THE NEW MEROLOGY

by Lee Sallows

Old merology, or “that branch of anatomy that deals with the elementary tissues and fluids of the body” (*Oxford English Dictionary*), we know about. What of the new?

In the November 1989 *Word Ways*, Dave Morice pointed to the lack of self-descriptive English number words whose gematric value (using A = 1, B = 2, etc.) is equal to the number indicated by the word. “However,” he went on, “perfect number names can be found in neo-alphabets whose letters have been rearranged to accommodate the letter values.”

Neo-alphabets? Alphabets using the 26 letters of the alphabet in *non*-alphabetical order? I call this logological heresy. If I may paraphrase Kronecker: God constructed the alphabet, everything else is the work of Man. Depart from this principle and logology is lost.

But like Morice and others he mentions, the failure of “perfect” or *self-descriptive* numbers to exist bothered me too. In the search for agreement between numbers and letters the best I could manage was the following gematric hat trick:

The gematric constant of this sentence is six hundred fifty three .
(33+76+106+21+56+85+28+52+74+122 = 653)
This is a beastly text: numerological constant of six-six-six .
(56+28+1+84+69+145+106+21+156 = 666)
Double check: E = 5, O = 15, so the Number of the Boast is six hundred *seventy* six.
(59+30+5+15+34+33+73+21+33+57+238+52+74+110+52 = 676)

This was challenging to complete, but the result is tedious to verify and thus anything but crisp in impact. Furthermore it is simply not the animal sought. However, at length a new approach to perfect number names suggested itself.

Observe that in Morice’s rearrangment scheme every letter retains a value in the range 1 to 26, but differently ordered. However, I suggest now is the time to stop thinking in terms of positions and to see this as simply a reallocation of numbers to letters. This view not only dispenses with neo-alphabets, it reminds us that we are free to assign values to letters at will. Any values. Not merely those between 1 and 26, or indeed whole numbers only. The time-honoured practice of linking each letter to its position number is an expendable convention. New merology takes this as its starting point.

Suppose ONE is a ‘perfect’ number name. Then O+N+E = 1 by definition. Clearly, either O, N, and E are not whole numbers or at least one of them must be negative. Leaving non-integral numbers for future consideration, we allow negative integers and explore further. Now N and E also occur in both NINE and TEN, and perhaps these are perfect numbers too. Let us assume so, and suppose further that the values of E and N are already fixed. Then by elementary algebra, O = 1 – N – E, I = 9 – 2N – E, and T = 10 – N – E. Three new letter values have now been established, but we can do more. Perhaps TWO is a perfect number name as well. If so, W = 2 – T – O, and T and O are already identified.

At this stage a question arises. Suppose E = 4 and N = 2. Then T, which is 10 – N – E, equals 4, the same value as E. Are different letters to share identical values? The notion offends a basic principle of gematria. Accordingly, we make it an axiom that the identity of each letter must be reflected in a unique numerical value. For the sake of discussion let E = 1 and N = 2. This entails I = 4, T = 7, O = –2, and W = –3. All distinct. ONE, TWO, NINE and TEN are now perfect. Can we go further?

Suppose THREE is perfect. Then H = 3 – T – R – 2E, but R is unknown. Trial and error must suffice.Choosing the first positive integer not yet used, let H = 3. This makes R = 3 – T – H – 2E = –9, a new integer. Then FOUR may be perfect as well. This would mean F = 4 – O – U – R , with U still unknown. As before, 1, 2, 3, and 4 having been allocated, we set F = 5 and see what happens. It works: U = 4 – F – O – R = 10, another new addition. This brings us to FIVE, which implies V = 5 – I – F – E = –5. Different again. The numbers employed so far are: –9, –5, –3, –2, 1, 2, 3, 4, 5, 7, 10. ONE, TWO, THREE, FOUR, FIVE, NINE and TEN are now perfect.

SIX is our next candidate, but it contains two unknowns: S and X. Better to try SEVEN first, whence S = 7 – V – 2E – N = 8. Another fresh face. And now that we know S, X = 6 – S – I = –6. Yet a new number. We arrive thus at EIGHT, from which G = 8 – E – I – H – T = –7. Again original. NINE and TEN have already been dealt with. Dare we try further? Fifteen letters appear in the English number names from ONE through NINETEEN: E, F, G, H, I, L, N, O, R, S, T, U, V, W, X. Fourteen have been accounted for. The only remaining one, L, appears in both ELEVEN and TWELVE, from which L = 11 – 3E – V – N = 12 – T – W – V – 2E. Is it possible that both expressions evaluate to the same number, and that this is one hitherto unused? It is. The number is 11.

We pause for assessment. Combining algebra with serendipity, the values of 15 letters have been established:

E	F	G	H	I	L	N	O	R	S	T	U	V	W	X
1	5	-7	3	4	11	2	-2	-9	8	7	10	-5	-3	-6

Ignoring sign (and the few consequent repetitions), these numbers make up the consecutive set 1,2,3,4,5,6,7,8,9,10,11. Under these assignments the gematric values of ONE through TWELVE equal 1 through 12. The next question is obvious. Will

THIRTEEN turn out to be unlucky, as numerologists have ever insisted? Neomerology now supplants superstition with rigorous proof.

From arithmetic we know that 13 = 3 + 10. Hence, assuming that THREE, TEN and THIRTEEN are all perfect, we have T+H+I+R+T+E+E+N = T+H+R+E+E + T+E+N. But cancelling common letters on both sides yields I = E, which is to say I and E must share the same value, contrary to axiom. Thus, irrespective of letter values selected, if it includes THREE and TEN, no unbroken run of perfect numbers can exceed TWELVE. Which is to say, for perfectionists THIRTEEN is unlucky.

Having failed at the higher end, can we extend to ZERO at the lower? But in that case Z = 0 – E – R – O = 10, the same value as U. As yet though we have considered only one set of assignments. Using different numbers the goal is achievable. Consider the following allocations:

E	F	G	H	I	L	N	O	R	S	T	U	V	W	X	Z
3	9	6	1	−4	0	5	−7	−6	−1	2	8	−3	7	11	10

Not only is Z now included but the 16 unsigned integers again comprise a consecutive set, 0,1,2,3,4,5,6,7,8,9,10,11, to yield:

Z+E+R+O	=	10 + 3 − 6 − 7	=	0
O+N+E	=	−7 + 5 + 3	=	1
T+W+O	=	2 + 7 − 7	=	2
T+H+R+E+E	=	2 + 1 − 6 + 3 + 3	=	3
F+O+U+R	=	9 − 7 + 8 − 6	=	4
F+I+V+E	=	9 − 4 − 3 + 3	=	5
S+I+X	=	−1 − 4 + 11	=	6
S+E+V+E+N	=	−1 + 3 − 3 + 3 + 5	=	7
E+I+G+H+T	=	3 − 4 + 6 + 1 + 2	=	8
N+I+N+E	=	5 − 4 + 5 + 3	=	9
T+E+N	=	2 + 3 + 5	=	10
E+L+E+V+E+N	=	3 + 0 + 3 − 3 + 3 + 5	=	11
T+W+E+L+V+E	=	2 + 7 + 3 + 0 − 3 + 3	=	12

The letter values selected here are far from forming a unique solution. So weak are the interdependencies imposed by English orthography that the number of different solution sets using integers below a given ceiling is surprisingly large. No fewer than 153 exist using integers between –15 and 15, for instance. Moreover, since there is no upper limit on allowable integers new solutions can be found without bound.

