



Unraveling the K&E Mystery Rules

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Abstract

While most of the slide rule models manufactured by Keuffel & Esser (K&E) were listed in K&E catalogs, there are several 10-inch (25cm scale length) and 20-inch (50cm scale length) rules that were never listed in catalogs. These rules have collectively become known as the K&E mystery rules.

There are three distinct types of 10-inch mystery rules that are believed to have been produced for sale only at universities. There are also at least three different types of 20-inch mystery rules, one of which was likely developed for military applications, while the purpose of the other two is unknown at this time. None of the 10-inch rules are marked with a model number. Some of the 20-inch mystery rules are marked with the model number 4104 while others don't have a model number.

This article presents an analysis of a dataset of known examples of over fifty 10-inch and thirteen 20-inch K&E mystery rules. The data on these rules were gathered from online collections, descriptions and pictures from online sales of mystery rules, and from postings describing mystery rules in various slide rule forums. The analysis presents a clearer view of the timelines of when these rules were manufactured.

Introduction

One of the earliest collectors to write about the K&E mystery rules online was Clark McCoy. At his website he provides data on three 10-inch and one 20-inch mystery rules.¹ Clark's website also shows a 20-inch model 4104 rule that has the same scale set as the 20-inch mystery rule. Clark does not categorize the 4104 rule as a mystery rule, but it is included here as a mystery rule since it has the same scale set as other 20-inch rules with no model number and it does not appear in any K&E catalogs.

Mike Syphers has written extensively about his investigations into the K&E mystery slide rules in his collection at his website.² He has also identified a connection between the scale sets on some 10-inch mystery rule variants and the Beghin scale set on slide rules from the French manufacturer Tavernier-Gravet. Mike has written an accompanying article about his investigations into this previously unrecognized connection.³ Mike has also published a sortable,

searchable table summarizing the serial numbers and other data he has collected on mystery rules from his and other online collections, as well as on mystery rule data provided to him by others.⁴ These data are included in the dataset compiled for this analysis.

Other online collections showing K&E mystery rules include those of Paul Tarantolo (a very impressive twelve 10-inch and five 20-inch mystery rules),⁵ Miguel Ramirez,⁶ Mike Frey,⁷ Tom Wyman,⁸ and the International Slide Rule Museum (ISRM).⁹ Jay Ballauer has written about K&E mystery rules at his website,¹⁰ which includes his thoughts on the reasons why K&E may have been motivated to manufacture these rules. All of these websites are well worth visiting for the wealth of information they provide on mystery rules and on many, many other slide rules in the respective collections.

Descriptions, including serial numbers, of mystery rules also appear in the archives of the International Slide Rule Group that was hosted by Yahoo Groups between 1998 and 2019. The searchable archives of this group are now hosted at Rod Lovett's website.¹¹ Searches at the website worthpoint.com, which provides a searchable history of eBay auctions, have identified many more mystery rules. However, serial numbers and slide rule markings are not always visible in the pictures or in the auction descriptions for these rules. The eBay price history search¹² on Rod Lovett's website contains data on another 10-inch mystery rule. I have three 10-inch mystery rules in my personal collection, all purchased via eBay. Additional rules were identified among recent eBay auctions and Facebook marketplace listings and from discussions in the groups.io slide rule discussion group.

Combining the information from all these sources provides a dataset of fifty-six 10-inch and eleven 20-inch mystery rules.

The 10-inch Mystery Rules

There are three types of 10-inch mystery rules. As mentioned previously, none of the rules have a model number printed on the rule and none appear in any K&E catalogs.

