Some Facts and Impressions on Chinese Slide Rules

Pierre Vander Meulen

Introduction

As a slide rule collector for more than ten years, my view of the slide rule world is continuously changing. Initially, my view was limited to the standard European brands like Nestler, Faber-Castell, Aristo and so on, but even at the start I wondered about world production and more specifically about the far countries or the third world. Actually I still wonder about it, but my collection having gotten bigger, I now own some "non-standard" slide rules, and I have found through the literature some additional information on the manufacture of slide rules in other countries. A recent business trip to China provided the opportunity to buy some Chinese slide rules, and to establish relationships in order to get others. Most of them are from the Shanghai area. The purpose of this article is to give my collecting colleagues some impressions or observations I have made after examining these slide rules. It is not intended as a definitive work on Chinese slide rules. It simply describes some observations based on a random collection of examples.

General Appearance

A quick look at the Chinese slide rules does not show any specific distinguishing features from other slide rules. The overall look, layout and assembly are of a similar standard to the ones with which we are more familiar.

On the other hand, looking more in detail does show some significant particularities; this article deals with some of them.

A Cardboard Slide Rule

One of the slide rules is made of cardboard (see Figure 1). The translation of the Chinese inscription says "made of 7.1 middle school". This slide rule obviously intends to reproduce the features of non-cardboard models, even down to the imitation of the "end bars". The printing quality is good and, except for its lasting qualities, this slide rule is more than adequate for its purpose.

Figure 1. Cardboard slide rule.
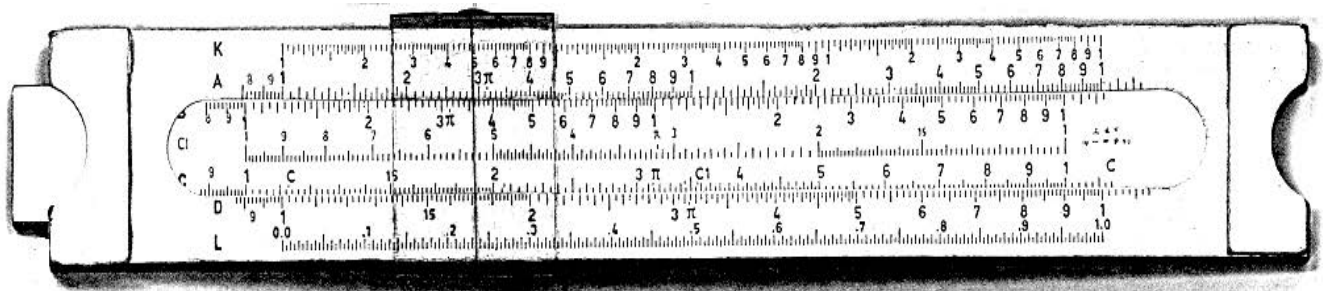
Wooden Slide Rules

Some rules are of very elementary construction and have, therefore, been damaged. Some others are of good, or even very good quality. The construction of them, and the mention on the box of "joint venture", may indicate that these were built under license, or imitate a foreign process.
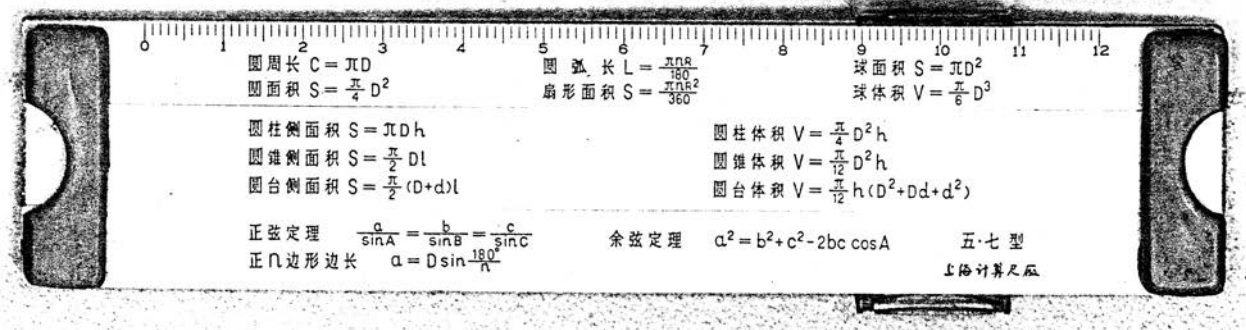
Plastic Slide Rules

There is nothing special to note about these. The colors are generally less attractive than those familiar to us. The Flying-Fish slide rules are generally supplied with "white coffee" end bars, and light blue boxes; the slide as well as the body are white.

