S and T tables, with the sexagesimal second as unit, appeared already in the first stereotyped edition of

(13s). F. Callet, *Tables Portatives de Logarithmes*, Paris, 1795. In his *Report . . . on Mathematical Tables*, London, 1873, J. W. L. Glaisher states (p. 54), "Tables of S and T are frequently called, after their inventor, Delambre's tables." In a letter of C. M. Merrifield written to Glaisher in 1873, listing matters he wishes to bring to his friend's attention, he notes "the so-called Delambre's tables of log $(\sin x/x)$ and log $(x/\tan x)$ really John Newton in 1658." I have examined Newton's *Trigonometria Britanica* (*sic*), of 1658, but as yet I have found no printed S or T tables before 1795. Delambre's dates are 1749–1822. We have already referred to the manuscript S and T tables of the *Tables du Cadastre* (*MTAC*, p. 34) possibly dating from 1792 or 1793.

S and T "are required for passing from log arc to log sin and log tan, and are of particular value in geodetic calculations, where long operations have sometimes to be performed with small arcs which are usually expressed in seconds, while four or five places of the second have to be retained" (3s).

R. C. A.

MATHEMATICAL TABLES—ERRATA

8. France, Service Géographique de l'Armée, *Tables des Logarithmes à huit Décimales des Nombres entiers de* 1 *a* 120000 *et des Sinus et Tangentes de dix Secondes en dix secondes d'Arc dans le Système de la Division Centésimale du Quadrant.* Paris, 1891. Compare *MTAC*, p. 36.

In the differences and proportional parts which correspond to Log cos $4^g75'$ to $5^g00'$,

	for					read			
	49	**48**	**47**	**46**		**51**	**52**	**53**	**54**
1	4.9	4.8	4.7	4.6	1	5.1	5.2	5.3	5.4
2	9.8	9.6	9.4	9.2	2	10.2	10.4	10.6	10.8
3	14.7	14.4	14.1	13.8	3	15.3	15.6	15.9	16.2
4	19.6	19.2	18.8	18.4	4	20.4	20.8	21.2	21.6
5	24.5	24.0	23.5	23.0	5	25.5	26.0	26.5	27.0
6	29.4	28.8	28.2	27.6	6	30.6	31.2	31.8	32.4
7	34.3	33.6	32.9	32.2	7	35.7	36.4	37.1	37.8
8	39.2	38.4	37.6	36.8	8	40.8	41.6	42.4	43.2
9	44.1	43.2	42.3	41.4	9	45.9	46.8	47.7	48.6

	for	read
Log Sin $4^g65'40''$	$\bar{2}.86355936$	$\bar{2}.86355935$
Log Tan 4 65 40	$\bar{2}.86472090$	$\bar{2}.86472089$
Log Cot 4 65 40	1.13527910	1.13527911
Log Cot 34 53 60	$\underline{0}.21981237$	$\underline{0}.21981257$
Log Cos 41 28 80	$\bar{1}.90143668$	$\bar{1}.90143666$

J. De Mendizábel Tamborel, Sociedad Cientifica "Antonio Alzate," Mexico, *Revista*, v. 5, p. 9–10, 1891.

9. Authors of frequently used works in the field of Statistics display some carelessness in the preparation of tables they publish. Here are a few illustrations (an asterisk * denotes an exact result):

R. A. Fisher and F. Yates, *Statistical Tables for Biological, Agricultural and Medical Research*, Edinburgh, 1938. P. 33, $n_1 = n_2 = 2$, *for* 99.01, *read* 99.00*; and $n_1 = 2$, $n_2 = 3$, *for* 30.81, *read* 30.82. The same mistakes occur in

G. W. Snedecor, *Statistical Methods applied to Experiments in Agriculture and Biology*, Ames, Iowa, Collegiate Press, third ed., 1940, p. 184. On this same page (through $n_2 = 13$) are at least 53 other last figure errors of 1 to 3 units, which suggest that there may be 200 errors on the 4 pages of this table of 5% and 1% points for the F distribution. Five of these

53 errors occur also in FISHER and YATES. The careful worker will naturally hereafter turn to such tables as reviewed in RMT **102**.