But is the above a *minimal* solution in the sense of using the lowest possible values (when ZERO is included)? The answer to this and related questions has been given by a simple computer program. The algorithm works similarly to the approach explained, with nested DO-loops trying out all possible values in systematically incremented steps (details available from lee.sal@inter.nl.net).In fact the above solution is one of two sets coming in second place to the minimal solution. Alas, the latter lacks an 8 or –8 needed to form a complete consecutive set:

E	F	G	H	I	L	N	O	R	S	T	U	V	W	X	Z
−2	−6	0	−7	7	9	2	1	4	3	10	5	6	−9	−4	−3

Ideal Maps

So far we have looked at three solution sets, each of them using integers less than 12. As a result, they share an interesting reflexive property: the values assigned to the letters are themselves numbers occurring within the range of perfect number names they produce. (I refer here to the absolute or unsigned letter values used; henceforth unsigned values can be assumed whenever numbers, integers or values are mentioned). Now, since there are 16 different letters and only 13 possible number names (ZERO through TWELVE), some of those values must occur twice. The minimal set shows six such repeats: E,N (both 2), S,Z (both 3), R,X (both 4), F,V (both 6), H,I (both 7), and L,W (both 9). But suppose we relax the demand for a serial sequence of perfect numbers and take in all possibilities. Could there exist a set of entirely distinct letter values giving rise to an *identical* set of perfect number names? Or, more realistically, giving rise to a set that *includes* all of its letter values? Call such a set of assignments an *ideal map*. A near miss discovered is one containing 15 rather than 16 different integers:

E	F	G	H	I	L	N	O	R	S	T	U	V	W	X	Z
0	–10	9	–8	1	–7	4	–3	5	–11	6	12	14	–1	16	–2

The numbers employed here are 0 through 12, plus 14 and 16, almost the lowest sixteen integers. As previously, we find ZERO through TWELVE are perfect, but now E = 0, so that T+E+E+N is equal to T+E+N, whereby FOURTEEN and SIXTEEN (as well as SEVENTEEN and NINETEEN) are also self-descriptive. It is a pity that this almost flawless gem is spoiled by the 1 and –1.

Even so, it creates a basis for an impressive display of number magic. To perform this, make up a set of cards, each showing one of the above letters together with its associated number on the same side of the card. You will need three cards bearing E/0 and two with N/4, for a total of 19 cards. Lay them out from left to right with the numbers in serial order. Point out to your audience that every letter has its own number and that, ignoring sign, these run from 0 through 16, excluding 13 and 15. Get someone to choose one of the numbers. The (unsigned) integer named is now spelled out by assembling the appropriate letters in order, whereupon their associated numbers are added up aloud by the demonstrator to reveal the magical identity. The surprise this produces is gratifying. Aside from the small integers it uses, another nice feature is that naughty attempts to spell out THIRTEEN and FIFTEEN are nicely foiled through lack of a second T or F.

At the price of larger integers, however, unblemished specimens can yet be found. We note that extension beyond NINETEEN will bring in Y, while if ZERO drops out, Z may disappear. Here follow two examples:

E	F	G	H	I	L	N	O	R	S	T	U	V	W	X	Y
8	–24	–11	–20	25	3	–12	5	1	7	6	22	–4	–9	–26	21
7	20	–6	24	–8	–1	5	–11	–26	2	–9	21	–14	22	12	4

Observe in each case that besides the 16 numbers appearing, TWENTY through TWENTY-NINE are all perfect, as are ONE through NINE, ELEVEN, TWELVE, FOURTEEN, SIXTEEN, SEVENTEEN and NINETEEN. In the first, setting Z = –14 will make ZERO perfect, resulting in an ideal map of 17 letters. These examples represent the lowest integer solutions so far unearthed. Probably they can be improved upon. However, the task of generating ideal maps should not be underestimated.

One further example is worth presenting. Sixteen distinct numbers occur in the following, eight positive, eight negative. This lends itself to display on a checkerboard:

E 4	I 17	N 2	S 16
L 24	F 9	T 20	R 6
W 25	U 12	G 22	O 7
V 1	X 27	Y 11	H 3

Choose any number on the board. Call out the letters that spell its name, adding up their associated numbers when on white squares, subtracting when on black. Their sum is the number you selected.

Related to the above is the question of seeking letter values that maximize the perfect number names produced. Again, this is trickier than first sight suggests. In my best solution to date, as before ZERO through NINE, ELEVEN, TWELVE, FOURTEEN, SIXTEEN, SEVENTEEN, and NINETEEN are perfect. But now, so also are TWENTY through FORTY-NINE, making a total of 46 self-descriptive number words under ONE HUNDRED:

E	F	G	H	I	L	N	O	R	S	T	U	V	W	X	Y	Z
–11	21	10	–1	–8	27	14	–2	8	12	18	–23	3	–14	2	–5	5

Staying under ONE HUNDRED, can anyone improve on this?

Ross Eckler has pointed out that the list of 46 can be doubled to 92 by proper choice of the D's in (ONE) HUNDRED, 92 doubled again through proper choice of the A in THOUSAND, and so on with M in MILLION, B in BILLION, Q in QUADRILLION, P in SEPTILLION, and C in OCTILLION. This leads to a grand total of $128 \times 46 = 5888$ perfect number names.

Perfect Number Names in French

The behaviour of the French perfect number names is so different from English that they merit a glance. Seventeen letters are employed: A,C,D,E,F,H,I,N,O,P,Q,R,S,T,U,X,Z. Working out correlations among the admissible values as dictated by UN, DEUX, TROIS, etc., holds such a surprise that I urge readers who enjoy (logo)logical deduction to stop reading now and try it for themselves. The following paragraph gives a good idea of the reasoning involved.

In the first place, in French it is not TREIZE (13) but QUATORZE (14) that is unlucky. The proof is neat. Subtracting QUATRE (4) from QUATORZE shows that O + Z = 14 – 4 = 10. Now O and Z occur in ONZE (11). Hence ONZE – (O + Z) = N + E = 11 – 10 = 1. But 1 is UN. Thus U + N = N + E, from which U = E. A perfect number run including QUATRE and ONZE therefore cannot exceed TREIZE. C'est tout.

