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THE DUODECIMAL SOCIETY OF AMERICA

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THE DUODECIMAL SOCIETY OF AMERICA

is a voluntary nonprofit organization for the conduct of research and education of the public in the use of Base Twelve in numeration, mathematics, weights and measures, and other branches of pure and applied science.

Full membership with voting privileges requires the passing of elementary tests in the performance of twelve-base arithmetic. The lessons and examinations are free to those whose entrance applications are accepted. Remittance of $6, covering initiation fee ($3) and one year's dues ($3), must accompany applications.

The Duodecimal Bulletin is the official publication of the Duodecimal Society of America, Inc., 20 Carlton Place, Staten Island 4, New York. George S. Terry, Chairman of the Board of Governors. F. Emerson Andrews, President. F. Howard Seely, Vice-President. Ralph H. Beard, Editor. Separate subscriptions $1 a year.

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THE DO-METRIC SYSTEM

A Dozenal System of Weights and Measures

by Ralph H. Beard

The ensuing article is submitted by Mr. Beard as a basis for discussion and consideration. It does not express the views of the Society, nor of its Committee on Weights and Measures, of which Mr. Beard is Chairman.

Progress in the organization of the world as an economic whole is forcing consideration of a system of weights and measures that shall be standard for the entire world. Daily, the need of a world standard becomes more apparent. Yet none of the present official standards seem acceptable for this purpose.

Duodecimals offer a solution of this problem that is amazingly simple. With minor modifications, the Anglo-American standards of weight and measure can be integrated and organized into an ideal unified duodecimal metric system. (The word, "metric", will be used in this article in its normal sense, as meaning "measurementa1".) The importance of the problem today, emphasizes the necessity for serious consideration of this possibility.

As the only set of standards that can be properly called a system, primary consideration is given to the French Decimal Metric System. It has become the official system of many countries, and its use is permitted in nearly all the rest. Yet, where the Anglo-American measures are commonly used, the French Metric System has made little progress in supplanting them in the eighty years of competitive use.

The English and American standards have achieved wide recognition because of the preponderance of England and America in world production and world trade. The scales of their measures and the sizes of their units are convenient for practical use in measuring things. However, because these standards are relatively unsystemized, they are unsatisfactory for scientific applications.

The French Metric System offers two great advantages. Its components do constitute a SYSTEM, in that the measures of area, length capacity and weight are interrelated, permitting ready

conversion between them without complicated mathematical operations. And, secondly, it is a UNIFIED metric system, in that the scales of its measures conform to the number system. Both use the base ten.

Yet the way in which these advantages are fitted into the French Metric System has created the obstacles which have blocked its progress into general use. The sizes selected for the basic units of the system are not well adapted for practical application in trade and commerce. Their sizes have not been determined by a long process of selective survival in practical competition, as is the case with the Anglo-American units. Moreover, the scale of ten is awkward in actual use in weighing and measuring things. It has too few factors. It is not flexible enough in subdivision.

Sidney A. Reeve has admirably summerized the metric controversy in a terse statement:-

"The reasons for both the continued advocacy and the continued rejection of the metric system are plain. They are parallel and quite compatible.

"a. The metric system is attractive because its measures are arranged on the same system as our numerical notation.

"b. The metric system is cumbrous because it is decimal in its arrangement."

We are confronted, then, with this impasse. A world standard of weights and measures is necessary. This standard should constitute a unified metric system, whose units are convenient in practical use, whose scales accomodate ready subdivision into halves, thirds and quarters, and whose components are precisely integrated. None of the present official standards meets these requirements. None shows any real promise of becoming the world's standard. Yet there is a fully adequate solution to this problem.

Today, there is a growing interest in the use of base twelve in numeration. It is generally recognized that counting by dozens offers many advantages over counting by tens. It is to be expected that the change from tens to twelves may take a long time, but, since the dozen base is better, ultimately the change is inevitable.

With this change, then, there is available to us a unified metric system whose units are accustomed, convenient and practical in size, whose scales facilitate easy subdivision, and whose elements are precisely integrated. This duodecimal metric system, termed "The Do-Metric System," offers excellent potentialities for adoption as the world standard.

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PEOPLE WITH TWELVE FINGERS

by F. Emerson Andrews

The cause of counting by dozens has lately been enlisting the help of fiction writers who set their stories in Mars or some other planet where people have six fingers on each hand, and therefore naturally count by dozens. In explaining the dozen system, many of us have doubtless pointed out that all would have been simple from the beginning, and the present ten base would never have been considered for a moment, if only people had been born with six fingers on each hand.

As a matter of fact, many people do have twelve fingers, an extra small finger or an extra thumb on each hand. We have records of them from classical literature to the latest treatises on heredity, and the cases are really quite numerous. As a curiosity for duodecimalians, it may be interesting to cite a few.

