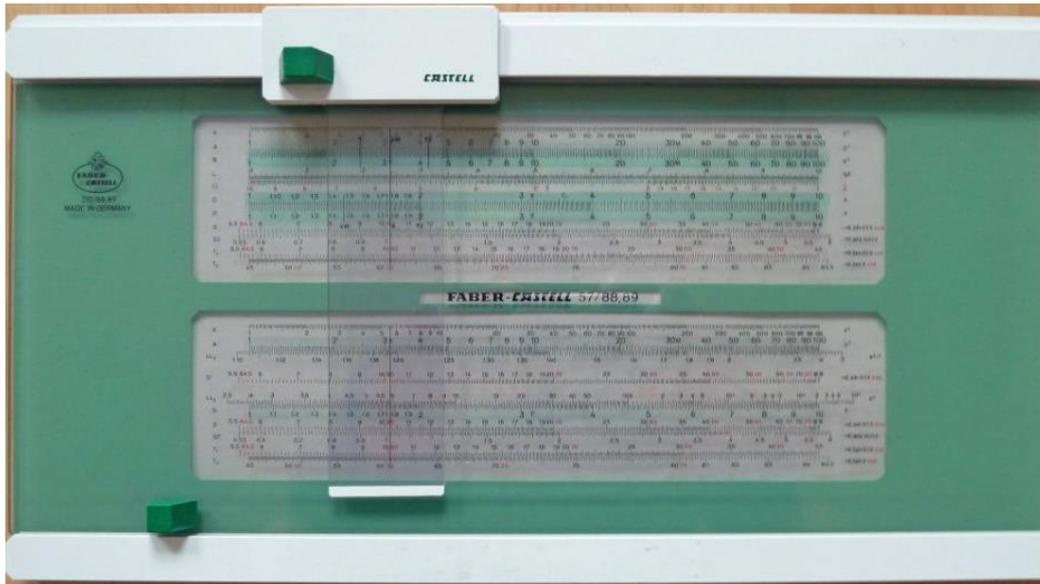


Figure 6: Faber-Castell Rietz/Log-Log 310/88,89 advanced projection slide rule

Generically two sheets of plastic were sandwiched between a solid top and bottom bar. The bottommost sheet was fixed and showed the scales normally carried on the stock. The other sheet slid horizontally over it and was for the corresponding scales on the slide. The top bar incorporated the cursor. Being the width of a projector, such OHP slide rules had the room to show both sides of the equivalent conventional duplex model in the same plane. Makers *ARISTO*, *F-C*, *Staedtler-MARS*, *K&E*, *Dietzgen*, *POST* and *Sun Hemmi* all sold such advanced versions [8]. However, it is unlikely that any of them had (or wanted) the tooling needed to make them in-house. Tellingly none of the known examples carry any manufacturing identification marks. In fact they are so similar they may have all been commissioned from the same, sadly unknown, specialist 3rd party [9]. Like the early demonstration models they also would have been expensive to make and most likely were also sold as “loss-leaders”.

Ironically alongside such sophisticated advanced projection slide rules, a “self-help” educational aid came onto the market. It was an inexpensive kit containing everything needed to build a crude slide rule and more importantly, understand how and why a slide rule made basic arithmetic quick and easy.



Figure 7: Boxed 6 x 4½ x 1 inch “do-it-yourself” slide rule kit

Such “*Things of Science*” boxed kits were part of a post WWII programme to educate the public about science. They were the brainchild of Watson Davis (1896-1967), a director of the American scientific news publisher: *Science Service* ⁽ⁱⁱⁱ⁾. Early on the

programme's emphasis shifted to a subscriber-based service for mainly schoolchildren and students. The resulting series flourished for over 50 years with over 350 educational kits covering an eclectic mix of "things" to do and/or build. In the mid-1960s the concept crossed the Atlantic and a UK-based series was produced by the *Advisory Centre for Education* (ACE) based in Cambridge. Although mimicking the concept and style of the original series, ACE chose their own topics and produced their own copyrighted kits. No more than 40 were produced by ACE but in 1967 they issued kit 14 for the slide rule.

Last but not least there was a variant. In the 1970s *ARISTO* and *Sun Hemmi* marketed a version of the basic projection model specifically for photographic 35mm slide projectors.