The Chinese Characters and Inscriptions

The effective area of the slide rule is fully "printed" with characters we are familiar with. Outside this area, and in the related literature, things are somehow different. For those who are familiar with technical Chinese literature such as technical books, advertising, codes and standards, the use of a mixture of Chinese characters and European symbols in formulae or tabulations is rather common (see Figure 2).

Figure 2. Excerpt of a technical book related to reinforced concrete design

图 3-35　单筋矩形梁计算简图

由式（3-46）可得：

$$\varepsilon = \frac{x}{x_0}\varepsilon_0 = \frac{x}{x_0} \times 0.002 \qquad (3-47)$$

又，

$$x_0 = \frac{\varepsilon_0}{\varepsilon_{hmax}} X = \frac{0.002}{0.0035} X = \frac{4}{7} X \qquad (3-48)$$

由图3-35 c，根据水平力平衡，即 $\Sigma X = 0$ 可有：

$$\int_0^x \sigma(\varepsilon) \cdot b \cdot dx = R_a * A_g \qquad (适筋梁) \qquad (3-49)$$

上式等号左边，

$$\int_0^x \sigma(\varepsilon) b dx$$

$$= \int_0^{\frac{4}{7}x} 0.85 R_b' * \left[1 - \left(1 - \frac{\varepsilon}{\varepsilon_0} \right)^2 \right] b \cdot dx$$

$$+ \int_{\frac{4}{7}x}^x 0.85 R_b' * b \cdot dx$$

将式（3-47）和式（3-48）代入上式积分，再代到式（3-49）中，整理后可得：

That is also the case for the few instruction manuals I own (see Figure 3).

Figure 3. Two pages of an instruction manual

An even more elaborate system appears on the cover sheet of the Flying-Fish 1001 user manual where the phonetic transcription "SHUANGMIANJISUANCHI" of the Chinese title "instruction for duplex slide rule" appears under it (see Figure 4).

Figure 4. Cover sheet of the Flying-Fish 1001 instruction manual

The same system exists in the Flying-Fish logo, where both character systems are mixed with a very realistic fish picture (see Figure 5).

Figure 5. Flying-Fish logo.

Another interesting view is given on the reverse of a pocket slide rule where standard formulae for circles, spheres, etc. are supplied (see Figure 6).

Figure 6. Backside of a pocket slide rule.

Dating

As with many slide rules, determination of the fabrication dates is not easy. The information I have through a Chinese engineer, which seems to be confirmed by an "80" engraved on a Flying-Fish slide rule, is that production of slide rules in China was still going on at the beginning of the 1980s.

Scales

In general, there are no surprises. The standard scale labeling of "A, B, C, D, ..." is common for the Chinese slide rules. The non-standard scales are generally supplied with a symbolic description of the function (like $\sqrt{1 + (1x)^2}$) and sometimes with an indication of the decimal point position to be considered (like $.01 \to .1$).

In addition to the standard "A, B, C, D, ..." scales we find some scales with either different labeling from what we are familiar with, or with some unusual scales. Table 1 lists the characteristics of six of my duplex slide rules. The backs of three of these are shown in Figure 8.

Figure 8 shows more specifically three types of Flying-Fish slide rule, of a similar plastic manufacture, in ascending order of complexity. It should be noted that some of these slide rules are of the so called "vector" type (with hyperbolic functions).