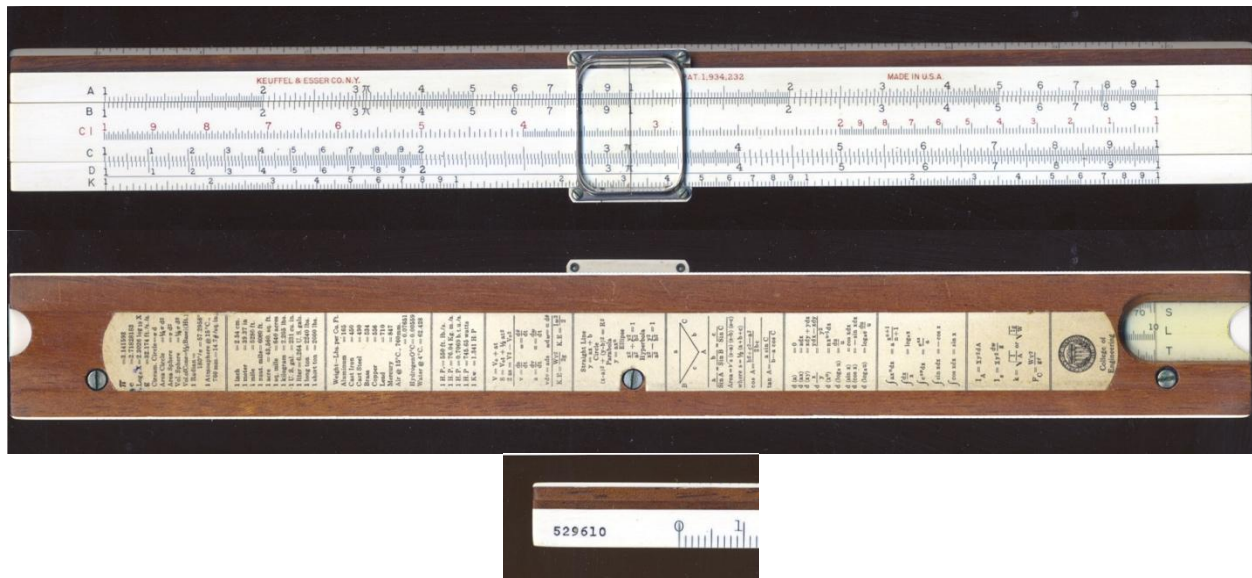


FIGURE 1. UW Polyphase Mystery Rule with Portrait Oriented Label

University of Washington (UW) Polyphase Mystery Rule

The first type of 10-inch mystery rule is built on the same frame as the common K&E 4053-3 Polyphase rule and has the same scale set as the 4053-3:

- Front: 10 inch / A [B C I C] D K | 25 cm
- Rear: [S L T]

The most obvious difference from the 4053-3 is that the stock and slide on the UW Polyphase rule is about 2.5cm longer than on the 4053-3 (~29.5cm vs ~27cm). The width of both rules is the same. The label on the back of the UW Polyphase rule is also different to the labels printed on the 4053-3 rules. The label has the seal of the University of Washington, College of Engineering, a public university in Seattle, WA, U.S.A., indicating that the rule was specially produced for use and/or sale at this university. The label lists useful constants, physics equations, formulas for solving triangles, and differential and integral identities. This information would have been very useful for university engineering students. On the earliest UW Polyphase mystery rules, the text on the label is aligned along the long direction of the rule (i.e., printed in landscape orientation). Later UW Polyphase mystery rules have the same text, but it is printed along the short direction of the rule (portrait orientation). See Figure 1.

Beghin Mystery Rule

The second type of 10-inch mystery rule is also built on a simplex wooden frame similar to the K&E 4053-3. However, the scale set on this rule is very different:

- Front: 10 inch / A DF [CF CI C] D K | 25 cm
- Rear: [S B L T]

The only other slide rule K&E produced with this scale set is the 4097D rule.

As mentioned previously, Mike Syphers has uncovered a link between this scale set and the Beghin scale set that appears on slide rules produced in the 1920s by the French manufacturer Tavernier-Gravet. Because of this connection, I refer to this type of mystery rule as the Beghin mystery rule.

The body of the Beghin mystery rule is slightly longer than the 4053-3 body (~28.2cm vs 27cm). Again, the width is the same as the 4053-3. The slide on most of the Beghin mystery rules is even longer than the stator, at 28.8cm.¹³ When the scale indices on the slide and stator are aligned with each other, the left side of the slide is flush with the stator, but the right side of the slide juts out by about 6mm.

The label on the rear of the rule appears to be unique to the Beghin mystery rule. It has instructions for determining the location of decimal points in computations. The text on this label is printed along the long direction of the rule (landscape orientation) on all known samples of this rule.

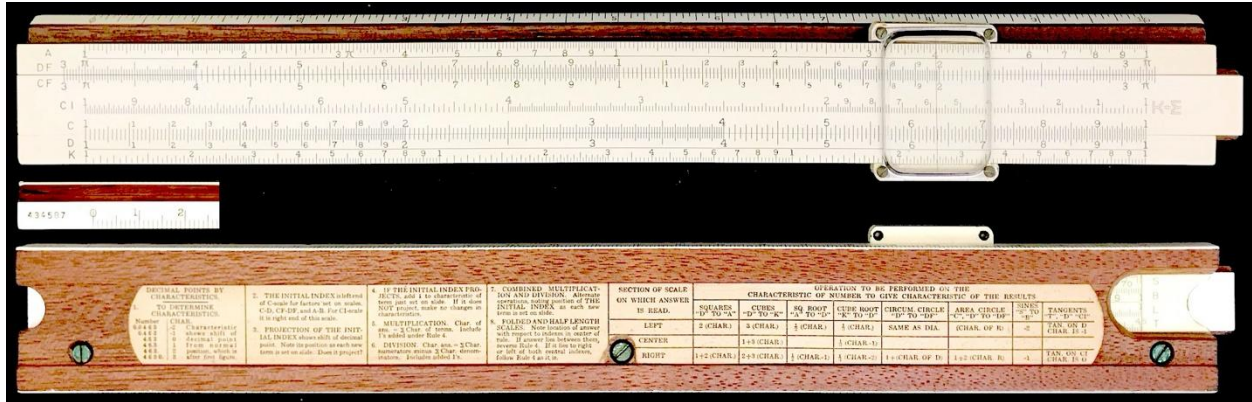


FIGURE 2. Beghin Mystery Rule (picture courtesy of Mike Syphers)

UW Beghin Mystery Rule

The third type of 10-inch mystery rule has the same scale set as the Beghin mystery rule. However, the rear label on the UW Beghin mystery rules is the same as the portrait-oriented label on the UW Polyphase mystery rules. For this reason, I refer to this type of mystery rule as the UW Beghin mystery rule.

Additionally, the stator and slide of all known examples of the UW Beghin mystery rules are both about the same length as on the UW Polyphase mystery rule, i.e., ~29.5cm.

The main characteristics of the three types of 10-inch mystery rules are summarized in Table 1.