One of the earliest records is in the Old Testament. A giant of Gath (apparently a son of Goliath) "had on every hand six fingers and on every foot six toes, four and twenty in number; and he also was born to the giant. And when he defied Israel, Jonathan the son of Shimei David's brother slew him." II Samuel XXI:20, date attributed to 1019 B.C.

Pliny speaks of a Roman poet named Volcatius who had six fingers on each hand, and was therefore surnamed Sedigitus. He also tells of two daughters of a Roman noble who each had six fingers and were called the Sedigitae. Scipio Africanus (237-183 B.C.) is reputed to have had six fingers and six toes and to have been the remote ancestor of the still surviving Scipion family, in whom the thumbs are duplicated and who claim to trace their peculiarity definitely back for 700 years and possibly back to Scipio Africanus - more than two thousand years and eighty generations.

For duodecimalians, the case of Zerah Colburn, related in the Philosophical Transactions of the Royal Society is especially interesting. He was born in Vermont, the son of Abiah Colburn, but was brought to London on account of his "extra-ordinary powers in arithmetical computation from memory." He had a perfectly formed extra little finger on each hand, but whether he used it for rapid calculations by the efficient dozen system, the record seems not to say.

Scientists call six-fingeredness hexadactyly, and have studied it considerably. De Linores reported in 1930 visiting a village near Madrid where every person in the population of about 150 had more than five fingers (one had 26 digits on the two hands), and over a hundred had the more normal variation of six fingers on each hand. The Foldi family of the Arab tribe of Hyabites are so regularly six-fingered that any child born with merely

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DUODECIMAL NOMENCLATURE

by Kingsland Camp, F. A. S.

This article is submitted by Mr. Camp as a basis for discussion and consideration. It does not express the views of the Society, nor of its Committee on Nomenclature and Symbology, of which Mr. Camp is Chairman.

An important advantage of the present forms of decimal number-symbols is their nearly universal acceptance; they signify the same numbers no matter in what civilized language may be the rest of a text in which they appear. Let us introduce for our duodecimal system a scheme of spoken number-symbols that can be or become similarly compact and universal, and, despite inevitable differences in intonation and in vowel lengths, intelligible everywhere. Also let us attack this problem scientifically, utilizing for all they are worth the most common phonetic elements of spoken words to construct number-names of maximum brevity consistent with most nearly universal pronounceability.

There are available in the leading European tongues, five basic vowel sounds which for clarity will be designated hereinafter by paired letters (all single alphabetical vowel symbols are regrettably ambiguous or worse), and which by repetition or combination with each other form easily spoken and clearly distinguishable double-vowel or diphthong sounds as suggested in the table below:

	+ee	+oo	+ah	+oh	+eh
ee (as in seen, machine. Indistinguishable for many Europeans from short sound in pin.)	ye	you	yacht area	yoke oleo	yea
oo (as in pool, rude.)	wee	woo	watch	woe	way
ah (as in art, calm, father. The unmistakably related short sound, a in cat, forms almost undistinguishable diphthongs.)	mice	cow			
oh (as in go, boat. Nearly same sound in sore, ewe.)	boy	oh-oo*	boa		
eh (as in they, pain.)				kayo	

The last-quoted vowel, eh, is somewhat impure and diphthongized in English, but better pronounced in the French thé, eté. We speak a shorter form correctly in such words as pen, which, by the way, Spanish-speaking Americans differentiate with difficulty from pain. This illustrates the problems of contriving a universally satisfactory phonetic code!

The diphthong oh-oo, marked above with an asterisk, although probably not found in English (neither, except in proper names, was that in "kayo" not meny years ago), is eminently pronounceable and may be useful in constructing a systen of number-symbols such as the following:

Let the sound oo represent digit *0*; the sound ee, digit *6*. Then assigning ah, oh, and eh, respectively, to digits *1*, *2*, and *3*, we may designate their subtraction by making them precede, their addition by making them follow *0*, or *6*; thus:

	oh-oo	ah-oo	oo	ah	oh	eh
	...	cow	pool	calm	go	they
As in digit:	↊	Ɛ	*0*	*1*	*2*	*3*

	oh-ee	ah-ee	ee	ee-eh	ee-oh	ee-eh
	boy	mice	seen	yacht	yoke	yea
As in digit:	*4*	*5*	*6*	*7*	*8*	*9*

Note the logic of this arrangement for purposes of addition and subtraction: Ɛ+*1*, ↊+*2*, *5*+*7*, *4*+*8*, are all so formed phonetically as to suggest a sum ending in oo, the cipher, or (same result) twice six; while Ɛ+*7*, ↊+*8*, *5*+*1*, *4*+*2*, phonetically suggest additions that end in *6*. Deferring for the present, discussion of possible alternatives and improvements, let us proceed to discuss two-digit and multiple-digit numbers.