The "Flying-Fish 1003" is particularly rich in scales and we can count up to 34 scales. The only near equivalent I personally know of is the "Pickett N4-ES Log Log Vector Hyperbolic, dual base" where we can count 33 scales, but with only two hyperbolic functions (TH and SH).
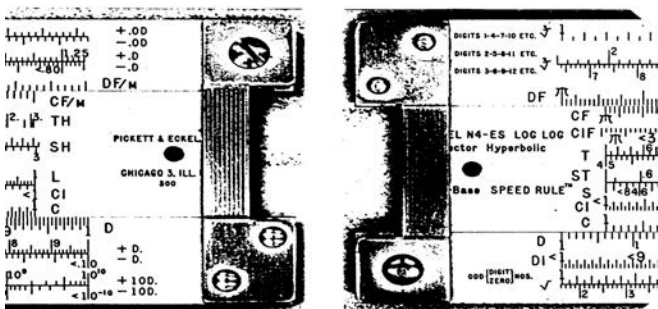
Figure 7. Pickett N4-ES scales.

Table 1 summarises the most significant differences among the scales on these slide rules. It is interesting to

note the following particularities among the scales, their labels and assemblies, as they are shown in the table and on the figures:

1. Surprisingly, different Flying-Fish slide rules do not use the same labeling for identical scales.

2. The Flying-Fish 1001 is a rather conventional slide rule (very similar to ARISTO or other European slide rules); the two others have more characteristic features. Gunter Kugel has noticed that the subscript "z" on scales X2 and X, as well as the scales arrangement, show very close similitude with the early ARISTO Studios.

3. The scale ln_1 of the Flying-Fish 1002 does not correspond to the scale ln_1 of the Flying-Fish 1003 (equivalent to LL1 in one case and to LL3 in the other).

4. The equivalent to our scales $LL0_x$ and LL_x are both labeled ln_y on the Flying-Fish 1003 scales; the only difference is given by the label inclination.

5. A scale 2D exists on the *Ding Fen x;* it is in fact a scale with an offset of log 2, giving the product of "D" by 2.

6. The Flying-Fish 1003 has no K scale but it has three $\sqrt[3]{2}$ scales which answer perfectly the purpose. (NB: these three scales also exist on the Pickett shown in Figure 7.)

7. The labeling $s_{-1}r_{-1}t_{-1}$ on the Flying-Fish 1003, corresponding to our ST, seems rather logical, since this scale is used to get the arcsin, convert the radians in small angles, and give the arctan.

8. The Sida 1083 may suggest a K&E design with the inclined figures for the cot and cos angles, as well as with the end bars (but it is not the same quality).