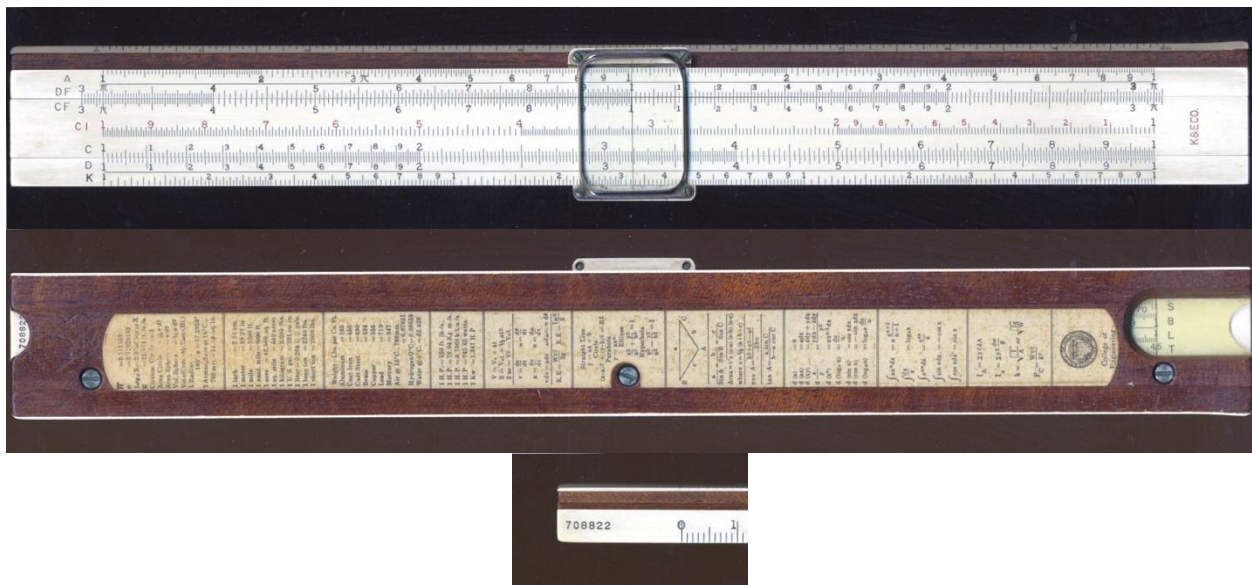


FIGURE 3. UW Beghin Mystery Rule

TABLE 1. The Three Types of 10-inch Mystery Rules

Mystery Rule Type	UW Polyphase	Beghin	UW Beghin
Scale Set	A [B C I C] D K [S L T]	A D F [C F C I C] D K [S B L T]	A D F [C F C I C] D K [S B L T]
Rear Label	UW School of Engineering	Decimal Point Placement	UW School of Engineering
Stator length	29.5cm	28.2cm	29.5cm
Slide length	29.5cm	28.8cm	29.5cm

The 20-inch Mystery Rules

There are three types of 20-inch mystery rules, distinguished by their scale sets.

4104 Mystery Rule

The mystery rule dataset has nine samples of the 20-inch mystery rules with following scale set:

- Front: A [B C I C] D L \ K
- Rear: [S A T]

Four of the mystery rules with this scale set are marked with a model number, 4104, at the end of the slide. The other five mystery rules are not marked with a model number. These five rules were manufactured a little earlier than the four with the 4104 model number. It appears that K&E initially produced these rules without a model number and then added the model number a short while later. In this paper I refer to all 20-inch mystery rules with this scale set as 4104 mystery rules.

A distinguishing feature of the 4104 mystery rules is that the trig scales are marked with decimal degree divisions instead of sexagesimal degree-minute-second (DMS) divisions marked on most other K&E simplex rules. K&E manufactured a variant of the 4053-3 slide rule for military use, the D4053-3, that also has decimal degree divisions. Since the 4104 mystery rule also has decimal degree scales, it is believed that the 4104 was also manufactured for military use.

For some reason K&E labeled the rear two-decade length scale on this rule as an A scale. Since this scale is on the slide, it would seem to have been more appropriate to use the label B, as is done on the 10-inch Beghin mystery rule.

20-inch Beghin mystery rules

Only one example is known of each of the other two types of 20-inch mystery rules. Both appear in the collection of Paul Tarantolo. They each have Beghin-style scale sets. For convenience, I discuss both in this section, and refer to them as the 20-inch Beghin Type A and 20-inch Beghin Type B mystery rules. The scale sets of these rules are:

20-inch Beghin Type A:

- DF [CF C I F C] D
- [Degrees?]

The front scales on the 20-inch Beghin Type A rule are the same as very early versions of the Beghin scale set. The rear of the slide has a single unlabeled scale on the bottom edge of the slide. This is a folded inverted scale marked in degrees and minutes. The scale markings range from 0 degrees to 33 degrees and 30 minutes, folded at 31 degrees and 34 minutes. When the slide is flipped and inserted into the slide rule, this Degrees scale is read against the D scale. When aligned with the D scale, the zero-degree tick mark on the scale is opposite ~5.15 on the D scale and the D indices are opposite the 31 degrees and 34 minutes marks at each end of the scale.