This brings us to our main thesis. Let the unit of spoken duodecimal numbers be, not the digit, but, the digit pair, - represented in every instance by a single syllable formed as a consonant-and-vowel, or consonant-and-diphthong. Double consonants are ruled out, since considerable groups of people in the world find them virtually impossible to pronounce or imitate, (quite otherwise than double vowels, which can be creditably imitated by anyone who can pronounce the component elements). Hence, we cannot formulate any addition or subtraction suggestiveness in the consonant scheme. Somewhat arbitrarily, therefore, I suggest the following:

Consonant	n	p	r	s	t	v	sh	f	g	j	k	m
Digit	*0*	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	↊	Ɛ

Some of these items deserve comment. Practically every language contains at least one liquid (r or l), but not all the same one; so that, for some languages, l may have to be substituted for r, as liquids not learned in infancy are very hard to imitate. If you doubt this, try, unless you are one of them, to pronounce r with the trill some Europeens put into it. The deliberate omission of d emasculates a number of profane word-beginnings or endings. Sh, although not assigned a single letter in our alphabet, is perhaps the most readily imitated consonant for any ear or tongue; in nearly all speech, it is used to request silence: "Sh-h".

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OFFICIAL NEWS

The Secretary reports seven additions to our roster, as follows:

Richard L. Akers,
712A Hamilton Bouldvard, Peoria 4, Illinois.
Special Interest: Measures, Logs, Slide Rule.

Mrs. Lesbia S. Beard,
20 Carlton Place, Staten Island 4, N. Y.
Special Interest: The Society.

Jamison Handy, Jr
3422 W. 59th Place, Los Angeles 43, Calif.
Special Interest: Weights and Measures.

Robert H. Hoskins, S. 1/c.,
Co. 107, Billet 218, Navy Pier, Chicago, Illinois.
Special Interest: Number Theory, Publicity.

Alfred Norland, (Admitted as Member)
528 West 1st., Seattle, Washington.
Special Interest: Duodecimals. Author of Twe System.

Daniel Saint,
Huntingdon Valley, Pa.
Special Interest: Weights and Measures, Symbology.

Charles P. Stewart.
39 Marlboro Road, Valley Stream, L. I., N. Y.
Special Interest: Inverse Notation.

Vice President Seely regrets that pressure of business matters occassioned delays in the handling of his correspondence, but informs us that the work of the Aspirants is very satisfactory. He reports that the following Aspirants have been advanced to full standing as Members.

Kingsland Camp	H. K. Humphrey
Wendell B. Campbell	Eugene M. Scifres
William S. Crosby	Lewis Carl Seelbach

Mr. Alfred Norland has been admitted to advanced standing as a Member because of his long familiarity with duodecimals. He is the author of a duodecimal proposal which was published in 1935 under the title, "The Twecimal System and its Application to our Dimensions."

This action is in accord with policy recently approved by the Board of Governors. The purpose of the lessons and examinations is that our Members may be reliably familiar with, and competent in, duodecimal computations. When a member of the Board of Governors has determined that an applicent is fully competent, he may so certify, and further examination may be waived.

SAMUEL SLOAN

The Duodecimal Society has lost another publisher friend in the sudden death, following an emergency operation, of Samuel Sloan, Vice President and Treasurer of Duell, Sloan and Pearce.

Mr. Sloan was the first publisher in America to recognize the possibilities of duodecimal counting to the point of publishing a book on the subject. In the spring of 1935, as an editor for Harcourt, Brace and Co., he saw the manuscript of Mr. Andrews' NEW NUMBERS, accepted it at once, and published it that fall.

He left Harcourt in 1939 to become the co-founder of the aggressive young publishing house of Duell, Sloan and Pearce. Last spring, while chatting with our President about another publishing matter, he inquired after the book, learned that his former house had let it go out of print, and promptly helped arrange for the new edition, which has just been issued under the Duell, Sloan, and Pearce imprint of Essential Books.

In his last letter to our President, he wrote, in his usual jocular vein, "Thanks ever so much for sending me the fascinating literature of the Duodecimal Society. It is my hope that some day before long I may sit and watch Mr. Henry (of Essential Books) taking the tests for membership; I assume that I myself will just get an honorary membership and not run the risk of tripping over the digits - Sam."

To Samuel Sloan, perspicacious publisher and most friendly of men, the Society owes indeed an "honorary membership," and your President acknowledges deep personal gratitude and grievous loss.