F. E. CROXTON and D. J. COWDEN, *Applied General Statistics*, New York, Prentice Hall, 1939, p. 878, has the following errors:

	.05		.01		.001	
n_2	*for*	*read*	*for*	*read*	*for*	*read*
1			4999.0	4999.5*		
2	18.999	19.00*	99.008	99.00		
3			30.815	30.817		
4	6.945	6.944	18.001	18.000*	61.238	61.246

R. C. A.

Other errors in FISHER and YATES are as follows:

P. 15, l. 10, $A = \bar{y}$, not $\bar{x}$.

P. 28, footnote to table, the formula should read,

$$z\text{ (20 percent)} = \frac{0.8416}{\sqrt{h-1}} - 0.4514\left(\frac{1}{n_1} - \frac{1}{n_2}\right).$$

P. 42, Table XII, the entry for $p = 72$ should be 58.1 *not* 58.7.

P. 48, l. 1, solution 16, the letter *e* in block 2 is blurred; the block letters are *adefj*.

W. G. COCHRAN

Yet other slips in FISHER and YATES are as follows:

P. 8, l. 10, *for* "ordinate is $\frac{1}{2}\text{sech}^2 z$," *read* "ordinate is $\frac{1}{2}\text{sech}2z$."

P. 57, Table XXIII, $n = 39$, bottom of col. 2, *for* 496,388, *read* 4,496,388.

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10. LEO HUDSON, and E. S. MILLS, *Natural Trigonometric Functions Tables. Sine, Cosine, Tangent, Cotangent, Secant, and Cosecant to Eight Decimal Places. With Second Differences to ten Decimal Places, Semi-quadrantally arranged.* 1941; see RMT **80**.

The sines and cosines given in this table were checked against the values appearing in the Coast and Geodetic Survey Table (see RMT **77**). In the case of a discrepancy Peters' *Eight-figure Table* was referred to (see RMT **78**), and finally the function was calculated to fifteen places by using Peters' *Einundzwanzigstellige Werte der Funktionen Sinus und Cosinus* (Berlin, 1911). In this way 32 last-figure sine errors were found. One of these, at 0°02′, where the eighth figure should be increased by two units, was indicated on an errata slip in the volume. The other 31 errors were of a unit in the eighth place. The first 8 cases where the eighth digit should be diminished by 1 are listed below and then the 23 cases calling for an increase by unity.

(−1) 13°31′, 27°08′, 27°21′, 27°24′, 43°25′, 55°09′, 77°18′, 84°03′.

(+1) 1°15′, 2°10′, 2°25′, 8°43′, 9°35′, 11°39′, 11°42′, 12°45′, 18°32′, 33°00′, 34°36′, 38°49′, 39°53′, 40°59′, 42°17′, 51°08′, 54°55′, 60°33′, 67°05′, 67°25′, 71°05′, 80°48′, 88°24′.

In comparing the column "Diff. per second" with 1/60 of the differences per minute of eleven-place functions interpolated from Peters' 21-place values, it is noted that the last figure of the printed difference is totally unreliable; from 0° to 1° it is wrong in 27 cases; from 1° to 2°, it is wrong in 30 cases; and from 2° to 3° in 13 cases. It is obvious therefore that the sines and cosines of this table are not to be relied on for more than seven-place accuracy, especially after using these differences with linear interpolation. Computation to "ten decimal places" is wholly out of the question. In making a test with the thought of using this table for seven-place work instead of such tables as Benson (RMT **75**) or Ives (RMT **76**), it was found that, after setting up a routine, it is possible, when interpolating to hundredths of a second, to save nearly 25% of the time used in locating the function in Benson to the nearest ten seconds and then interpolating. Tangents and secants have not yet been checked.