In a similar series of deductions the relations among ZERO, UN, DEUX, TROIS, QUATRE, CINQ, SIX, SEPT, HUIT, NEUF, DIX, ONZE, DOUZE, and TREIZE can also be uncovered. What fascinates me is the rigidity of the interlocking pattern thus disclosed. Amazingly, of the 17 letters involved, nearly three quarters are expressible as simple arithmetic functions of just one letter, N. That is to say, in assigning a value to N, the values of eleven other letters are simultaneously decided! The completed analysis looks like this:

A = *	F = 13−3N	O = 0	S = 2N−4	Z = 16−4N
C = A−5N−4	H = 4N−11	P = 2	T = 14−5N	
D = 2N	I = 2N+4	Q = 2N+5−A	U = 1−N	
E = 3N−5	N = *	R = N−11	X = 6−4N	

Notice that besides the 11 values determined with N, although A can be assigned any number (provided it is different from the others), C and Q are then defined, while O and P are the fixed constants 0 and 2. Such a tight pattern of correlations means the existence of a solution set cannot be taken for granted. Nevertheless, trying in turn N = 1, 3, 4, …, the first solution occurs when N = 7. It is not difficult to see that this is made minimal by setting A = 20:

A	C	D	E	F	H	I	N	O	P	Q	R	S	T	U	X	Z
20	−19	14	16	−8	17	18	7	0	2	−1	−4	10	−21	−6	−22	−12

The perfect French number names are then as follows:

Z+E+R+O	=	−12+16−4	=	0
U+N	=	−6+7	=	1
D+E+U+X	=	14+16−6−22	=	2
T+R+O+I+S	=	−21−4+0+18+10	=	3
Q+U+A+T+R+E	=	−1−6+20−21−4+16	=	4
C+I+N+Q	=	−19+18+7−1	=	5
S+I+X	=	10+18−22	=	6
S+E+P+T	=	10+16+2−21	=	7
H+U+I+T	=	17−6+18−21	=	8
N+E+U+F	=	7+16−6−8	=	9
D+I+X	=	14+18−22	=	10
O+N+Z+E	=	0+7−12+16	=	11
D+O+U+Z+E	=	14+0−6−12+16	=	12
T+R+E+I+Z+E	=	−21−4+16+18−12+16	=	13

Again, the absence of any upper bound on assignable values means that although more thinly spread than their English counterparts, the number of different solutions is unlimited.

Final Remarks

It ought to be clear by now that the foregoing is merely an initial step in a field that may well yield more to the spade. Less clear is whether we are dealing here with recreational linguistics or mathematics. Personally I find great attraction in the no-man's-land between the two. What more might computational isopsephy have to offer?

In the first place there are the perfect number names in the remaining alphabetic languages, as yet to be examined. Beyond these stranger structures may await. For instance, notice that we are not bound to assign numbers so as to produce only perfect numbers. Consider the following assignments:

	E	F	G	H	I	L	N	O	R	S	T	U	V	W	X	Z
(a)	7	−4	−5	2	−2	6	−7	−1	−9	−8	−10	10	−6	9	4	3
(b)	2	13	12	−10	−1	3	11	−11	−5	5	16	10	−3	−2	9	14
(c)	2	−7	10	−6	6	−5	1	−1	9	−2	−3	4	5	7	3	−9

And the gematric sums:

			(a)	(b)	(c)
Z+E+R+O	=		0	0	1
O+N+E	=		-1	2	2
T+W+O	=		-2	3	3
T+H+R+E+E	=		-3	5	4
F+O+U+R	=		-4	7	5
F+I+V+E	=		-5	11	6
S+I+X	=		-6	13	7
S+E+V+E+N	=		-7	17	8
E+I+G+H+T	=		-8	19	9
N+I+N+E	=		-9	23	10
T+E+N	=		-10	29	0

(a) yields the negative integers, (b) the first ten prime numbers, while (c) maps each number word onto its successor (modulo 10). That is, starting with any number (say EIGHT) and moving in steps as follows: EIGHT to 9, NINE to 10, TEN to 0, ZERO to 1, etc., ten steps will always return us to our starting point. Variations on these themes will occur to readers. The above are merely curiosities, suggestive of the potential.

A final item of interest in the present context is to see what happens when a *reflexicon* or self-descriptive word list is encoded by replacing its letters with perfect number producing integers. Reflexicons occur in different formats. Low totals and absence of plural S are convenient in this case:

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TWELVE E,     FIVE R,
SIX F,        FIVE S,
THREE H,       SIX T,
SEVEN I,     THREE U,
TWO L,         SIX V,
TWO N,        FOUR W,
FIVE O,       FOUR X.
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The number of E's in the list is twelve, the number of F's is six, etc. Any of our previous examples will provide integers to substitute for the letters. In doing so, it is useful to reverse items and add brackets so that, for instance, TWELVE E becomes E(TWELVE). The result of this is a single mathematical expression consisting of a sum of products:

```
 1(7-3+1+11-5+1) + -9(5+4-5+1)    +
 5(8+4-6)        +  8(5+4-5+1)    +
 3(7+3-9+1+1)    +  7(8+4-6)      +
 4(8+1-5+1+2)    + 10(7+3-9+1+1)  +
11(7-3-2)        + -5(8+4-6)      +
 2(7-3-2)        + -3(5-2+10-9)   +
-2(5+4-5+1)      + -6(5-2+10-9)   .
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Predictably, this is no longer an ordinary sum such as might be set in a test on Erasmus. Thanks to perfect numbers, the self-descriptive property is retained. Here the sums of the terms in parentheses tell how many times the associated multiplier occurs in the entire expression. Integer 1 occurs (7–3+1+11–5+1) = 12 times, –2 occurs (5+4–5+1) = 5 times, for instance. But curiously, since the above set of numbers is just one among many that might be used, the reflexicon is revealed as a template defining an infinite family of self-descriptive sums. A strange fusion of algebra, cryptanalysis and logology!

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Einschwein's Magic Numbers

Paying a recent call on my old friend Professor Einschwein, the world famous Transylvanian logologist, I was priviledged to learn about his latest numerological invention. Drawing forth a curious pack of cards, he showed me that each card bore a single letter of the alphabet on one side and a single integer, sometimes positive, sometimes negative, on the other.

"You see that every distinct letter is paired with its own distinct number on the reverse side, and that some cards are duplicated." I verified this, noting a total of 20 cards showing the 16 letters E,F,G,H,I,L,N,O,R,S,T,U,V,W,X,Y,Z but with three cards for E, two for N and two for T.

"Now observe carefully," he said. Spreading out the cards on the table, the Professor carefully selected four, sliding them with his index finger into a single line so as to spell the word ZERO. Next, turning the cards over one by one, he invited me to add up the numbers so revealed. Their sum was zero. "That's cute," I responded, "but don't I recall seeing something along these lines in a recent *Word Ways*?" "Have patience," he purred, "we are not finished.. Check me at every step."

Einschwein continued in the same vein, ZERO followed by ONE, TWO, THREE, etc., until he had reached TWELVE. I watched him like a hawk throughout. There was no question of any new cards being palmed. Each time, the cards needed were slid into line as before and then turned over. The sum of the numbers always tallied with the number word spelled. "It's a nice trick, Professsor," I said. "But that's it; you can't get beyond TWELVE. THIRTEEN is unlucky, as proved in that article I saw in the February 1990 issue, '*The New Merology*'.

Slowly and deliberately he lined up the letters to spell THIRTEEN. With a sinking feeling I saw him turn the cards over one by one. Incredibly, their sum was indeed 13.

"But this is against logic!" I cried. "Not only do I recall the earlier imposssibility proof that cancelling common letters in the equation T+H+I+R+T+E+E+N = T+H+R+E+E +

T+E+N shows that I = E, and thus I and E could never have different values. We can go even further. From N+I+N+E = 9, we know that I = 9-2N-E. But since I = E, then E = 9-2N-E, from which 2E = 9-2N. Yet, since 2E is even, while 9-2N must be odd, we have a contradiction. Thus, if THREE, NINE and TEN are self-descriptive, no assignment of numbers, distinct or otherwise could ever make THIRTEEN perfect as well!"

"For vy you are shouting at me already?" cried Einschwein plaintively, his Transylvanian accent momentarily in the ascendent. "You vant ve should repeat ze demonstration for you all over again?"

Question: What were the numbers on Einschwein's magic deck of cards?

[This appeared in *Word Ways*, August 1991. pp165-6]

<u>Answer</u>

There are various possibilities for the numbers on Einschwein's cards. Here is one set showing small integers:

E	F	G	H	I	L	N	O	R	S	T	U	V	W	X	Z
0	14	-2	9	-3	11	6	-5	-10	7	4	5	-6	3	2	15

Using these numbers, ZERO to TWELVE are perfect, while it seems THIRTEEN = 10. However, the Professor is not called Einschwein for nothing; in turning card N he does it so that the resulting number is "9" not "6". Hence THIRTEEN becomes 10+3 = 13.

The same trick can be worked in innumerable different ways. In the following, by reversing card R to make "6" from "9", besides ZERO to TWELVE, both THIRTEEN and FOURTEEN become perfect:

E	F	G	H	I	L	N	O	R	S	T	U	V	W	X	Z
3	-18	11	-19	6	-12	0	-2	9	-13	7	15	14	-3	13	-10

SPANAGRAMS

In “The New Merology” (*Word Ways,* February 1990) I discussed how distinct integers could be assigned to letters so as to produce “perfect” English number words whose gematric value is then equal to the number named. As was shown, THIRTEEN is unlucky: starting from ZERO, ONE, TWO, …, a consecutive run of perfect numbers cannot exceed TWELVE. The same article also examined French, for which QUATORZE turns out to be unlucky. Recently I decided to look at Spanish.

The Spanish cardinals begin as follows: 0 = CERO, 1 = UNO, 2 = DOS, 3 = TRES, 4 = CUATRO, 5 = CINCO, 6 = SEIS , 7 = SIETE, 8 = OCHO, 9 = NUEVE, 10 = DIEZ, 11 = ONCE, 12 = DOCE, 13 = TRECE, and 14 = CATORCE. Using elementary algebra, from UNO we see that U = 1 – N – O; from ONCE that C + E = 11 – O – N; from DOCE that D = 12 – O – (C + E) = N + 1. Thus, from DOS, S = 2 – D – O = 1 – N – O, which is the same value as U. A consecutive perfect number run using distinct values for each letter therefore cannot exceed ONCE. In short, DOCE is unlucky.

Using a simple computer program similar to that mentioned in the previous article, the smallest set of values for perfecting CERO to ONCE then reveal themselves as:

A	C	D	E	H	I	N	O	R	S	T	U	V	Z
-9	20	4	7	10	-19	-5	-11	-16	9	3	17	-17	18

which yields:

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C+E+R+O      = 20+7-16-11        =  0
U+N+O        = 17-5-11           =  1
D+O+S        =  4-11+9           =  2
T+R+E+S      =  3-16+7+9         =  3
C+U+A+T+R+O  = 20+17-9+3-16-11   =  4
C+I+N+C+O    = 20-19-5+20-11     =  5
S+E+I+S      =  9+7-19+9         =  6
S+I+E+T+E    =  9-19+7+3+7       =  7
O+C+H+O      = -11+20+10-11      =  8
N+U+E+V+E    = -5+7+17-17+7      =  9
D+I+E+Z      =  4-19+7+18        = 10
O+N+C+E      = -11-5+20+7        = 11
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The focus of this note, however, is less on these perfect numbers than it is on a discovery made along the way. In preparing the program to look for integer assignments, first a number of simultaneous linear equations must be solved. This is because for a given language the value of certain letters will depend on those of others, subject to spelling.

The program has to know about these relations. Examining the equations involved for Spanish, certain peculiarities in the results emerging under my pencil seemed to imply that

U+N+O +	C+A+T+O+R+C+E =	C+U+A+T+R+O +	O+N+C+E
(1)	(14)	(4)	(11)

irrespective of the values assigned to the letters involved.

It took me a while to digest the import of this. Having done so, and controlling my excitement, I continued with the equation solving. Ten minutes later this self-control seem justified. The truth is that nobody is more error prone than I am when it comes to doing sums. It seemed I had fouled things up yet again since the results now coming out could only imply that:

D+O+S +	T+R+E+C+E =	T+R+E+S +	D+O+C+E
(2)	(13)	(3)	(12)

again*, irrespective of the values assigned to the letters involved*.

The patent absurdity of these conclusions so irritated me with my own inability to calculate that I decided to drop the whole thing until the fog had cleared from my brain. Returning to it later however, it took three separate re-checks to convince myself of what seemed (and still seems) incredible and wonderful: in the above equations the sum of the numbers named on the left-hand side is of course the same as the sum of the numbers named on the right-hand side. But in addition, the left-hand side is a perfect *anagram* of the right-hand side! They are in fact Spanish counterparts to the well known single English example ONE + TWELVE = TWO + ELEVEN. That both Spanish examples sum to 15 is a further bonus thown in by the gods. (They remain anagrams when expressed in digits or Roman numerals, also). The same cardinals can therefore be regrouped to form more extraordinary anagrammatic equations, such as:

30 = UNO + DOS + TRECE + CATORCE = CUATRO + TRES + ONCE + DOCE = 30
30 = UNO + TRES + DOCE + CATORCE = DOS + CUATRO + ONCE + TRECE = 30

I should be interested if any reader can supply a reference to any previous discovery of these anagrams.

[The above article first appeared in *Word Ways*, February 1992, Vol 25, No.1]

Rare Maps For Collectors

Three previous articles in *Word Ways* [1,2,3] have discussed ways of mapping distinct integers onto letters so as to produce "perfect" or self-descriptive number-names. So far English, French, and Spanish have been examined. Glancing next at German, the same pencil and paper plus computer program approach already outlined in [1] can be used to find mappings such as :

A	B	C	D	E	F	G	H	I	L	N	O	R	S	T	U	V	W	Z
-1	-4	-5	-9	10	-2	22	-7	-3	3	-10	16	5	4	21	19	-8	-22	17

from which:

```
E+I+N+S      =  10-3-10+4      =  1     S+I+E+B+Z+E+H+N = [7]+[10]  = 17
Z+W+E+I      =  17-22+10-3     =  2     A+C+H+T+Z+E+H+N = [8]+[10]  = 18
D+R+E+I      = -9+5+10-3       =  3     N+E+U+N+Z+E+H+N = [9]+[10]  = 19
V+I+E+R      = -8-3+10+5       =  4     Z+W+A+N+Z+I+G               = 20
F+Ū+N+F      = -2+19-10-2      =  5     E+I+N+U+N+D+Z+W+A+N+Z+I+G   = 21
S+E+C+H+S    =  4+10-5-7+4     =  6           .
S+I+E+B+E+N  =  4-3+10-4+10-10 =  7           .
A+C+H+T      = -1-5-7+21       =  8     D+R+E+I+S+S+I+G             = 30
N+E+U+N      = -10+10+19-10    =  9     E+I+N+U+N+D+D+R+E+I+S+S+I+G = 31
Z+E+H+N      =  17+10-7-10     = 10           .
E+L+F        =  10+3-2         = 11           .
Z+W+Ō+L+F    =  17-22+16+3-2   = 12     V+I+E+R+Z+I+G               = 40
D+R+E+I+Z+E+H+N   = [3]+[10]   = 13     E+I+N+U+N+D+V+I+E+R+Z+I+G   = 41
V+I+E+R+Z+E+H+N   = [4]+[10]   = 14           .
F+Ū+N+F+Z+E+H+N   = [5]+[10]   = 15           .
S+E+C+H+S+Z+E+H+N = [6]+[10]   = 16     N+E+U+N+U+N+D+V+I+E+R+Z+I+G = 49
```

This unbroken run from 1 up to 49 puts German far in front of the other three languages, the best of which, French, reaches only 14. Note that because VIERZIG is 40 and VIER is 4, Z+I+G must equal 36. Therefore, FŪNFZIG must always be 5+36, or 41, not 50.

<u>*Astrologology*</u>

Looking beyond cardinals, the same idea can be extended to other groups of words. Kickshaws for May 1991 included the following example using *consecutive* integers applied to the names of the months:

-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	0	1	2	3	4	5	6	7	8	9	10
B	J	F	G	S	D	N	R	M	L	A	T	P	H	O	C	I	Y	V	E	U

J+A+N+U+A+R+Y	=	-9+0-4+10+0-3+7	=	1
F+E+B+R+U+A+R+Y	=	-8+9-10-3+10+0-3+7	=	2
M+A+R+C+H	=	-2+0-3+5+3	=	3
A+P+R+I+L	=	0+2-3+6-1	=	4
M+A+Y	=	-2+0+7	=	5
J+U+N+E	=	-9+10-4+9	=	6
J+U+L+Y	=	-9+10-1+7	=	7
A+U+G+U+S+T	=	0+10-7+10-6+1	=	8
S+E+P+T+E+M+B+E+R	=	-6+9+2+1+9-2-10+9-3	=	9
O+C+T+O+B+E+R	=	4+5+1+4-10+9-3	=	10
N+O+V+E+M+B+E+R	=	4+4+8+9-2-10+9-3	=	11
D+E+C+E+M+B+E+R	=	-5+9+5+9-2-10+9-3	=	12

The above is one of six possible assignments all using the integers from –10 to +10. If this seems surprising, note that the same trick can be worked for the seven days of the week using the integers from –7 to +7 in no less than 664 different ways! One example is seen here:

-7	-6	-5	-4	-3	-2	-1	0	1	2	3	4	5	6	7
S	R	O	E	M	U	N	F	I	D	Y	H	T	A	W

S+U+N+D+A+Y	=	-7-2-1+2+6+3	=	1
M+O+N+D+A+Y	=	-3-5-1+2+6+3	=	2
T+U+E+S+D+A+Y	=	5-2-4-7+2+6+3	=	3
W+E+D+N+E+S+D+A+Y	=	7-4+2-1-4-7+2+6+3	=	4
T+H+U+R+S+D+A+Y	=	5+4-2-6-7+2+6+3	=	5
F+R+I+D+A+Y	=	0-6+1+2+6+3	=	6
S+A+T+U+R+D+A+Y	=	-7+6+5-2-6+2+6+3	=	7

Alternatively, astrology identifies each month with a sign of the Zodiac: January-Aquarius, February-Pisces, March-Aries, April-Taurus, May-Gemini, June-Cancer, July-Leo, August-Virgo, September-Libra, October-Scorpio, November-Sagittarius and December-Capricorn. Distinct integers can be assigned to the 17 letters of the Zodiac as follows:

A	B	C	E	G	I	L	M	N	O	P	Q	R	S	T	U	V
-3	-8	7	-4	9	4	11	-2	-6	0	-7	-9	5	1	-5	3	-10

to yield:

A+Q+U+A+R+I+U+S	=	-3-9+3-3+5+4+3+1	=	1
P+I+S+C+E+S	=	-7+4+1+7-4+1	=	2
A+R+I+E+S	=	-3+5+4-4+1	=	3
T+A+U+R+U+S	=	-5-3+3+5+3+1	=	4
G+E+M+I+N+I	=	9-4-2+4-6+4	=	5
C+A+N+C+E+R	=	7-3-6+7-4+5	=	6
L+E+O	=	11-4+0	=	7
V+I+R+G+O	=	-10+4+5+9+0	=	8
L+I+B+R+A	=	11+4-8+5-3	=	9
S+C+O+R+P+I+O	=	1+7+0+5-7+4+0	=	10
S+A+G+I+T+T+A+R+I+U+S	=	1-3+9+4-5+5-3+5+4+3+1	=	11
C+A+P+R+I+C+O+R+N	=	7-3-7+5+4+7+0+5-6	=	12

The above assignments are the smallest set of integers to produce a solution. One using consecutive integers is impossible. On the other hand, astrology also associates the signs of the Zodiac with heavenly bodies: sun, moon or planet in each case. However, nine planets plus one sun and and one moon do not make twelve, so that a simple one on one relation cannot obtain. An alternative is to take the nine planets in order of their distance from the sun, a mapping that *can* be achieved with consecutive values:

-8	-7	-6	-5	-4	-3	-2	-1	0	1	2	3	4	5	6	7	8
J	H	M	L	C	N	V	T	U	R	I	S	E	Y	A	P	O

S+U+N	=	3+0-3	=	0
M+E+R+C+U+R+Y	=	-6+4+1-4+0+1+5	=	1
V+E+N+U+S	=	-2+4-3+0+3	=	2
E+A+R+T+H	=	4+6+1-1-7	=	3
M+A+R+S	=	-6+6+1+3	=	4
J+U+P+I+T+E+R	=	-8+0+7+2-1+4+1	=	5
S+A+T+U+R+N	=	3+6-1+0+1-3	=	6
U+R+A+N+U+S	=	0+1+6-3+0+3	=	7
N+E+P+T+U+N+E	=	-3+4+7-1+0-3+4	=	8
P+L+U+T+O	=	7-5+0-1+8	=	9

Chromatic Codes

Turning to a quite different area, the International Color Code is much used in the electronics industry for indicating component values, the ohmic value of resistors especially. The code assigns colors in spectral order to the ten decimal digits, 0-9, as follows: BLACK = 0, BROWN = 1, RED = 2, ORANGE = 3, YELLOW = 4, GREEN = 5, BLUE = 6, VIOLET = 7, GRAY = 8, WHITE = 9. Component values are represented by strings of colored dots or stripes which are then read from left to right, starting with the stripe printed nearest to one end of the component. Is it possible to map integers onto the 18 letters in the color words to produce self-descriptive codes? It is. Moreover, it can even be achieved using those self-same single decimal digits. The first assignment below is American usage (GRAY), and the second, British (GREY):

-9	-8	-7	-6	-5	-4	-3	-2	-1	1	2	3	4	5	6	7	8	9
O	Y	C	D	H	B	N	K	E	G	T	V	U	I	A	L	W	R
C	T	D	G	N	L	O	H	U	K	R	W	B	Y	V	E	A	I

to produce:

B+L+A+C+K	=	-4+7+6-7-2	=	0
B+R+O+W+N	=	-4+9-9+8-3	=	1
R+E+D	=	9-1-6	=	2
O+R+A+N+G+E	=	-9+9+6-3+1-1	=	3
Y+E+L+L+O+W	=	-8-1+7+7-9+8	=	4
G+R+E+E+N	=	1+9-1-1-3	=	5
B+L+U+E	=	-4+7+4-1	=	6
V+I+O+L+E+T	=	3+5-9+7-1+2	=	7
G+R+A+Y	=	1+9+6-8	=	8
W+H+I+T+E	=	8-5+5+2-1	=	9

Another way to present this is to prepare a strip as shown below, using felt pens to write the three symbols of each column in the appropriate color. Get someone to choose a color on the strip. The name of the color can now be spelt out letter by letter, while the associated digits, positive when above, negative when below, are totalled. Their sum is of course that number printed in the color first selected.

G	T	V	U	I	A	L	W	R	+
1	2	3	4	5	6	7	8	9	0
E	K	N	B	H	D	C	Y	O	−

Note that no letter is assigned to zero here. Alternative mappings using –8, -7,..0,1,…9 or –9, -8,…,0,1,…8 can be found to produce American or British versions in both cases. Going one step further, since negative values cannot be represented in the International Color Code, I speculated whether an extra color could be brought in to use as a minus sign, Suppose pink in first position is to indicate that the value it precedes is negative. Thus pink multiplies by –1. Bringing in the new letter P and assigning all *ten* digits as follows:

-9	-8	-7	-6	-5	-4	-3	-2	-1	0	1	2	3	4	5	6	7	8	9
P	O	K	C	W	V	E	G	U	D	B	Y	A	H	R	T	I	N	L
T	K	N	U	D	W	L	G	V	R	A	C	Y	O	P	H	E	B	I

yields the same sums as above, together with P+I+N+K = -1, as required. Surprisingly the same trick can be worked using silver (and adding S) or magenta (and adding M) instead. Below, the first pair of codes employ SILVER, and the second pair, MAGENTA:

-9	-8	-7	-6	-5	-4	-3	-2	-1	0	1	2	3	4	5	6	7	8	9
N	W	V	D	A	U	C	I	S	K	L	E	Y	G	O	R	B	T	H
I	C	N	U	D	W	L	G	V	R	A	K	Y	O	S	H	E	B	T
T	C	K	O	U	M	D	G	W	N	Y	E	R	L	B	A	V	H	I
W	G	D	C	U	T	V	K	N	L	O	A	M	R	E	B	Y	I	H

A Sematric Variant

One further map deserves a place in this collection. As detailed in [4], in *sematria* numbers are represented in a positional notation that uses letters as digits. The base used is 27, with A = 1, B = 2, etc, and an extra sign standing for 0, e.g. the undescore "_". Every letter string then corresponds to a unique integer. Thus ABC = $A\times27^2 + B\times27^1 + C\times27^0 = 1\times729 + 2\times27 + 3 = 786$. Word-integers are called *wints.* This system can be exploited to produce perfect numbers of a quite novel kind. A clear distinction between lower case *variables* and upper case *digits* is then essential. For example, let:

e	=	7052	=	IRE	r	=	10779793	=	TGRBP
f	=	-78366425	=	-ELLKNE	s	=	-68017387	=	-DSZQHM
g	=	2555594	=	DUVPQ	t	=	5684	=	GTE
h	=	1	=	A	u	=	67714013	=	DSKFDK
i	=	271396	=	MUGS	v	=	7331	=	JAN
n	=	2029	=	BUD	x	=	67760109	=	DSMOJR
o	=	2237	=	CAW	z	=	-10273178	=	SHYDB

then:

```
z+e+r+o       = 515904   = ZERO
o+n+e         = 11318    = ONE
t+w+o         = 15216    = TWO
t+h+r+e+e     = 10799546 = THREE
f+o+u+r       = 129618   = FOUR
f+i+v+e       = 125258   = FIVE
s+i+x         = 14118    = SIX
s+e+v+e+n     = 10211981 = SEVEN
e+i+g+h+t     = 2839691  = EIGHT
n+i+n+e       = 14729    = NINE
t+e+n         = 14729    = TEN
e+l+e+v+e+n   = 78236429 = ELEVEN
```

The sum of the letter values in the words *zero, one, two*, .. is now the same as those numbers represented by the letter strings *zero, one, two*,.. when interpreted in sematric notation. Note that a few of the integers mapped onto *e,f*,.. are themselves wints. Could the same result be achieved using wints only? The above is the best solution known. Going beyond consecutive series, what letter values will maximize the cardinals produced? That ELEVEN marks the limit here can be proved as follows. From the anagram *twelve* + *one* : *eleven* + *two,* we see that t+w+e+l+v+e = e+l+e+v+e+n + t+w+o – (o+n+e). But although 12 = 11 + 2 –1, TWELVE ≠ (ELEVEN + TWO – ONE) because 78236429 + 15216 - 11318 = 78240327 = ELF_NX ≠ TWELVE = 299309045.

A mathematical proof that relies on an anagram? Now these are deep waters, Jeeves!

[1] L. Sallows, The New Merology, Word Ways, Feb. 1990, pp 12-19
[2] L. Gordon and A.R. Eckler, Answering the Sallows Challenge, Word Ways, May 1990, pp 93-5
[3] L. Sallows, Spanagrams, Word Ways, Feb. 1992, pp 59-60
[4] L. Sallows, Base 27: The Key To A New Gematria, Word Ways, May 1993, pp 67-77

Postscript [added August 2016]

Franz Kaslatter of Innsbruck has written to me to point out that my German map on page 13 is flawed. In German, 16 is SECHZEHN not "SECHSZEHN". As he says, since SECHS = 6 and ZEHN = 10, if SECHZEHN = 16 then S must equal zero. Similarly, since SIEBEN = 7 and SIEBZEHN = 17 we know E+N = 0, which with EINS = 1 means that I = 1. The lowest-values solution (now reaching only 39 rather than 49) I then find is as follows:

A	B	C	D	E	F	G	H	I	L	N	O	R	S	T	U	V	W	Z
-14	-1	9	-9	7	-2	26	-10	1	6	-7	14	4	0	23	16	-8	-26	20

The resulting list of perfect German number names is as shown:

```
E+I+N+S       =    7+1-7+0    = 1  S+E+C+H+Z+E+H+N = 0+7+9-10+[10] = 16
Z+W+E+I       =   20-26+7+1   = 2  S+I+E+B+Z+E+H+N = 0+1+7-1+[10]  = 17
D+R+E+I       =   -9+4+7+1    = 3  A+C+H+T+Z+E+H+N  = [8] + [10]   = 18
V+I+E+R       =   -8+1+7+4    = 4  N+E+U+N+Z+E+H+N  = [9] + [10]   = 19
F+U+N+F       =   -2+16-7-2   = 5  Z+W+A+N+Z+I+G                   = 20
S+E+C+H+S     =    0+7+9-10+0 = 6  E+I+N+U+N+D+Z+W+A+N+Z+I+G       = 21
S+I+E+B+E+N =   0+1+7-1+7-7 = 7          .
A+C+H+T       =   -14+9-10+23 = 8          .
N+E+U+N       = -7+7+16-7     = 9          .
Z+E+H+N       = 20+7-10-7    = 10  N+E+U+N+U+N+D+Z+W+A+N+Z+I+G     = 29
E+L+F         = 7+6-2        = 11  D+R+E+I+S+S+I+G = [3]+0+0+1+26  = 30
Z+W+O+L+F     = 20-26+14+6-2 = 12  E+I+N+U+N+D+D+R+E+I+S+S+I+G     = 31
D+R+E+I+Z+E+H+N = [3]+[10] = 13          .
V+I+E+R+Z+E+H+N = [4]+[10] = 14          .
F+U+N+F+Z+E+H+N = [5]+[10] = 15  N+E+U+N+U+N+D+D+R+E+I+S+S+I+G   = 39
```

The Ontological Problem

Paying a recent call on my old friend Professor Einschwein, Transylvania's former leading logologist, I discovered him busy in his laboratory. "How's tricks, Professor?" I asked, noting as I did that he was using a Bunsen burner to melt chocolate letters into a glass flask that was perched on one side of a chemical balance. The opposing balance pan supported a similar flask containing what on closer inspection looked suspiciously like alphabet soup. Einschwein is eccentric of course, but an ackowledged genius in his subject. His projected opus, *Principia Logologia* promises to be a landmark in the field.

"Oh, nothing special," he murmured, gazing fondly at a gently disssolving Z held in his forceps. "It's just another little experiment connected with the alphabet problem. I don't suppose it will yield much of interest."

"The alphabet problem?" I said, looking around me at the clutter of Einschwein's workspace and noting a curious diagram on a nearby piece of paper. "Hey, what is this peculiar pattern of marks here?"

"They are only the serifs of Nottingham," he replied.

"The sherrif of Nottingham? What on earth do you mean?"

"Not sherrif, *serifs*," he said, "they are the serifs of the word 'NOTTINGHAM', but minus the letters themselves." I looked carefully at the pattern and saw he was right: there were the four serifs of the leading N, a space for the O, two similar triangular groups corresponding to two capital T's, and so on. I could hardly believe my eyes.

"But of what conceivable interest are the serifs of the word Nottingham?" I exclaimed.

"Mmmn…?" he responded, his attention still absorbed in the melting Z. "Well, I suppose it *is* a bit abstruse now that you mention it. I'm afraid it would take while to explain in detail, but it's all part and parcel of my work on the problem."

"On the *alphabet* problem, you mean?"

"Naturally."

"What problem do you mean? Is there a problem with the alphabet?"

He glanced at me over his pince-nez. "But of course," he said, "the ontological problem. What else?"

"The *ontological* problem? How it first emerged, its history?"

"No, no, that *aietiology*, theory of causes. I'm talking about the being or essence of the thing, its metaphysical quiddity, abstract substance, intrinsic nature, fundamental reality, what the entity really *is*."

"What the alphabet *is*?" I laughed. "Oh, come on Professor, you've got to be kidding!"

He looked at me with curiosity. "You surprise me," he said, "I'd always assumed the problem was widely recognized."

"Wait a moment," I said, "maybe I misunderstood. For a minute you seemed to imply that you couldn't describe the alphabet —that you couldn't even explain what the thing actualy comprises."

"You have it perfectly."

"You're trying to tell me that you don't know what the alphabet is—that you cannot give a *definition* of the word alphabet?"

“Not any more than you can.”
“Not any more than *I* can? You don’t seriously believe that *I* can’t explain what I mean by the word ‘alphabet’, do you?”
“But that is exactly what I mean!” he replied, laying down his forceps and smiling.
“Let’s get this right,” I said, “you mean the ordinary, everyday alphabet that we learned at school—the Roman alphabet.”
“The Roman alphabet.”
“But for Heaven’s sake Professor,” I said, “the alphabet is only a bunch of letters!”
“Now you’re being flippant.” he said, “Pray be precise.”
“Very well, I will. The Roman alphabet is a set of conventional typographical signs called letters. There are twenty-six letters in all and they occur in the alphabet arranged in a certain pre-defined order. How’s that?”
“Better,” said Einschwein. “So, the alphabet is an ordered set of twenty-six signs called letters?”
“It is.”
“You are sure there are twenty-six?”
“Exactly and precisely twenty-six.”
“And what are these twenty-six signs?” he asked.
“The twenty-six signs, my friend,” I said, trying hard to keep an edge of sarcasm out of my voice, “are the typographical entities known to us as A, B, C, and so on.”
“I’m not sure I know what you mean,” he said, pushing a pencil and notebook over the table. “Show me.”
Taking up Einschwein’s pencil, I dutifully wrote out ‘A’, ‘B’, ‘C’ etc up to and including ‘Z’. Having done so I slid the notebook back to him.
“I see,” he said, “so the twenty-six typographical symbols here are the things you call letters, and the complete set, arranged in this order, is what you call the Roman alphabet. Have I got that quite right?”
“You have grasped it to perfection, Prof.”
“Then tell me,” he said, “what exactly would this be?” He drew something on the page and handed it back. I looked at the sheet and saw he had drawn an ‘a’.
“It’s a lower-case A,” I replied.
“I beg your pardon?”
“A lower-case form of the letter A” I repeated.
“Are you implying this sign is a *letter*?”
“Of course it is.”
“But it is not one of the twenty-six you showed me.”
“No,” I said, “I just told you, this is a *lower-case* letter.The ones I wrote out are *upper-*case.”
“So the sign I have just drawn *is* a letter but it is not one that is in the alphabet?”
“Not at all. The letters of the alphabet come in two different forms, upper-case and lower-case. I just happened to write out the upper case forms.”