Charting the values on the D scale that are opposite the rear slide scale values indicates that the scale may be a scaled and shifted cosine scale. A linear regression of these D values against $\cos(\text{Degrees})$ provides the following best fit equation with a R^2 value of 0.9995: $D = 28.17 * \cos(\text{Degrees}) - 23.05$.¹⁴

The values on D scale opposite the Beghin Type A mystery rule degrees scale, and the scaled and shifted cosine values from the equation above are charted in Figure 4. As can be seen, the two curves are a close fit. Despite this observation, I still don't know what the purpose of this scale might have been.

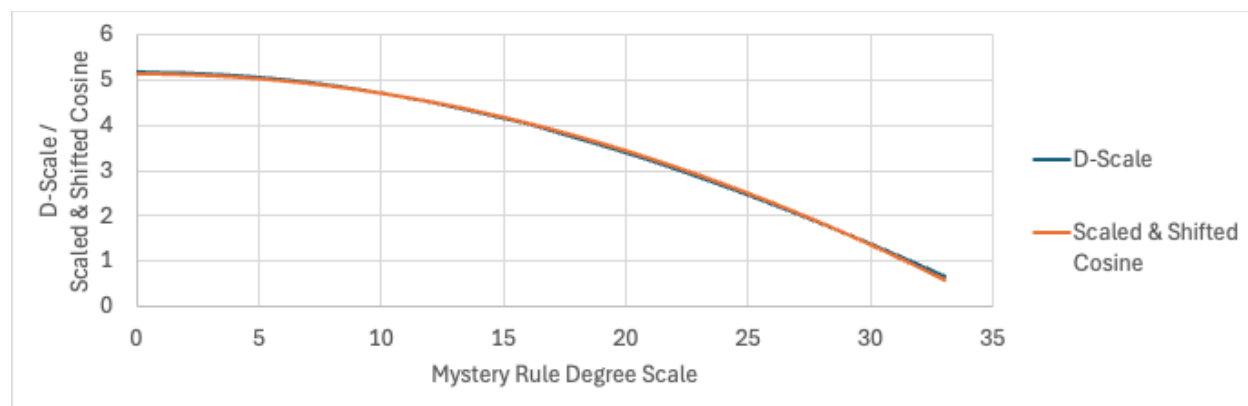


FIGURE 4. Mystery Rule Degree Scale Comparison with Cosine Scale

20-inch Beghin Type B:

- K DF [CF CI C] D A
- [S B T]

The scale set of this rule is a variation of the Beghin scale set and is very similar to that on the 10-inch Beghin mystery rules. The differences are that the positions of the K and A scales on the front of the rule are swapped, and the L scale is not present on the rear slide (or elsewhere) of the 20-inch rule. It is not known at this time for whom K&E manufactured this rule.

Mystery rule production dates

Starting in 1922, K&E applied six-digit serial/production numbers to their slide rules. The serial numbers increased over time, and they can be used to estimate the year of production of a slide rule using the charts in the article, "*Dating K&E Slide Rules*", by Clark McCoy, published in the *Journal of the Oughtred Society*, Vol 24:2, 2015,¹⁵ also available at Clark's website.¹⁶ These charts are estimated to be accurate to within plus or minus a year or so.

All of the K&E mystery rules in the dataset have serial numbers, so the production dates can be estimated. Since K&E produced over 3.5 million wooden slide rules between 1922 and the early 1970's when they stopped manufacturing slide rules, the six-digit serial numbers roll over from 999,999 to 0 three times. This adds some complexity when dating a slide rule using just the serial number, as a given serial number maps to three or four different years of production.

Other characteristics of the slide rules need to be considered to completely determine the year of production of a given rule. The main characteristics used to narrow down the year of production of the mystery rules are:

K&E Manufacturer Markings: Beginning in 1943, K&E started using a stylized K+E logo with the letters K+E rendered in a double line font, in their catalogs.¹⁷ This logo started appearing on their products shortly afterwards. Mystery rules with the stylized logo were therefore manufactured after 1943. Prior to 1943, K&E typically marked their slide rules with the text 'Keuffel and Esser'. All of the UW Polyphase mystery rules are marked in this way. The pre-1943 Beghin and UW Beghin scale mystery rules have different manufacturer markings that don't typically appear on rules in the K&E catalogs, namely 'K&E C^o' (note the raised letter 'O' with the line underneath) and 'K&E CO.' (all uppercase with a period at the end). See Figure 5. Rules with these markings were produced prior to 1943.

Markings on the Log Scale: The log scales on K&E simplex rules manufactured prior to ~1938 are marked with the numbers 0 to 10. After ~1938 (around serial number 600,000), K&E started marking log scales with the numbers 0 to 1.

Presence of the number 45 on the Tan Scale: The 45-degree tick mark on the tan scale on K&E simplex rules prior to 1938 was not marked with a number – it was left blank. Starting around 1938 (around serial number 600,000), K&E marked the 45-degree tick mark on the tan scales with the number 45.¹⁸

Patent numbers: Many of the K&E mystery rules have patent numbers or patent dates printed on the rules. Prior to 1927 manufacturers were required to mark products with the date of patents covering the product. After 1927 manufacturers were required to mark products with patent numbers instead of patent dates. However, an exception was allowed for patents issued prior to April 1, 1927. K&E was still marking many slide rules, including UW Polyphase mystery rules with "Pat. June 5, 1900" as late as 1931.¹⁹



FIGURE 5. K&E C^o, K&E CO., and K+E Logos

Patent numbers do provide an indication of the earliest date of production of a rule, as a patent number could only have been marked on a rule after the patent had been issued by the US Patent Office. Patent numbers appearing on mystery rules include 1,934,232, issued in 1933 and 2,086,502 (marked on metal rimmed cursors), issued in 1937.