It seems rather a shame that anyone should have put in the enormous amount of time and energy required to compute these values from a series, and not attain the accuracy that was already available in Peters' *Eight-figure Table*, 1939, or in an abridgement of Andoyer, 1916. It would not be much of a job to compute the differences per second to six significant figures instead of five, using ten-place functions, interpolated either from Peters or Andoyer or Pitiscus, which would make the table far more valuable than it is in its present state.

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A comparison of Legendre's table of sines, to 15D, for each 15′ (*Traité des Fonctions Elliptiques*, v. 2, Paris, 1826, p. 252–255), readily revealed not only three of the errors noted by Mr. Hoffman, but also a similar error for 48°15′. Comparison with Andoyer's table of sines and cosines to 15D (*Nouvelles Tables Trigonométriques Fondamentales, Valeurs Naturelles*, v. 1, Paris, 1915) showed that for the sines the eighth place values should also be increased by unity at 10°31′ and 32°36′. In the C.G.S. table (which Mr. Hoffman used for comparison) there were also errors in the three new cases noted.

R. C. A. and D. H. L.

11. J. Y. DREISONSTOK, *Navigation Tables for Mariners and Aviators* (H. O. no. 208), sixth ed., 1942; see RMT **103**.

Tables I and IA of this volume have been recomputed at the Ladd Observatory, using 7-place logarithms and punched cards in Hollerith Machines. The comparison between values given in H. O. 208 and the newly computed values is complete only for A and C.

In table I, 1858 errata were found in A, of which 158 were of two or more units in the last place given. In table IA, 426 errata in A were noted, 9 of two or more units. 345 errata in C were located in table I, 8 of two or more units; 263 errata in C were found in table IA, 28 of two or more units in the last place given.

Thus a total of 2892 errata have been noted in A and C, 203 of which are of two or more units in the last place given. The largest error in A was 26 units in the last place; the largest in C 20 units. The largest error in a computed altitude resulting from one of these errata would be about 4.4 minutes of arc, with a corresponding error of position of 4.4 nautical miles. This largest error would probably not occur in ordinary navigation; it represents a theoretical maximum.

The list of 203 errata of two or more units in the last place are given below.

L	t	A should be	L	t	A should be	L	t	A should be	L	t	A should be	L	t	A should be
1°	75°	58608		89	140877	5°	73	51710		83	76521		82	68142
	77	64667	3°	66	38771		76	59129		84	79574		83	70469
	78	68066		67	40485		87	99328		87	87786		86	76717
	80	75821		77	63703		88	102764	8°	78	60465		88	79537
	81	80305		78	66934		89	105123		79	62953		89	80305
	84	97486		80	74200	6°	68°	41236		80	65517	10°	75	51086
	85	105123		82	82825		72	48863		81	68142		80	61311
	86	114329		83	87786		77	60742		84	76083		81	63426
	87	125836		84	93267		79	66424		86	80862		82	65517
	88	140877		85	99328		80	69493		87	82825		83	67554
	89	160767		89	125836		82	76083		88	84345	10°	84°	69493
2°	68	42481	4°	73	52304		83	79574	9°	64	33690		86	72876
	71	48514		75	57276		84	83144		65	35089		87	74200
	76	61211		76	59996		87	93267		70	42914		88	75199
	80	75199		79	69310		89	97486		71	44661		89	75821
	81	79537		80	72876	7°	65	35970		72	46475	11°	68	38270
	82	84345		81	76717		72	48144		77	56586		78	55378
	85	102764		82	80862		74	52360		78	58813		81	61096
	86	110812		88	110812		80	67554		79	61096		82	62953
	88	130680		89	114329		81	70469		80	63426		84	66424