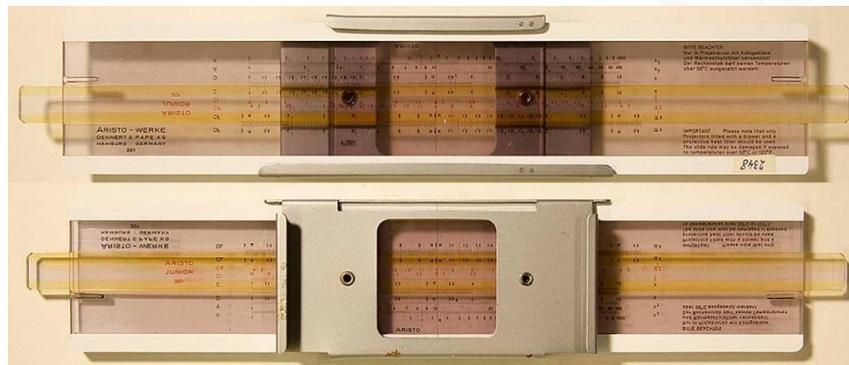


Figure 8: Front and back of ARISTO School 201 Junior basic projection slide rule

Such metal and clear plastic variants are mounted up in the fashion of a "magic lantern ^(iv)" slide. This created greater enlargement possibilities as the projection slide rule was fixed into the feeder slot of a manual feed 35mm slide projector. To be seen the needed parts of the scales on the stock and on the slide had to be aligned with the central projection window in the metal frame. However, this design did mean that they could only be used with a specific type of 35mm projector – e.g. the *Leitz Prado 250/500 Projector*.

Multimedia - too little, too late

In the early 1950s Italian company *Filotecnica Salmoiraghi* developed a dedicated backlight screen slide rule projector. But the innovative design never made it past the prototype stage [10]. However, it was the forerunner of the swansong of slide rule teaching aids.

In the 1970s at least three prominent slide rule makers took the brave step of commissioning an expensive multimedia slide rule training course. For the first time the teaching aid included a pre-recorded audio

accompaniment. Given their past track record it is not surprising that *ARISTO* was one of them but multimedia courses were also marketed by *P&E* and *British Thornton*. They all wanted to harness the higher resolution and greater enlargement potential possible with 35mm transparency photography. When I was growing up “the projectionist” in our house was my father. In a darkened room friends or family had to endure our latest holiday transparencies. My lasting memory is everybody saying in unison “*wrong way up*” when my father inevitably loaded one of the slides upside down. But this human failing was avoided with such multimedia training sets as the catalyst for their development was the **Carousel Slide Projector**. Such projectors had an audio interface and could also be preloaded with a set of slides for an unbroken slide show.



Figure 9: Pickett multi-media carousel with 80 slides

The *British Thornton 35mm Sound Synchronized Slide Training Programme* boxed set came in a chunky 3-ring stiff cardboard insert binder (8 x 9 x 2½ inch) covered in black imitation leather. The company logo and name are emblazoned on the front in gold.



Figure 10: British Thornton 35mm “Sound Synchronized” Slide Training Programme

The binder has two types of plastic sleeve. The uppermost sleeve is for the teaching instruction book/audio script. The rest have pouches for 6 slides per sleeve. There are 47 plastic mounted coloured slides in the set. The binder also came with a box containing a Ø 4 inch spool of ¼ inch reel-to-reel magnetic tape. The 15-minute soundtrack is recorded dual-track but at the long-outdated speed of 3¾ inch/second (9.53

cm/second). The left-hand channel carries the narrator's voice and audible cueing tones for manually advancing to the next slide. The right-hand channel or "click track" has just pulse tones at 1000 Hz. When played through a carousel projector's audio interface these pulses automatically trigger the carousel to advance to the next slide in synchronisation with the soundtrack. As the "*How to Multiply and Divide using a Slide Rule*" title suggests, the course covers just basic arithmetic. The set came about through cooperation between *British Thornton, International & Commercial Education Macmillan Ltd* (ICEM) and an external consultant. At the time ICEM was a UK based company specially founded for improving employee education in industry and commerce. The introduction course only dealt with the elementary 1-cycle **C** and **D** scales. Follow-on training programmes using other scales and solving more complex problems were planned by *British Thornton*. However, there is no record of any other instalment ever being produced.

Reliving history

None of the advances in teaching aids helped rectify the fact that slide rule proficiency never made it into the curriculum of secondary schools. Although admirable, even the multimedia training courses of the 1970s were sadly too little, too late. By now pocket electronic calculators were on sale and the days of the slide rule were numbered [11]. Ironically today many impressive computer simulations of slide rule models popular in their day are readily available online. Educators from the slide rule era would be jealous of such powerful teaching aids.