Cursor type: Up until ~1934, K&E simplex rules were shipped with a frameless glass cursor. Starting in ~1934, K&E switched to a metal framed cursor. Note that the type of cursor is not always a reliable indicator of when a rule was manufactured, as users commonly replaced broken or missing cursors with cursors of a different type. Nevertheless, rules with the frameless cursor were most likely manufactured prior to 1934.

Not all of the above information is needed to determine if the serial number on a mystery rule belongs to the first or second sequence of K&E serial numbers. The logo alone is generally sufficient. If a mystery rule has the K+E stylized logo, then the serial number belongs to the second sequence, else it belongs

to the first sequence. The other markings on all mystery rules are consistent with this observation and can be used to further validate the year of production of a given rule.

Analyzing The Mystery Rule Data

The mystery rule data have been compiled into a spreadsheet for analysis. This spreadsheet can be readily downloaded from JOS Plus (<https://www.oughtred.org/josplus.shtml>). Table 2 and Table 3 provide summaries of the data from this spreadsheet for the 10-inch and 20-inch rules respectively. The summary tables show the serial numbers, adjusted serial numbers (where 1,000,000 is added to serial numbers from the second series of serial numbers), delta between serial numbers, logo on the rule, the estimated year of manufacture and the source of the data for each rule. A key to the "Source" columns in these tables is provided in Table 4. Additional information on the mystery rules can be viewed in the JOS Plus materials²⁰.

TABLE 2. 10-inch Mystery Rule Summary Table

Type	Serial #	Adjusted Serial #	Delta	Logo	Year of Mfg.	Source
UW Polyphase	291505	291505	-	KEUFFEL & ESSER CO. N.Y.	1929	MS
UW Polyphase	402458	402458	110953	KEUFFEL & ESSER CO. N.Y.	1932	PT
UW Polyphase	402574	402574	116	KEUFFEL & ESSER CO. N.Y.	1932	WP
UW Polyphase	402655	402655	81	KEUFFEL & ESSER CO. N.Y.	1932	PT
UW Polyphase	402738	402738	83	KEUFFEL & ESSER CO. N.Y.	1932	WP
Beghin	403313	403313	575	K&EC ^Q	1932	PT
Beghin	403487	403487	174	K&EC ^Q	1932	EB
Beghin	435096	435096	31783	K&EC ^Q	1933	DC
Beghin	441003	441003	5907	K&EC ^Q	1933	EC
Beghin	468950	468950	27947	K&EC ^Q	1934	CO
Beghin	468962	468962	12	K&EC ^Q	1934	PT
Beghin	468980	468980	18	K&EC ^Q	1934	MOL
Beghin	471354	471354	2374	K&ECO.	1934	MS
Beghin	471620	471620	266	K&ECO.	1934	WP
Beghin	471659	471659	39	K&ECO.	1934	EC
UW Polyphase	499633	499633	27974	KEUFFEL & ESSER CO. N.Y.	1935	BS
UW Polyphase	529531	529531	29898	KEUFFEL & ESSER CO. N.Y.	1936	WP
UW Polyphase	529600	529600	69	KEUFFEL & ESSER CO. N.Y.	1936	MS
UW Polyphase	529605	529605	5	KEUFFEL & ESSER CO. N.Y.	1936	CMC
UW Polyphase	529610	529610	5	KEUFFEL & ESSER CO. N.Y.	1936	EG
UW Polyphase	529664	529664	54	KEUFFEL & ESSER CO. N.Y.	1936	WP
Beghin	564336	564336	34672	K&ECO.	1936	PT
Beghin	564351	564351	15	K&ECO.	1936	FB
Beghin	632200	632200	67849	K&ECO.	1937	CMC
Beghin	632308	632308	108	K&ECO.	1937	JB

Type	Serial #	Adjusted Serial #	Delta	Logo	Year of Mfg.	Source
Beghin	632558	632558	250	K&ECO.	1937	DB
UW Beghin	668500	668500	35942	K&ECO.	1938	WP
Beghin	692285	692285	23785	K&ECO.	1938	PT
UW Beghin	708822	708822	16537	K&ECO.	1939	EG
UW Beghin	708840	708840	18	K&ECO.	1939	JW
UW Beghin	790092	790092	81252	K&ECO.	1940	MR
UW Beghin	790141	790141	49	K&ECO.	1940	WP
UW Beghin	790196	790141	55	K&ECO.	1940	MOL
UW Beghin	790347	790347	151	K&ECO.	1940	PT
UW Beghin	847828	847828	57481	K&ECO.	1941	EG
UW Beghin	847840	847840	12	K&ECO.	1941	WP
UW Beghin	847869	847869	29	(not visible)	1941	RL
UW Beghin	848106	848106	237	K&ECO.	1941	CMC
UW Beghin	877545	877545	29439	K&ECO.	1941	PT
UW Beghin	877678	877678	133	K&ECO.	1941	WP
Beghin	877776	877776	98	K&ECO.	1941	PT
Beghin	877823	877823	47	K&ECO.	1941	HH
Beghin	358978	1358978	481155	K+E	1948	PT
Beghin	434542	1434542	75564	K+E	1949	MF
Beghin	434587	1434587	45	K+E	1949	MS
Beghin	434672	1434672	85	K+E	1949	PT
Beghin	434918	1434918	246	K+E	1949	MS
Beghin	435059	1435059	141	K+E	1949	MR
Beghin	435096	1435096	37	K+E	1949	MOL
Beghin	552310	1552310	117214	K+E	1950	TS
Beghin	552503	1552503	193	K+E	1950	PT
Beghin	554194	1554194	1691	K+E	1950	ISRM
Beghin	554292	1554292	98	K+E	1950	EC