“So you mean there are really *fifty-two* letters in the alphabet?”
“No! Hey, you are deliberately confusing the issue.”
“On the contrary,” responded Einschwein, “it is you who confuses things. First you tell me that the alphabet comprises ‘exactly and precisely’ this set of twenty-six signs and no others. Next you imply that although quite distinct from any of your signs, the symbol I

have drawn is nevertheless a member of the alphabet. What are you trying to tell me, that there are really two alphabets, one upper-case, the other lower-case?"

"Of course not. Look, be reasonable. Everyone knows that the alphabet is comprised of twenty-six letters."

"Once upon a time everyone knew the earth was flat. Did that prove that it was?"

"Now wait a minute, that is an empirical question. Here we are talking about a *definition*. The alphabet is made up of twenty-six letters, each of which can appear in one of two forms: upper-case or lower-case. The form may vary but the letter remains the same."

"The form may vary but the letter remains the same? I thought you said that a letter was a typographical sign, which is to say a written symbol having a definite shape?"

"So it is."

"Well, I can see that small variations in form could be overlooked provided the intended shape remains recognizable. But how can you argue that upper-case 'A' and lower-case 'a' are really the *same* letter, which according to you means the same *symbol*, when their two shapes are entirely distinct? How can the first symbol in the alphabet be both this symbol here *and* that different symbol there?"

"Well, I grant you seem to have a point." I replied weakly, 'but until now I guess everybody has always just kind of …"

"Forget everybody. Use your reason. Two distinct typographical signs cannot be one particular typographical sign. So if two distinct typographical signs are identified with a particular thing called a *letter*, then obviously the letter itself must be an entity that is something *other* than either of these two typographical signs."

"Well, all right, it may be that they cannot both be the same typographical sign yet nevertheless they are both *called* the same letter, they both have the same name," I said, "and they both stand for, *symbolize*, the same thing."

"And what thing is that?"

I hesitated. Einschwein had inveigled me onto unfamiliar ground. "Well, they both represent the same *sound*, I guess. The sound *ay*. And the sound *ay* is also their name."

"You mean that the two signs are alternative symbols for the sound *ay*?"

"Yes."

"But not symbols for the sound *ah*?"

"Okay, *ah* also. Look, I am not a phonologist. The two letters are alternative symbols for a whole family of different sounds: the *ay* in 'bay', the *ah* in 'bath', the *a* in 'cat'… it all depends on context."

"So these *two letters*—you admit the plurality—which are both sounds called *ay*, are interchangable symbols for a family of possible sounds, among them the sound *ay* itself?"

"You've got it."

"Do you now mean to tell me that the alphabet is really a set of twenty-six families of sounds?"

"No, the alphabet is a set of twenty-six *letters*. What those letters themselves stand for is strictly irrelevant to the problem of what the alphabet really is."

"Very well. I'll accept that. But at least you now seem to see that there *is* a problem to be faced here. However, you still overlook something."

"And that is?"

"You began by insisting that a letter was a typographical sign."

"It was youthful ignorance."

“Whereas a moment ago you said that although upper-case ‘A’ and lower-case ‘a’ may not be the same typographical sign, they are nevertheless called the same letter and they both symbolize the same thing.”

“I did.”

“But you now accept that whatever the entity known as ‘letter *ay*’ may be, it must be something that is distinct from either of the typographical signs ‘A’ and ‘a’?”

“So it would seem I am reluctantly compelled to acknowledge.”

“Now, assuming you were correct in the first place, doesn’t that tell you something?”

“How do you mean, ‘correct in the first place’?”

“Well, consider. If letter *ay* is a typographical sign, but it is not the typographical sign ‘A’ and it is not the typographical sign ‘a’, then …?”

“It must be some other typographical sign?”

“Is there any logical alternative?”

“You mean that letter *ay* might really be … the *ampersand*, for instance?”

“Now you are being inconsistent.”

“Inconsistent?”

“Well, did you or didn’t you insist that letters were members of the alphabet?”

“Of course I did, but I thought you had just overturned that idea!”

“Not at all. All I have done is to refute the notion that letter *ay* is the sign ‘A’ or the sign ‘a’. But does that prevent it from being some other typographical sign *in the alphabet*?”

“So letter *ay* might not be the ampersand but it could be … Q, for instance?”

“Q would certainly fit the bill—provided we could establish that Q *was* in the alphabet, of course. At least, if letter *ay* were Q, and Q could be shown to be a member of the alphabet, then it would clear up our immediate problem.”

“Our immediate *ontological* problem?”

“Exactly. Which is only a part—a one twenty-sixth part, you might say—of our general ontological problem.”

“But then we would come to the problem of letter *kew*?”

“There’s that, of course, but first, what of the validity of your primary assertion?”

“My primary assertion?”

“That letters *are* members of the alphabet.”

“You mean they may not be?”

“Well, do you have any firm evidence to offer in support?”

I gripped the table and gazed wildly about me. “Look here Professor, do you mind if I ask you a question?”

“By all means.”

“Then may I enquire why you are weighing melted chocolate letters against alphabet soup on that balance there?”

“With pleasure,” he said, “but it’s an experiment with a complicated background. How versed are you on the theory of letters?”

“The theory of *letters*?—I’ve heard of the theory of numbers.”

“Oh dear,” he said, “I’m afraid this is going to mean a descent to fundamentals.”

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