L	t	A should be	L	t	A should be	L	t	A should be	L	t	C should be	L	t	C should be
	86	69310		83	52360	24°	87	38771	9°	86°	6	86	19	1644
12°	74	46792		88	55647	25°	81	35089	29	42	233	86	78	1166
	76	50169	17°	81	48357		83	35970	31	11	786	87	1	3039
	79	55378		85	51710	29°	85	30913	42	83	132	87	4	2438
	81	58813		86	52304	30°	74	25644	44	84	145	88	4	2614
	82	60465	18°	69	33719	38°	78	19580	55	18	751	88	5	2517
	87	66934		80	45546	42	65	13126	58	8	1132	89	1	3516
	89	68066		81	46475	52	78	9781	60	4	1457	89	3	3039
13°	69	38157		83	48144	66	76	3677	76	14	1233	89	4	2915
	81	56586		84	48863	67	16	253.3	79	15	1306	89	5	2818
	84	60742	18°	88°	50753	67	58	2526	79	17	1253	89	6	2739
	87	63703	19°	81	44661	71	59	1761	82	1	2615	89	8	2615
	89	64667		87	48240	71	78	2322	84	1	2739	89	10	2518
14°	78	50169		88	48514	73	62	1498	85	1	2818	89	15	2345
	82	55743	20°	74	36751	77	6	12.0	85	2	2517	89	20	2224
	85	59129		81	42914	77	86	1122	85	66	1099	89	58	1830
	86	59996	21°	72	33719	81	14	31.1	86	1	2915			
	88	61211		77	38157				86	2	2614			
15°	70	37708		83	42482				86	3	2438			
	78	48466		89	44522				86	17	1690			
	80	51086	22°	79	38270									
	86	57276		84	41236									
	89	58608		88	42481									
16°	70	36751	23°	85	39916									
	78	46792		87	40485									

C. H. SMILEY

12[A, D, P].—EARLE BUCKINGHAM, *Manual of Gear Design. Section one. Eight Place Tables of Angular Functions in Degrees and Hundredths of a Degree and Tables of Involute Functions, Radians, Gear Ratios, and Factors of Numbers.* New York, Machinery, 1935. 183 p. 21.2 × 27.9 cm. $2.50.

No explanation of any kind is given of the sources, construction or checking of these tables; letters to the author asking for information have been ignored. Hence a thorough examination was necessary in order that their value could be appraised.

Pages 8–97 give 8-figure values of sine, cosine, tangent and cotangent at interval 0°·01(=36″). This section has been compared by Mr. Sidney Johnston with every 36th value in Peters' *Achtstellige Tafel der trigonometrischen Funktionen für jede Sexagesimalsekunde des Quadranten*, Berlin, Reichsamt für Landesaufnahme, 1939. The corrections thus found were then confirmed by the present writer from Briggs' *Trigonometria Britannica* (1633), and afterwards analyzed to discover the mode of preparation.

All errors in the sines and cosines greater than 0·55 units in the eighth decimal are shown in Table I. The error is in units of the last decimal, in the sense True Value *minus* Buckingham. Of the remaining 96 end-figure errors, 7 are cases where Buckingham's value is too high, but only by a turn of the figure, 4 are too low by about 0·54 units, while the remaining 85 are too low by amounts that vary between 0·50 and an upper limit that increases steadily to 0·53 as sin x increases from 0 to 1. The distribution of errors in sin x at intervals of 30° is shown alongside, treating cosines as the sines of their complementary angles. Not one of the 96 end-figure errors occurs in an angle that is a multiple of 0°·05. A comparison with Gifford's *Natural Sines to every Second of Arc and Eight Places of Decimals* shows that those tables have not been the source of the values before us; and obviously they have not come from the *Trigonometria Britannica*, which would have been by far the best source.