TABLE 3. 20-inch Mystery Rule Summary Table

Mystery Rule Type	Serial #	Adjusted Serial #	Delta	Logo	Year of Mfg.	Source
Beghin Type 1	460528	460528	-	KEUFFEL & ESSER CO N.Y.	1934	PT
Beghin Type 2	687519	687519	226991	K&EC ²	1938	PT
4104	774832	774832	87313	KEUFFEL & ESSER CO N.Y.	1940	PT
4104	799620	799620	24788	KEUFFEL & ESSER CO N.Y.	1940	MOL
4104	836349	836349	36729	KEUFFEL & ESSER CO N.Y.	1941	CMC
4104	924511	924511	88162	KEUFFEL & ESSER CO N.Y.	1942	TW
4104	924545	924545	34	KEUFFEL & ESSER CO N.Y.	1942	PT
4104	924660	924660	115	KEUFFEL & ESSER CO N.Y.	1942	EB
4104	044071	1044071	119411	KEUFFEL & ESSER CO N.Y.	1944	TW
4104	044175	1044175	104	KEUFFEL & ESSER CO N.Y.	1944	WP
4104	044178	1044178	3	KEUFFEL & ESSER CO N.Y.	1944	CMC
4104	044201	1044178	23	KEUFFEL & ESSER CO N.Y.	1944	MOL
4104	118637	1118637	74436	KEUFFEL & ESSER CO N.Y.	1945	PT

TABLE 4. Source Data Key

Source	Owner	Where found
BS	Ben Shelley	Mike Syphers website
CA	Case Antiques auction	https://caseantiques.com/
CMC	Clark Mc Coy	Clark McCoy Website
CO	Charlie Oxford	ISRG Archives
DB	Dennis Boone	Groups.io
DC	Dan Cherry	ISRG Archives
EB	eBay listing	https://www.ebay.com/
EC	Ed Chamberlain	ISRG Archives
EG	Eamonn Gormley	Personal collection
FB	Facebook Marketplace Listing	https://www.facebook.com/marketplace/
HH	Hans Hansen	ISRG Archives
ISRM	International Slide Rule Museum	Website
JB	Jay Ballauer	Mike Syphers website
JW	Jeff Wiener	ISRG Archives
MOL	Michael O'Leary	ISRG Archives
MR	Miguel Ramirez	Miguel Ramirez Website
MS	Mike Syphers	Mike Syphers Website
PT	Paul Tarantolo	Oughtred Society collections
RL	Rod Lovett	Rod Lovett eBay history search
TS	Tom Savage	ISRG Archives
TW	Tom Wyman	Oughtred Society collections
WP	worthpoint.com	https://www.worthpoint.com/

10-inch Mystery Rule Observations

The following charts show graphically when the fifty-one 10-inch mystery rules of each type in the data set were produced. The adjusted serial numbers from the table are used so the different series of production numbers can be clearly seen.

Figure 6 shows the serial numbers of each of the 10-inch mystery rules, with the marker for each rule corresponding to the mystery rule type. Figure 7 shows the year of production of each of the 10-inch mystery rules, again with the marker indicating the mystery rule type.

From the charts, we can see that 10-inch mystery rules of the same type tend to be clumped together by serial number/year of production. This is not surprising, as K&E produced batches of the same type of slide rules with consecutive serial numbers.

The earliest 10-inch mystery rules produced were the UW Polyphase mystery rules. The oldest of these,

from the Mike Syphers collection,²¹ has the serial number of 291,505 with an estimated production date of 1929. The label on this rule is in the landscape orientation.

The next four mystery rules in the data set are also UW Polyphase rules and date to 1932. The difference between the largest and smallest serial number for these four rules span is just 300. It seems likely that these four rules were all produced in the same batch. The label on the first two of these four is also in the landscape orientation. The label of the third is in the portrait orientation. The label on the fourth is not visible in the pictures of the rule, nor is it mentioned in the description. Most likely, it is also in the portrait orientation. It is not clear why the labels on rules with serial numbers so close together (difference of only 81 between the serial numbers) should have such a sudden switch from landscape to portrait orientation. The labels on all later UW Polyphase rules and UW Beghin rules are also in the portrait orientation.



FIGURE 6. Mystery Rule Specimen vs. Adjusted Serial Number



FIGURE 7. Mystery Rule Specimen vs. Production Year

The earliest Beghin mystery rule has the serial number, 403,313, also dating to 1932. There is a gap of just 575 serial numbers between UW Polyphase rule 402,738 and this Beghin rule. It seems likely that these rules were manufactured in consecutive batches.

The next nine rules in the 10-inch dataset are also of the Beghin type. The text 'K&EC^O' appears at the right end of the slide until rule 468,980 (made in ~1934). With rule 471,354, the text changes to 'K&ECO.' (The 'O' is now uppercase with no line underneath, and a period is added).