There are few survivors of the short-lived multimedia training courses. Luckily I have the *British Thornton* version. To make sure that the inspiration and effort behind such courses is not forgotten I have recreated it as a self-running Microsoft (MS) PowerPoint slide show. But over the decades the 35mm slides had badly discoloured and suffered from foxing. It was only possible to digitally repair some of the damage. The soundtrack fared better but some "print through" distortion of the magnetic tape is audible and in places the volume level fluctuates. Nevertheless to experience the "look and feel" please download ^(v) my digital facsimile (file size: 33Mb) for your personal use from:

<http://tinyurl.com/hz4uykr>

The recreation runs automatically and correctly synchronised on any MS-Windows 7/8/10 system - even with Windows 10 Mobile on supported

tablets and smartphones! With a suitable MS-PowerPoint viewer it should also run trouble-free on any XP, LINUX ^(vi) or MAC OS system.

So after downloading have a chuckle and relive in 15 minutes a slice of 1970s slide rule nostalgia.

Acknowledgments

Friend and fellow collector, **Peter Holland**, kindly donated the *British Thornton* multimedia set to my collection. However, a special word of thanks must go to my brother-in-law: **Brian Hunt**. Having a passion for vinyl recordings and hi-fi, he provided the crucial introduction to professional sound engineer **Philip Ray**. In his commercial studio [12] Philip benevolently converted and remastered the sound recording into a contemporary digital format. In May 2017 Philip sadly passed away after a long illness.

Notes, References & Accreditations

- i. Revised and extended version of an article first published in the *Colin Barnes Memorial Issue* of the *UKSRC Gazette*, 2016.
 - ii. Proverb attributed to the writer Anne Ritchie (1837–1919).
 - iii. In 2008 the company became *The Society for Science and the Public*.
 - iv. Or *Laterna Magica* - an early candle or oil lit projector for showing images on glass.
 - v. A fast and secure standard Internet *File Transfer Protocol* (FTP) download service.
 - vi. The slide show will NOT run correctly with any *OpenOffice* presentation software.
1. **Holland, Peter**: "*Slide Rules in Schools*", SLIDE RULES in the ARITHMEUM – The Schuitema Collection, ISBN 978-3-89479-833-8, Euro 24, Nicolaische Verlagsbuchhandlung GmbH, 2013, Pg. 69-73.
 2. **Knot, John**: "*The Teaching of Sliderule Calculators*", Proceedings 2nd International Meeting of Slide Rule Collectors, 1996, UK, Pg. 10.
 3. **Anthes, Erhard**: "*Zur Einführung des logarithmischen Rechenstabes im deutschen Bildungssystem*", RST Rechenschieber-Brief 23, 2011.

4. **Von Jezierski, Dieter:** *"Slide Rules A Journey Through Three Centuries"*, Astragal Press, ISBN 1-879335-94-8, USD 19.95, 2000, Pg. 85-86.
5. **Rance, David:** *"MAXI Desktop Slide Rule"*, Proceedings 16th International Meeting of Slide Rule Collectors, 2010, NL, Pg. 194-195.
6. **Rance, David:** *"Hoe is het met jouw nauwkeurigheid?"*, Mededelingen en Informatie voor Rekeninstrumenten (MIR), No. 36, June 2004, Pg. 14.
7. **Kühn, Klaus & Kleine, Karl:** *"Dennert & Pape, ARISTO 1872 – 1978"*, Zuckschwerdt Verlag, ISBN 3-88603-863-7, Euro 65, 2004, supplements from 2 accompanying CD-ROM's.
8. **Various:** *"OHP Instruction Slide Rules"*, Proceedings 11th International Meeting of Slide Rule Collectors, 2005, UK, Pg. 49.
9. **Frank, Thomas:** private email correspondence, 2014.
10. **Francis, Jay:** *"The Back-Light Screen Projection Slide Rule"*, JOS, Vol. 9 No. 1, ISSN 1061-6292, Spring 2000, Pg. 27.
11. **Van Poelje, Otto:** *"The Demise of the Slide Rule (and the Advent of its successors)"*, JOS Vol. 12 No. 2, Fall 2003, ISSN 1061-6292, Pg. 49.
12. **Ray, Philip:** Audiovisuel production company: *"Running Frog Limited"*, www.runningfrog.com/# .

- Figure 2 **Colin Tombeur**, www.countbelmiro.com/slides/srindex.html, UK.
- Figure 3 **Wikipedia**, "The Free Encyclopaedia", Wikimedia Foundation, Inc. 22 July 2004. Web. 10 Aug. 2004.
- Figure 4 **Peter Hopp**, UK.
- Figure 5 **Peter Holland**, Germany.
- Figure 8 **Arithmeum/Rheinische Friedrich-Wilhelms-Universität**, Bonn, Germany.