PROPAGATION

In the Reader's Digest for September, 1944, there was an article by J. P. McEvoy on the amazing effectiveness of Dr. Frank C. Laubach in his life-work of teaching illiterates how to read. This mild, soft-speaking, American missionary genius has opened the windows of learning to literally millions.

Dr. Laubach attributes his success to a lesson he learned from one of the illiterates, a Moro chieftain. Dr. Laubach was being forced to limit his work because of inadequate funds. When the local chieftain learned the work would have to stop, he shouted, "This campaign shall not stop for lack of money. Everybody who learns has got to teach. If he doesn't, I'll kill him." And so in Dr. Laubach's darkest hour, this fierce, brilliant-eyed chief invented the method of "Each One Teach One" which has since gone round the world in more than eighty different tongues.

We are concerned with an illiteracy of a different type. We seek to remedy the unletteredness of the literate as regards duodecimals. But we can well apply Dr. Laubach's efficient tool in our work. If we will "Each One Teach One", and make sure that they in turn will teach another, familiarity with duodecimals will rapidly spread throughout the world.

THE MAIL BAG

There has been a most gratifying flow of letters from our members. We wish to express our thanks and hearty appreciation. Keep them coming. . . . One of the problems of our correspondence is that each letter contains material which should concern two or more of the Special Committees. . . . We wish to announce now that hereafter enough copies of each letter we receive will be made to enable us to forward a copy to each of the committees involved. . . . Cpl. Dallas H. Lien, of the Alaska Communication Service, made six hand-written copies of a meaty letter that he wished to bring to the attention of a number of the officers and committees. . . . Fine work, Corporal, and many thanks. . . . In the future, he, or any of us, can address his letter to the Secretary and specify who are to receive copies. They will be made and forwarded. . . . Carl Seelbach has been a grand correspondent. . . . His letters are as refreshing as ice-cream in Burma, with at least one new idea in every line. . . . He scintillates and corruscates. . . . Carl's able comments on the octic base, in response to E. M. Tingley's circularization, was as encyclopedic as the Britannica and as amusing as Bea Lillie. . . . Mr. Tingley must have enjoyed it, too. . . . It ran to seven densely typed pages, and among its store of Seelbach gems were these:

> " . . . . a generally fine piece of imagineering . . Quartic (base) would be natural for elephants, having four counters and a magnificent pointer. . . . Understandably, duodecimalovers do not go into ecstacies over the octivities of the octicians. . . . . "

Page Mr. Glencannon. . . . I thank God for Seelbach. . . . My intercession might be helpful. . . . Pvt. William S. Crosby, 39148677, has notified us to change his address to 41 Cml. Lab. Co., APO 512, Care of Postmaster, New York. . . . He writes the most handsome and interesting calligraphy that I have ever seen. . . . I am illiterate in this art, but his script suggests to me the print-script of a midieval hand-done prayer-book. . . . Howard Seely has been too busy with lessons and examinations to send us much, but he has done some musical composition, and he introduces into his letters now and then an idea on the dozenal structure of music that is interesting. . . . We have one correspondent who is beyond my ken. . . . Mr. Edward B. Webster, RFD. 1, Milford, Mich., writes a vein of metaphysical mathematics, based on Newton's Principia, that deserves a more able respondent. . . . Well there's his address. . . . Among our letters are some that deserve the attention of all of our members. . . .

Here are several of them. . . . Pvt. William S. Crosby writes:-

Uncial Jottings of a Harried Infantryman

On Propaganda: I favor great restraint. Advocates of the Metric System (and opponents of it), of the World Calendar, of various schemes of Nu Spelling and the like, in their printed outbursts seem to me to overstate their case, to sink their important arguments in a sea of minor points, to seek favor with too many separate interests at once, and consequently to sacrifice their dignity. Such passion as they display may better, I think, be saved for issues of larger importance.

The merits of counting by dozens don't need much arguing; the facts are pretty eloquent, given opportunity and time to do their work. The person to whom I've had the least trouble in explaining the system was a lad with a grade school education with whom I worked in Alaska, cutting and forming concrete-steel reinforcing. Having wrestled with feet and inches, and with dividing lengths into halves and thirds for so long, with him, the idea clicked with no exhortation or argument on my part.

Especially, argument for the twelve-system should not be even slightly chauvinistic. As I recall them, Grover Clevelend Perry's pamphlets laid objectionable stress on the Anglo-Saxon-ness of twelve.

On Nomenclature, Notation, and Numeration: Maybe I am a factionalist, but here are some of the prejudices I stick by:

Duodecimel, (two more then ten) is a derived concept as well as a clumsy word. What is needed is a word expressing "counting by the scale of twelve", but as far as possible not depending on any other concept. "Uncial" is a suitable word to replace "decimal" in naming point-form fractions, and I myself use the word for the whole field of counting by dozens. Its chief drawback is that only a specialized meaning (in the field of paleography) is given in most dictionaries. "Dozenal" I consider beneath contempt.