The next six rules are UW Polyphase rules, one manufactured in 1935 and five in 1936. There is a difference of just 133 between the lowest and highest serial numbers of the five 1936 rules.

The next five rules are all of the Beghin type, manufactured around 1936 and 1937. After that comes the first of the UW Beghin rules, manufactured around 1939, another Beghin (non-UW) rule and then 12 more UW Beghin rules, manufactured around 1939 and 1940. These are followed by two more Beghin rules manufactured in 1940/1941. The last of these has the serial number 877,823.

There is then a large gap in the production of 10-inch mystery rules during the second world war. The next 10-inch mystery rule in the dataset has serial number 358,978, dated to 1948. This rule and all the others that follow are Beghin rules (i.e., non-UW) and they all have the stylized K+E logo, allowing us to confidently date them to after 1943. In total, 11 Beghin mystery rules with the stylized K+E logo are known. The last has serial number 554,292, dating to 1950.

Coincidentally, the six-digit serial numbers on most of the mystery rules with the K+E logo are very close to the six-digit serial numbers on mystery rules from the first series of serial numbers, which can make it seem that they were produced around the same time. However, the presence of the K+E logo on these rules indicates that they were manufactured some 15 years after the rules with the other logos.

20-inch Mystery Rule Observations

The 20-inch Beghin mystery rules were manufactured in 1934 and 1938. Given that they have Beghin-type scale sets, there may be a relationship with the 10-inch Beghin mystery rules, but no further details of such a relationship are known at this time.

The 4104 mystery rules without a model number have serial numbers between 774,832 and 924,660. The rules marked with the 4104 model number have lower serial numbers, between 44,071 and 118,638. The L scale on the all the 4104 mystery rules is marked with the numbers 0 to 1 and the 45-degree tick mark on the tan scale is marked with the number 45. This indicates that all the 4104 mystery rules were manufactured after 1938. This means that the lower valued serial numbers are from the second series of serial numbers. The serial numbers map to manufacturing dates between 1940 and 1945, with the 4104 model number appearing on rules from the second series of serial numbers.

Mystery Rules with Unknown Serial Numbers

For five of the 10-inch mystery rules found at the worthpoint.com website, serial numbers are not visible in the pictures or listed in the description. Four of these are UW Beghin type rules, with the 'K&ECO.' logo. These rules most likely date to 1939 – 1940 based on the other rules in the dataset where the serial numbers are known. The other rule is a Beghin mystery rule, also with the 'K&ECO.' logo. The rear scale markings of this rule are visible in the pictures. The log scale is marked from 1 to 10 and the number 45 does not appear on the tan scale. Other rules with the same characteristics for which the serial numbers are known have been dated to between 1934 and 1937.

Original Owners of Mystery Rules

On his website, Mike Syphers provides information about the original owners of a couple of the 10-inch mystery rules. Rule 471,354, a Beghin mystery rule, originally belonged to Frank H. Colburn who studied chemical engineering at Iowa State College (now Iowa State University) in the 1930's.²² Mystery rule

499,633, a UW Polyphase mystery rule, originally belonged to Eugene Shelley who studied architecture at the University of Washington.²³

The leather case for mystery rule 668,500, a UW Beghin mystery rule, is marked with the name Gordon Munger.²⁴ An internet search shows that Gordon Wesley Munger was born in Bothell, WA on Feb 25, 1922. He was a graduate of Franklin High School in Seattle and attended the University of Washington for two years as an architectural student (as did Eugene Shelley). After graduation, he worked for the Boeing Aircraft company in Seattle before entering service with the Air Corps on March 28, 1943. He received his commission and wings at Pecos, TX on May 25, 1944. Sadly, he was killed on May 14, 1945, over Guam, close to the end of the second world war.²⁵

All of these original owners attended university around the time the rules were manufactured. This supports the theory that the K&E 10-inch mystery rules were sold at universities around the country.

Conclusions

With the serial number data and other data gathered from fifty-one 10-inch and eleven 20-inch K&E mystery rules, a clearer view of the timelines of production of the three different types has emerged.

The earliest 10-inch mystery rules produced were of the UW Polyphase type. The known UW Polyphase rules were manufactured between 1929 – 1932 and 1935 – 1936. It is not known if the UW Polyphase rules were produced outside these years.

The Beghin mystery rules were first produced around 1932. They continued to be produced until the start of the second world war. Production ceased during the war years and the rules were produced again starting around 1948. The last of the rules were produced around 1950.

The UW Beghin mystery rules in the dataset were all produced between 1939 and 1941. It seems that K&E switched from providing UW Polyphase rules to providing UW Beghin rules to the university. No UW Beghin mystery rules from the dataset have serial numbers from outside these years.

The 4104 20-inch mystery rules were produced between 1940 and 1945, during World War II.

The two Beghin 20-inch mystery rules were produced in 1934 and 1938.

It is still a mystery why the University of Washington is the only school whose logo appears on the 10-inch mystery rules. Keuffel and Esser was based in New Jersey, on the eastern coast of the U.S., almost 3,000 miles from Seattle on the west coast. It is somewhat surprising that no rules were produced with the logos of any other U.S. universities or colleges, particularly those on the east coast and in the mid-west that were closer to the K&E headquarters.