x °	no.
0	
	15
30	
	23
60	
	47
90	
	85

The explanation is that a table at interval 10″ has been used. This yields values at interval 0°·05 directly, while the remaining values have been formed by *linear* interpolation between the appropriate 10″ values. The maximum effect of neglecting second differences (in sines) is 0·03 sin x units of the eighth decimal and so varies from 0 at $x = 0°$ to 0·03 at $x = 90°$—precisely what we found after eliminating 23 (Table I) + 7 + 4 = 34 values that appear to be attributable to lack of care in handling end figures. This accounts also for the observed increasing frequency as x increases. The only natural tables at interval 10″ are the *Opus Palatinum* of Rheticus (1596), the *Thesaurus Mathematicus* of Pitiscus (1613, but computed by Rheticus), and Andoyer's *Nouvelles Tables Trigonométriques Fondamentales*, Paris, Hermann, 1915. Had the former been used, it is certain that there would have been many more errors, as every table based on Rheticus contains errors that can be traced to his tables. Actually none of the errors in Tables I and II are due to the *Opus Palatinum*, which, in all the multiples of 10″ bordering the values in these two lists, never differs from Andoyer by more than one unit in the tenth decimal. We may take it, therefore, that Andoyer has been used.

There is only one serious error in the tangents, namely on page 20, tan 6°·40, where for 0·11226 797 we must read 0·11216 797. Twelve end-figure errors greater than 0·60 units of the eighth decimal are given in Table II. Besides these there are 126 cases in which the error does not exceed 0·60 units, and so may be considered negligible in computations. In four of these Buckingham's value is too low, while in the remaining 122 (analyzed alongside) it is too high. Here again the total number of errors, and their increasing frequency as x increases, correspond as nearly as possible to our expectation if 10-figure values at interval 10″ were interpolated linearly. Three of these errors occur where x is a multiple of 0°·05, namely 2°·20, 16°·50 and 16°·55. An examination of Andoyer showed that these were three of the nine cases in which the ninth and tenth decimals are 50. In eight of these the eighth decimal has been rounded up—in five cases correctly, but in the three cases under review incorrectly. In the ninth case (23°·50) the eighth decimal has been correctly rounded down. In all nine cases, the *Opus Palatinum* values also end in 50.

x °	no.
0	
	1
5	
	3
10	
	6
15	
	8
20	
	5
21	
	13
30	
	17
35	
	32
40	
	37
45	
	122

The cotangents present an interesting problem to the "error-analyst." Table III lists 27 cases in which the error is greater than a unit of the last decimal. The table alongside gives an analysis of errors not exceeding ±1·6 units. The reason for the break at 5°·71 is that the number of decimals increases at that point from 6 to 7. The reason for the second break will appear later. It will be realized that errors of 0·5 include those from 0·50 to 0·55 only. Bearing this in mind, the distributions (taking positive and negative frequencies separately) are approximately gaussian. After 18°·50 Peters gives 8 decimals, and Buckingham 7, so this portion was also read against Briggs-Gellibrand in order to detect errors between 0·50 and 0·55 units. In no case is a cotangent that is a multiple of 0°·05 in error, even by a turn of the figure.

Error	0°·00 to 5°·71	5°·72 to 17°·00	17°·00 to 45°·00
≧+1·0		16	
+0·9	1	8	
+0·8	2	11	
+0·7	1	17	1
+0·6	5	32	1
+0·5	15	29	2
−0·5	4	9	64
−0·6	3	9	33
−0·7	1	1	2
−0·8		1	1
−0·9		4	
≧−1·0	3	2	1
	35	139	105

The five errors marked with an asterisk could all have been easily detected by writing second differences, since first differences are already given in the tables. There can be no excuse for the neglect of this simple and elementary table-maker's precaution. It appears probable that the first three of these errors have arisen from confusion in copying. Thus:

2°·27 227227 has been copied for 227224
2°·29 006670 has been copied from 00666696
3°·24 665099 has been copied from 66502899

We are faced then with the fact that up to 17° Buckingham's tendency is to be too low, and from that point too high. The sudden switch-over at 17° is even more apparent from the full list of errors than it is from the summary given above. The table below gives observed and theoretical maxima and frequencies.