℣ and £. I heartily approve of the flat-bottomed £. It is distinctive, elegant, and "looks like a numeral". In ℣, we are not, I think, so fortunate; the most that can be said for it is that it is not likely to be confused with any other numeral and that it has an internationally acceptable origin. But it sticks out on a page of print like a black WHEREAS ; and even Bill Dwiggins' artistry on the Society's seal has not much tamed its outlandishness; moreover it is liable to confusion with other ℣ symbols commonly used in mathematics. For these reasons I have been using the Irish ȝ for the past four years. I can recall only one instance of my confusing it with any other symbol, and I now transcribe numbers from the Terry Tables, substituting ȝ

for Ƶ without conscious thought. Like £, Ƶ is a handsome character, looks plausibly "like a numeral", and can be improvised, though not handsomely, on the typewriter by having a repairman mount an inverted 2 on one of the type bars.

Numeration. I consider the names dek, el, do, gro, bizarre and unnecessary, and instead read uncial numbers with the names at present corresponding to the digit-groups of identical appearance, except for *10*, *11*, *12*, which I render as "twelve, oneteen, twenteen" ; as for numbers involving Ƶ and £, I simply make appropriate use of "ten" (or "tendy-") and "eleven" (or "eleventy"), as *ƵƵ*, *Ƶ3*, *£4* - "tenteen, tendy-three, and eleventy-four", and so forth.

Italics. We unnecessarily cripple our typographical resources, in my opinion, if we continue to rely on italics to differentiate uncial from decimal numbers. Ambiguity can almost always be prevented by the context, and where this is not possible, by phrasing spelt-out numbers with the use of the words "dozen", "gross", etc., and by writing algorismic numbers with the subscripts, "$_{dec}$", or "$_{unc}$". Incidentally, I have found it convenient to use the symbol $\mathbb{R}_x$ as an operator indicating "transradication" from one base to another; as $\mathbb{R}_x\ 128_{dec} = Ƶ8_{unc}$.

On a System of Weights and Measures. The convenience of the common man should be the main consideration; that of specialists like chemists, navigators, astronomers, and physicists, should be subordinate. For this reason the system will be earth-bound, and will not give special prominence to such "unusual constents" of physics as the speed of radiation, or Planck's Constant, nor even to such rather nearer quantities as the dimension of the earth.

It seems to me desirable to define the units of the system arithmetically in terms of the existing international (Metric) standards, especially for the time being, so that the arithmetic of conversion from one system to the other can be unambiguous - in particular, the ratios of the "workshop" units of length should be simple, to facilitate conversion of machine-tools from one to the other. (e.g., The U.S. legal ratio of 100,000:3,937 for the inch to the millimeter has been rejected by industry both in this country and Great Britain in favor of the new inch whose ratio to the millimeter is 127:5, or 1:25.4)

A system based on these considerations that I have been doing some playing with, works out as follows:

Angle. Uncial subdivision of the circle, as universally advocated hitherto. However, why not denote the whole circle, one cycle, abbreviated c, and use the millicycle (*0.001* c, or *1* mc) and the microcycle (*0.000 001* c, or *1* Mc) as derived units when convenient?

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DOSENILE DEPT.

Mary Lloyd, Editor

Hello, Folks. We discovered that one of last issue's puzzles could have several answers. (We still don't know how we did it.) The other came out clearly, as PSYCHOMETRIA. But now we find ourselves named as Puzzle Editor. And here are two more long-division cryptograms. The letters form a word or phrase, when arranged in their proper numerical order.

```
          N T A
    ) Y C L O L S
A P E   Y S T H
        Y H Y L
        Y N N T
          L R H S
          L H H R
            E A
```

```
          H I O
    ) T N O O R L
N W W   T E A V
          V V A R
          E R V D
            I T R L
            A O R D
              V D L
```

Making up these crypts, with their camouflage and clues, is almost as much fun as solving them. And working up the rules for the clues and eliminations is quite an exercise in clear thinking. For example, can you state these cases exhaustively:- When ab = c, what are the possibilities for a, b, and c? We warn you, this is like eating peanuts. Quadrille-ruled paper is a big help. After you have solved the two puzzles above, try making up one, and send it our way.

Carl Seelbach sent us a page of poems written by one of his friends, and we enjoyed them. His crack at our Staten Island address, in one of them, will amuse you.

CHANGE YOUR BASE
by Phillp Haendiges.

Some day, upon a global scope,
The system Twelve will spread, I hope.
To bring that day, to speed the notion,
Move headquarters across the ocean.
From Staten Island, change your base
To Isles near center of our race.
The name will help, too, oversees,
With mail postmarked DODECANESE.