Of the fifty-nine 10-inch mystery rules in the dataset, twenty-nine (49%) have the University of Washington College of Engineering logo. However, this number is skewed by twelve of the fourteen mystery rules identified on worthpoint.com that have the UW logo. It is simply easier to find matches for e.g., 'Keuffel university' than to find matches for the 4097D scale mystery rules that may have more generic descriptions in auction listings, and that don't include the word 'mystery'.

Considering the forty-five slide rules in the dataset not found on worthpoint.com, there are seven UW Polyphase rules and nine UW Beghin rules. These represent 36% of the forty-five non-worthpoint.com sourced rules. Considering the thirty-three rules in the data set produced before 1941 that are not from worthpoint.com, 48% are represented by the sixteen UW Polyphase and UW Beghin rules.

There were several hundred universities and colleges in the U.S. in the 1930's. If many of them sold K&E 10-inch mystery rules in their bookstores, then I would expect that the proportion of mystery rules manufactured with the UW logo would be perhaps no more than 1% or 2% of all mystery rules produced. While there are surely many more Beghin (non-UW) mystery rules out there that have not been identified, collectors have been reporting on K&E mystery rules for over 20 years. Given the known samples, it seems

unlikely to me that there is a sufficient number of Beghin mystery rules that have yet to be uncovered that would result in a low single digit percentage of mystery rules with the UW logo.

This suggests that the mystery rules may have only been sold at UW and perhaps only a handful of other universities and colleges. Only three original owners of mystery rules have been identified to date: two at UW and one at Iowa State College. Information on the original owners of other Beghin (non-UW) mystery rules would be beneficial in understanding at which universities the mystery rules were sold.

Since the evidence to date strongly supports the hypothesis that the various types of K&E 10-inch mystery rules were produced for sale at university and college bookstores, a more appropriate term for these rules might be K&E University Rules. However, the K&E mystery rule terminology has been used for so long now that it would likely be difficult to change, even though many of the mysteries surrounding these rules have been solved.

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A huge thank you to Mike Syphers for reviewing this manuscript and for his correspondence in which he provided helpful guidance, feedback and suggestions. Mike also brought to my attention the connection between the Beghin scale set Tavernier-Gravet rules and the mystery rules with almost the same scale set. I am also extremely grateful to the slide rule collectors that have taken the time to document and present information online about the mystery rules in their collections. This information has been critical to putting together a more complete picture of the production timelines of these rules.

Notes

1. <http://www.mccoys-kecatalogs.com/KECollection/Mystery/kemysteryfamilyrules.htm>
2. <https://www.followingtherules.info/a-ke-rule-of-mystery.html#a-ke-rule-of-mystery>
3. Mike Syphers, A French Connection to a K&E Mystery Rule, *Journal of the Oughtred Society*, 33:2, Fall 2024.
4. <https://www.followingtherules.info/ke-mystery-rules-update.html#ke-mystery-rules-update>
5. https://osgalleries.org/collectors/tarantolo/tarantolothumbnails.cgi#goto_kandemyst
6. <https://sites.google.com/gpapps.galenaparkisd.com/myrules/all-purpose/ke-polyphase-4097d>
7. <https://www.freystuff.com/mike-frey-slide-rules/keuffel-esser/knemystery-434542/>
8. <https://osgalleries.org/collectors/wyman/wymanthumbnails.cgi>

9. https://www.sliderulemuseum.com/KE/KE_MysteryMannheim_V1_sn552914_c1937_4054-3_Stock_with_4097C_Scales_FranklinGfinkCollection_Gifted%20by%20JudyJohnson.jpg
10. <https://www.allaboutastro.com/all-about-ke-rules.html>
11. <https://sliderules.lovett.com/groupsio/isrg/isrgarchivesearch.html>
12. <https://sliderules.lovett.com/srsearch.html>
13. In one sample, serial number 358978 from 1948, the slide and the stator are the same length, 28.2cm. It is not known if it was shipped this way, or if a previous owner may have trimmed a longer slide so it was flush with the stator.
14. Mike Syphers informed me that he also did a curve fit for this scale and derived a similar cosine-based formula.
15. <https://osgalleries.org/journal/displayarticle.cgi?match=24.2/V24.2P56.pdf>
16. <http://www.mccoys-kecatalogs.com/keserialnumbers/Dating-2.htm>
17. Images of the catalogs can be found at <http://www.mccoys-kecatalogs.com/KEmain.htm>
18. Credit for highlighting the differences in markings on the log and tan scales goes to Paul Tarantolo, who has noted these and other subtle differences between mystery rules in his collection, such as the relative position of the A and DF labels on Beghin mystery rules.
19. It should be noted that this patent expired on June 5, 1917, many years before the mystery rules were manufactured.
20. The author would appreciate any information that readers might provide about other K&E mystery rules not included in the current revision of the spreadsheet.
21. <https://www.followingtherules.info/ke-mystery-rules-update.html#ke-mystery-rules-update>
22. <https://www.followingtherules.info/a-ke-rule-of-mystery.html#a-ke-rule-of-mystery>
23. <https://www.followingtherules.info/ke-mystery-rules-update.html#ke-mystery-rules-update>
24. <https://www.worthpoint.com/worthopedia/e-keuffel-esser-co-ny-10-slide-rule-1788042429>
25. <https://www.findagrave.com/memorial/34934353/munger#view-photo=223080254>