9. The material used for two of the slide rules listed in the table consists of wood and not bamboo (as the design might suggest); the quality is not the same as that of a Hemmi; the *Ding Fen x* is nevertheless of high quality.
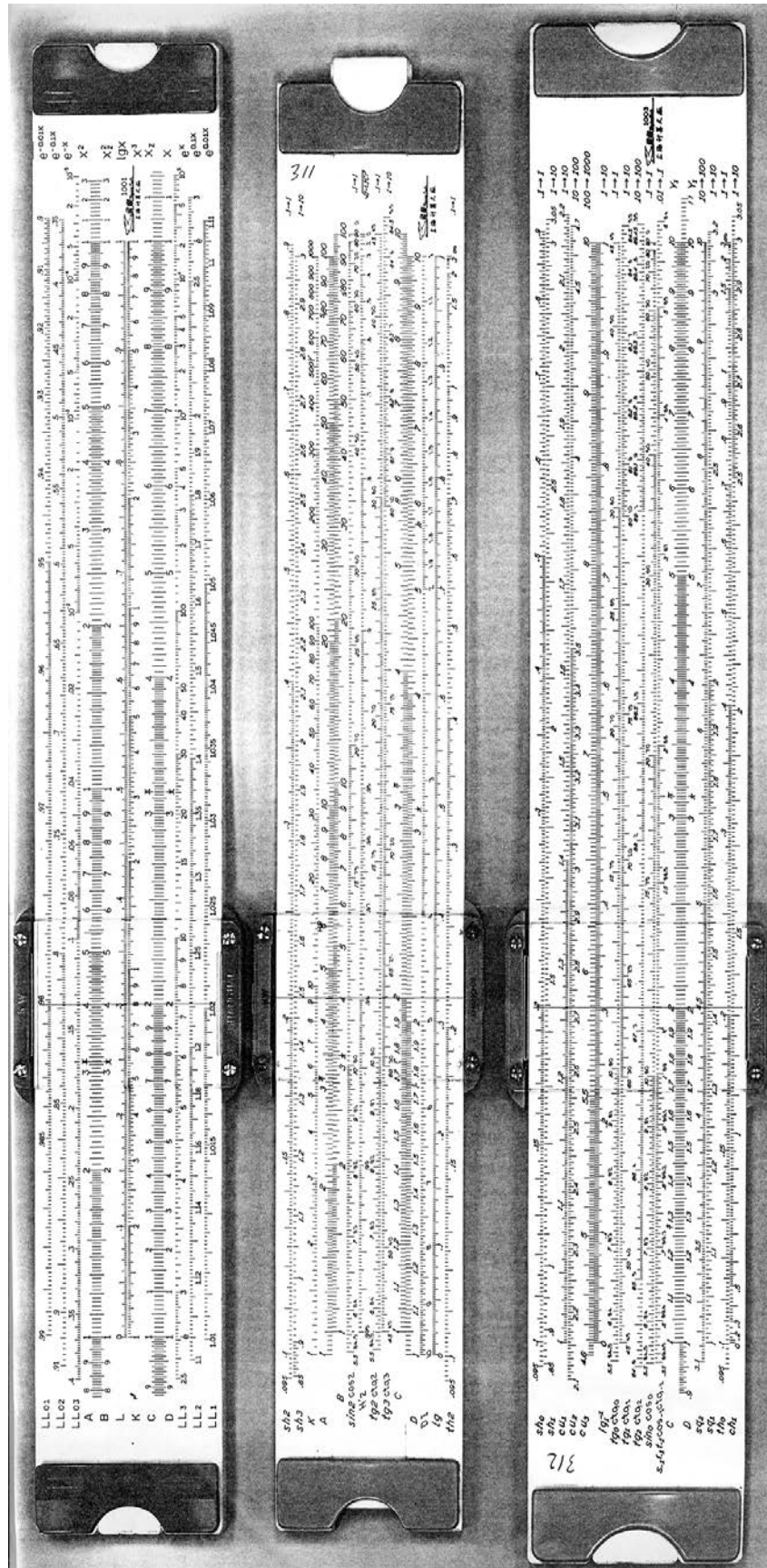
Figure 8. Three Flying-Fish duplex slide rules (from left: 1001, 1002, and 1003; rear side)

Equivalent scale on European slide rules or function	Flying-Fish 1001	Flying-Fish 1002	Flying-Fish 1003	Sida 1083	Ding-Fen X	Ding-Fen 5471	Notes
$\sqrt{1+(0.1x)^2}$		H_2	H_0		H	H	
$\sqrt{1+(1x)^2}$		H_3	H_1				
$\sqrt[3]{x}$			cu_1 to cu_3				(1)
$2*x$					2D		(3)
arcosh x			ch_1				
arsinh 0.1x		sh_2	sh_0	Sh_1	Sh_1	Sh_1	
arsinh x		sh_3	sh_1	Sh_2	Sh_2	Sh_2	
artan > 84.29°			tg_2				
artanh 0.1x		th_2	th_0		Th		
K	K	K			K		(1)
L	L	lg	lg_1^{-1}	L	L	L	
LL0			ln_{-2}				(2)
LL00			ln_{-2}				(2)
LL01 to LL03	LL01, LL02, LL03	ln1I, ln2I, ln3I	ln-1, ln0, ln1	LL00,LL0	LL1I, LL2I, LL3I	LL1I, LL2I, LL3I	(2)
LL1 to LL3	LL1, LL2, LL3	ln1, ln2, ln3	ln-1, ln0, ln1	LL1, LL2, LL3	LL1, LL2, LL3	LL1, LL2, LL3	(2)
P	P	H'_2	H'_0		H'		
R1			sq_1				
R2			sq_2				
S	S	sin_2	sin_0	S	Sin	Sin	
ST	ST		$s_{-1}r_{-1}t_{-1}$	ST			
T1	T	tg_2	tg_0	T	Tan	Tg	
T2		tg_3	tg_1				

Table 1. Comparison of scale contents and labels among eight Chinese duplex slide rules.

(1) The Flying-Fish 1003 has no K scale but does have 3 cube root scales.
(2) The Flying-Fish 1003 uses the same labels for the e+.. and e-.. scales; but they are differently inclined.
(3) It is not a square scale but a scale resulting from the multiplication by 2.