If you feel bad, and have to write poems, send them to us. Perhaps some one else would like to feel bad, too.

Mary.

EDITORIAL

This issue of the Bulletin is a magazine in several senses. We have intentionally spread upon its peges a most varied array of proposals affecting the duodecimal system. Whether fulminations and explosions will follow, remains to be seen. The purpose for which this exposure is risked, is simple.

The Duodecimal Society of America will take no official position on any of the controversial factors for some years to come. It has taken but one modest step in any such direction. It has accepted for current use certain terms and symbols as the simplest and clearest practice in this pioneering stage. But this is by no means to be regarded as a final and official decision.

Our necessities have required that we use symbols that can be approximated on every typewriter, in every newspaper and magazine office, by every correspondent and critic. The need for clarity in expression has compelled us to use a terminology that is acceptable and understandable (though not agreed to) by all of us That usage is open to change as the developments may require.

Any constructive policy must provide for the review of all of the available ideas as to symbols and terms and standards, so that there may be a selection of those found most adequate and fitting. There will be a slow relinquishment of the undesirable and the inept. A concensus will gradually emerge.

This concensus may embrace two infusibly separate lines of thought, or simple unity may be found. But the inauguration of progression toward some concensus is essential. That is our purpose.

We are gratified by the quantity and quality of the ideas presented. It is the clearest testimony that the Society is fulfilling the purpose for which it was established. Most evidently, it is being effective in eliciting the expression of views and attitudes that differ widely. It begins to be a forum for the discussion and modification of such views.

It is equally clear that, with regard to any one factor of the duodecimal proposals, there begins to be possible a general grouping, a classification, of concepts. Here is the field in which rationalization will eliminate needless diversity of idea. The papers and letters that appear in this issue are but representative of many others of similar vein. They will serve as illustrative examples, rendering unnecessary for others the devotion of time and effort to accomplish, anew, what has been already done.

THE DO-METRIC SYSTEM. (Continued from Page 2)

In the interim, while we continue to count by ten, the same units of weight and measure form a simple measurement system that should prove advantageous and popular. All of its scales would be arranged in steps and subdivisions of twelve, but the numeration would be decimal.

For these reasons it seems justifiable to propose that these weights and measures be legalized as standards for permissive use, and be granted official recognition. In selected applications, these standards will be found of immediate advantage, and can begin to earn their way into popular favor. Thus the initial step toward establishment of a world standard can be accomplished.

BASIC DEFINITIONS

The YARD will be the base of the Do-Metric System. This is the familiar English and American yard, whose relation with the meter is established as 25.4 millimeters to the inch, in accordance with standard manufacturing practice. The inch and the foot will be retained exactly as they are. Their subdivisions will acquire new names, but their present scale divisions will coincide exactly with divisions of the new scales.

A new set of metric prefixes will be used, paralleling in form the prefixes of the French Metric System. Steps and scale divisions will be in twelfths and multiples of twelve.

The following will illustrate the new Do-Metric prefixes:-

10	yards	equal	*1*	doyard
10	doyards	equal	*1*	groyard
10	groyards	equal	*1*	moyard
.1	yard	equals	*1*	edoyard
.1	edoyard	equals	*1*	egroyard
.1	egroyard	equals	*1*	emoyard

These prefixes are derived as follows: "do" is a short form for dozen, "gro" is a short form for gross, and "mo" is a short form for "meg-gross", or great-gross. The "e" means, "of", or "out of"; thus "*1* edo" means "one twelfth", or "one out of a dozen"; and so on.

A new term will be applied at the step of the great-gross, or mo. Thus, *1* moyard equals *1* mile (the Do-Metric mile being 1728 yards instead of 1760.)

THE LINEAR MEASURE

By basing the duodecimal measures on the yard, rather than on the foot, we are able to secure the advantages of a duodecimal relation with the measures of weight and capacity, the pint and

the pound. This was first proposed, we believe, by Sidney A. Reeve, and later by Admiral Elbrow and George Terry.

The first ordinate subdivision of the yard (*.1* yard) is the Palm, the familiar unit of *3* inches. The cubic palm is the new pint, being 27 cubic inches instead of 28.875. This pint of water weighs the new pound, which is three percent lighter than the pound avoirdupois, being 6825 grains. Thus our correlatives are the Palm, Pint, and Pound.

It is important that the smallness of these changes be recognized and adequately evaluated. And instead of being new values, these changes restore to our accustomed measures their original orderliness. The cubic foot, or twelve-inch cube, was the old amphora, the six-inch cube was the gallon, and the three-inch cube was the pint, which weighed one pound. Considering the minor changes involved, it is surprising that these measures were not restored to their original sizes long ago.