x °	Maximum obs.	comp.	No. in range obs.	comp.	o–c
17	0·79	0·74	27	34	−7
20	0·66	0·63	27	32	−5
25	0·54	0·57	21	17	+4
30	0·53	0·54	13	10	+3
35	0·52	0·52	7	7	0
40	0·51	0·52	5	5	0
45			100	105	−5

The theoretical maximum error resulting from linear interpolation of values at interval 10″ is, in units of the seventh decimal,

$$0{\cdot}50 + 2 \cot x \operatorname{cosec}^2 x \operatorname{arc}^2 10'' \times 0{\cdot}12 \times 10^7$$

in which 0·12 is the coefficient of the second difference for 0·4 and 0·6. The computed frequency is found with the aid of the difference Δ' (taken positively) of $\operatorname{cosec}^2 x$, and is

$$\Delta'(\operatorname{cosec}^2 x)10^7 \operatorname{arc}^2 10'' \times 0{\cdot}1 \times 80 \times 57{\cdot}3 = 10{\cdot}8\,\Delta'(\operatorname{cosec}^2 x)$$

where

0·1 is average coefficient of second difference
80 is number of interpolates per degree.

The agreement between observation and theory supplies ample confirmation of the hypothesis of Buckingham's use of Andoyer and linear interpolation. Actually this section of the table is by far the most accurate, and has quite likely been done by a different computer.

It remains to account for the predominantly *low* values up to 17°. They have evidently been formed, not by interpolating Andoyer, but by taking the reciprocals of tangents formed by linear interpolation. These tangents would tend to be too *high* (as we found) and their reciprocals too *low*. The fact that a small number are slightly too high may possibly be the result of rounding off the tangents to nine decimals before reciprocating. The maximum error of such a procedure would be, in units of the seventh decimal, $0{\cdot}006 \cot x \pm 0{\cdot}005 \cot^2 x$, apart from any error arising from the final rounding off, i.e., a possible ±0·5. This gives errors up to +1·1 and −0·9 at 5°·7, +0·70 and −0·62 at 10°, and +0·57 and −0·53 at 17°. Actually the observed errors exceed these limits.

In six cases up to 17° the tangents and cotangents of the same angle are in error. In each case the errors are of opposite sign, the most striking examples being at 4°·59, 14°·88 and 14°·92.

One interesting fact emerges. In Andoyer's tangents the sixth decimal is one unit too low at 12° 15′ 10″, 20″, 30″ and 40″, but Buckingham is correct at 12°·26. Similarly the sixth decimal of Andoyer's value of cot 40° 43′ 20″ is a unit too high, but Buckingham is correct at 40°·72. The errors would, of course, be evident from the differences, since Buckingham's tables are linear at these points.

The above somewhat lengthy analysis affords an excellent example of the way in which errors in tables give clues to the sources from which the tables are derived, and the methods used in computing them. It is, however, far better that the author himself should give this information.

Page 98 is a table for converting minutes into decimals of a degree. In every case where the end figure is 6, it should be 7.

Pages 100–129 give the function involute x or $\tan x - x$ at interval 0°·01 up to 60°· 12 decimals are given up to 0°·5, 10 to 1°, 8 to 37°, and 7 to 60°. This table was examined by Mr. S. Johnston, by using the relation $\tan x - \operatorname{inv} x = x$, a process that would not detect errors of a unit or less in the last decimal. Some further examination was also made by Mr. J. C. P. Miller. Apart from a trivial omission of leading figures at 6°·03, there are two errors:

Page 104 inv 9°·15 for 6160 read 7160
Page 106 inv 13°·01 for 8468 read 8470

Pages 132–146 give, to 8 decimals, the radian equivalent of 0°(0°·01)45°. It should, of course, have been formed by taking multiples of 1° = $0^r{\cdot}01745\ 32925\ 19943$. Actually multiples of 0·01745 329 were first taken up to 18°. At this stage comparison with $\pi/10$

showed a defect of just over 4½ units in the eighth decimal. Instead of tracing the cause, and correcting it, the values at 17°·97, 17°·98, 17°·99 and 18°·00 were "fudged" by increasing them by 1, 2, 3 and 4 units respectively in the last decimal, to prevent a sudden discontinuity in the differences. Thereafter increments of 0·00017 45329 were again added, up to the end of the table at 45°, where the error has risen to more than seven units. Thus the value given for 45° is 0·78539 809, whereas $\pi/4$ is 0·78539 81634. It would be difficult to match this example of incompetent table-making.

Pages 148–169, described as "Brocot's Tables of Gear Ratios," give, to eight decimals, the values of all proper fractions (in their lowest terms) whose denominators do not exceed 120. Table IV gives a list of 27 errors found by Mr. S. Johnston and by Mr. J. C. P. Miller, who made a partial examination. Eight of these are of a unit in the last figure, and are thus of no engineering consequence. Every one of these errors and omissions could easily have been detected by the simple process of seeing that N/D and $(D - N)/D$ added precisely to 1. It was observed that, with one exception (argument 44/87 for 44/47), D is always greater than 60 in the error list. As *Machinery's Handbook* gives a similar table, also called Brocot's, but with D not exceeding 60, the inference is that Buckingham computed the values for D greater than 60, and introduced the errors now found. Compare RMT **87**.

Pages 172–183 give all the factors of *all* numbers up to 6009. A comparison by Mr. S. Johnston with the Br. Ass. Adv. Sci., *Mathematical Tables*, v. 5. (London, 1935) showed that two numbers on page 182 given as primes are really composite, namely 5183 = 71.73 and 5461 = 43.127. These errors do not occur in any other table that I know.

TABLE I—Sines and Cosines

page	col.	x °	for	read	error
8	sin	0·02	906	907	+0·6
8	cos	0·04	975	976	+0·6
10	cos	1·43	857	856	−1·0
11	sin	1·54	484	483	−0·6
15	cos	3·64	264	265	+0·9
20	cos	6·27	827	828	+0·6
21	cos	6·71	026	027	+1·2
22	cos	7·46	576	574	−1·6
25	sin	8·52	462	463	+1·4
26	sin	9·04	397	396	−0·7
27	sin	9·96	060	061	+1·0
34	sin	13·36	871	872	+1·1
42	sin	17·06	299	298	−0·6
47	cos	19·76	704	702	−1·7
54	sin	23·25	387	386	−1·4
79	cos	35·87	856	855	−0·7
80	cos	36·31	495	494	−0·6
81	cos	36·56	353	352	−0·7
85	sin	38·99	475	474	−0·6
89	cos	40·77	709	708	−0·8
89	cos	40·87	618	619	+0·7
92	sin	42·11	610	611	+0·8
97	sin	44·76	867	866	−0·6

TABLE II—Tangents

page	x °	for	read	error
12	2·27	971	972	+0·6
17	4·59	242	243	+0·9
29	10·59	428	427	−0·6
37	14·88	569	568	−0·8
37	14·92	323	324	+1·0
45	18·83	216	215	−0·8
45	18·84	700	699	−0·7
62	27·49	523	524	+1·1
75	33·79	894	893	−0·9
81	36·98	692	691	−0·7
85	38·82	553	552	−0·7
87	39·66	736	735	−0·6