Ordinate units are arranged in steps of *.1* or *10*. Basic units are arranged in steps of *.001* or *1000*. The ordinate subdivision of the palm is the Quan (*.1* palm), or quarter-inch. The quan equals *3* lines.

Originally, twelve points equalled one line, and twelve lines equalled one inch. The present typographical "point" is approximately double the original. The do-metric scale uses the original point in the subordinate duodecimal series of point, line, inch, and foot.

The ordinate subdivision of the quan (*.1* quan) is the Karl, or quarter-line. This is also one of the basic units, being *.001* yard. It should also be noted that, using the do-metric prefixes, alternate names are available for all these quantities.

The Palm	is also the	Edoyard	or the	Grokarl
The Quan	"	Egroyard	"	Dokerl
The Karl	"	Emoyard	"	Moced

Standards of length are nowadays defined as so many wave-lengths of the red line of the cadmium spectrum. The basic subdivision of the karl (*.001* karl) is approximately half (*.5852*) of this wave-length, and for this reason is termed the Cad.

It is important to realize that our customary subdivisions of the inch coincide exactly with scale divisions of the new measures; -

1/2	inch equals	*2* quans
1/4	"	*1* quan
1/8	"	*6* karls
1/16	"	*3* karls
1/32	"	*16* grocads
1/64	"	*8* grocads

and that the machinist's decimal subdivisions of the inch are within practical tolerances of dozenal subdivisions.

.001 inch equals *7* docads, nearly.
(*7* docads equal 1.0127 thousandths inch.)

.000 001 inch equals *1* edocad, nearly.
(*1* edocad equals 1.0047 micro-inch.)

The foot, the inch, the line, and the point, constitute an interior dozenal series which is intermediate to the dozenal ordinate units. In itself, this interior series affords the extra advantage of the ease of accustomed units which are still commensurate and interchangeable with the ordinate system.

LINEAR TABLE

Basic Units
Arranged vertically in steps of *1000*

1000 Cads equal *1* Mocad or Karl
1000 Karls equal *1* Mokarl or Yard
1000 Yards equal *1* Moyard or Mile

Ordinate Units
Arranged vertically in steps of *10*

10 Karls equal *1* Quan
10 Quans equal *1* Palm
10 Palms equal *1* Yard

Intermediate Units
Arranged vertically in steps of *10*

4 Grocads	equal	*1* Point,	and	*3* Points	equal	*1* Karl
4 Karls	equal	*1* Line ,	and	*3* Lines	equal	*1* Quan
4 Quans	equal	*1* Inch ,	and	*3* Inches	equal	*1* Palm
4 Palms	equal	*1* Foot ,	and	*3* Feet	equal	*1* Yard

Each ordinate linear unit represents a "place" in dozenal figures. For instance:-

1.894 yard means *1* yard, *8* palms, *9* quans, and *4* karls, and
1.483 foot means *1* foot, *4* inches, *8* lines, and *3* points.

And note that conversions among these terms is accomplished by merely shifting the "decimal" point; the stated *1.894* yard also means *18.94* palms, or *189.4* quans, or *1894* karls; and *1.483* foot also means *14.83* inches, or *148.3* lines, or *1483* points.

The do-metric Acre is the area of the square whose side is *60* yards. The present acre is not the square of anything.

The length of the atomic bond, as measured between atoms in the pure carbon of the diamond, is *0.X56* emocad.

THE DO-METRIC SYSTEM (Continued)

SQUARE MEASURE

Basic Units
Arranged vertically in steps of 1000^2, or 1,000,000

1,000,000 square Cads equal 1 square Karl
1,000,000 square Karls equal 1 square Yard
1,000,000 square Yards equal 1 square Mile

Ordinate Units
Arranged vertically in steps of 10^2, or 100

100 square Karls equal 1 square Quan
100 square Quans equal 1 square Palm
100 square Palms equal 1 square Yard

Intermediate Units
Arranged vertically in steps of 10^2, or 100

14 sq. Grocads equal 1 sq. Point; 9 sq. Points equal 1 sq. Karl
14 sq. Karls equal 1 sq. Line ; 9 sq. Lines equal 1 sq. Quan
14 sq. Quans equal 1 sq. Inch ; 9 sq. Inches equal 1 sq. Palm
14 sq. Palms equal 1 sq. Foot ; 9 sq. Feet equal 1 sq. Yard

The area of the do-metric Acre is 30 sq. doyards, and equals the area of a square whose side is 6 doyards. There are 400 acres to the sq. mile.