TABLE III—Cotangents

page	x °	for	read	error
12	2·07	078	077	−1·3
12	2·27	227	224	−3·2*
12	2·29	670	667	−3·0*
14	3·24	099	029	−7·0*
14	3·42	251	250	−1·0
15	3·51	153	158	+5*
17	4·59	027	026	−1·3
21	6·66	885	886	+1·4
21	6·74	093	095	+2·4*
21	6·87	905	906	+1·2
23	7·88	360	361	+1·1
23	7·89	621	622	+1·0
24	8·31	853	854	+1·2
24	8·39	749	750	+1·0
25	8·64	140	141	+1·1
26	9·27	493	495	+1·6
26	9·28	305	307	+1·6
26	9·43	438	437	−1·4
28	11·19	992	993	+1·4
31	11·82	967	968	+1·0
34	13·24	731	730	−1·2
34	13·41	132	133	+1·1
35	13·52	037	038	+1·1
37	14·88	626	627	+1·2
38	15·36	019	020	+1·2
40	16·18	125	126	+1·0
94	43·36	504	503	−1·4

* These values, and the corresponding differences, should be corrected, even if the remaining errors are considered negligible.

TABLE IV—Brocot's Tables of Gear Ratios

page	N	D	for	read	authority
148	3	106	·02830 187	··· 189	J
148	3	86	Omitted	·03488 372	M; J
148	3	70	Omitted	·04285 714	M; J
149	7	79	·08860 760	··· 759	J
150	9	67	·13432 856	··· 836	J
151	13	72	·18055 555	··· 556	J
152	22	101	·21789 178	·21782 178	J
153	28	103	·27184 465	··· 466	J
154	32	113	·28318 585	··· 584	J
155	38	107	·35513 919	·35514 019	J
156	33	85	·38823 530	··· 529	J
156	46	117	·39316 293	··· 239	J
156	41	[100]	D = 00	D = 100	M
157	41	97	·42268 042	··· 041	J
157	46	103	Omitted	·44660 194	M; J
157	31	72	·43055 555	··· 556	J
157	39	79	·49367 087	··· 089	J
157	50	101	·49504 951	··· 950	J
159	41	79	Omitted	·51898 734	M; J
161	67	105	·63803 524	·63809 524	J
162	59	89	·66291 135	·66292 135	J
165	62	79	·78481 083	··· 013	J
166	61	73	·83561 484	··· 644	J
166	98	117	·83760 601	··· 684	J
167	95	[119]	D = 119	D = 109	M
168	44	[87]	D = 87	D = 47	M
168	107	112	·95535 710	··· 714	J

L. J. C.

In *Math. Gazette*, v. 26, Dec. 1942, p. 226–230, J. C. P. Miller has an article entitled "The decimal subdivision of the degree," which is also a review of Buckingham's book. Many of the facts stated above were first published in this article; for example, besides the 7 errors credited to M in Table IV, 12 more of the others were also published in his own review. —EDITOR.

UNPUBLISHED MATHEMATICAL TABLES

In *MTAC*, p. 27, we referred to an unpublished ms. of the late A. J. C. CUNNINGHAM giving the complete factorization of $n^2 + 1$ for $1 \leqq n \leqq 15{,}000$. Through L. J. Comrie we were informed by a letter, dated 5 May 1943, from A. E. Western, custodian of the Cunningham mss. of the London Mathematical Society, that this ms., as well as others, and many of the Society's books, housed in the library of University College, London, were destroyed by an enemy air raid.

4[L].—PROJECT FOR COMPUTATION OF MATHEMATICAL TABLES, *Spherical Bessel Functions.* Ms. in possession of the Project.

The Spherical Bessel Functions

$$Q_n(x) = \sqrt{\frac{\pi}{2x}}\, J_{n+\frac{1}{2}}(x)$$

occur in a wide variety of problems of wave motion, potential theory, heat conduction and quantum mechanics. The Project's preliminary manuscript is of the functions $Q_n(x)$ for $n = 0, \pm 1, \pm 2, \cdots, \pm 21$ and $x = [0(0.01)10; 8S\text{–}10S]$, with second and fourth central differences. It is contemplated to extend this table for values of n ranging from -20 to -35, $n = 20$ to $n = 35$ and for $x = [10(0.1)30$; about 7S].