CUBIC MEASURE

Basic Units
Arranged vertically in steps of 1000^3, or 1,000,000,000

1,000,000,000 cubic Cads equal 1 cubic Karl
1,000,000,000 cubic Karls equal 1 cubic Yard
1,000,000,000 cubic Yards equal 1 cubic Mile

Ordinate Units
Arranged vertically in steps of 10^3, or 1000

1000 cubic Karls equal 1 cubic Quan
1000 cubic Quans equal 1 cubic Palm
1000 cubic Palms equal 1 cubic Yard

Intermediate Units
Arranged vertically in steps of 10^3, or 1000

54 cu. Grocads equal 1 cu. Point; 23 cu. Points equal 1 cu. Karl
54 cu. Karls equal 1 cu. Line ; 23 cu. Lines equal 1 cu. Quan
54 cu. Quans equal 1 cu. Inch ; 23 cu. Inches equal 1 cu. Palm
54 cu. Palms equal 1 cu. Foot ; 23 cu. Feet equal 1 cu. Yard

THE DO-METRIC SYSTEM (Continued)

CAPACITY MEASURE

The unit of coordination for the do-metric measures is the cubic palm. A cubic palm of water, at the temperature of its maximum density, and normal barometric pressure, is the capacity of the do-metric Pint, and the weight of the do-metric Pound.

10 Dribs equal 1 Dram
10 Drams equal 1 Founce (fluid-ounce)
10 Founces equal 1 Pint
10 Pints equal 1 Sigal (sesqui-gallon).
10 Sigals equal 1 Kin
10 Kins equal 1 Tun

Intermediate Units

3 Founces equal 1 Gill
4 Gills equal 1 Pint
2 Pints equal 1 Quert
(4 Quarts equal 1 Gallon (216 cu.in.)
6 Quarts equal 1 Sigal
8 Gallons equal 1 cu. Foot

Correspondences

The Drib is the volume of 1 cu. Quan, and weighs 1 Cerat
The Pint is the volume of 1 cu. Palm, and weighs 1 Pound
The Tun is the volume of 1 cu. Yard, and weighs 1 Ton

WEIGHT MEASURE

10 Cerats equal 1 Gram
10 Grams equal 1 Ounce
10 Ounces equal 1 Pound
10 Pounds equal 1 Stone
10 Stones equal 1 Burden
10 Burdens equal 1 Ton

TIME AND THE CIRCLE

The use of separate standards for the measurement of time, of latitude and longitude, and of the circle, is not only unnecessary, but is excusable solely on the grounds of habit and custom. The increasing use of measurements of time and angular motion, and of time units in combination with other measures, requires a unified standard for such measurements. This was first proposed by George S. Terry.

The fundamental unit of the do-metric unified time and circular measure will be the Day, representing the mean solar day of

twenty four hours, and the 360° circle as well. The smaller ordinate units are derived by successive subdivision of the Day by twelve.

The first ordinate subdivision is the Duor. This unit of two hours, or 30°, is already used as a time unit in some oriental countries, where the complete revolution of the earth is divided into twelve hours. As a unit of angular measure it is very convenient, since the most frequently used angles are simple multiples and parts of this unit.

The duor is composed of twelve Temins. The temin is ten of our accustomed minutes, and is subdivided into twelve Minettes. Each minette is fifty seconds of time, and the minette, being one emoday, is the second basic unit.

The third basic unit, the emominette, is termed the Vic, because it is, very nearly, the vibration period of $C\#_0$, of the standard diatonic scale.

The ordinate subdivisions between the minette and the vic, are the Grovic and the Dovic. The present nautical mile is one minute of circular measure, or of arc. The grovic, being 1.04 minutes of arc, will be the new nautical mile. The present nautical mile is 6080.2 feet, or 1.15 land miles. The new nautical mile is 6333.6 feet, or 1.2 land miles.

The dovic is about 1/3 second (.35) of time, and will probably be the unit generally used for small time measurements.

Basic Units
Arranged vertically in steps of *1000*

1000 Vics equal *1* Minette
1000 Minettes equal *1* Day

Ordinate Units
Arranged vertically in steps of *10*

10 Vics equal *1* Dovic
10 Dovics equal *1* Grovic
10 Grovics equal *1* Minette
10 Minettes equal *1* Temin
10 Temins equal *1* Duor
10 Duors equal *1* Day

Tables of the natural functions of angles, of the log functions, and the numerical logs to *8* duodecimal places, may be found in George S. Terry's monumental work, "Duodecimal Arithmetic". Mr. Terry uses the duodecimal fraction of the circle for the arguments of his tables, but it should be noted that the "places" of these duodecimal fractions also represent the units of the do-metric measure. For example:- the angle *.87£,653* also is *8* duors, *7* temins, *£* minettes, and *6* gro *5* do *3* vics.

A word should be said about the 24 hour do-metric watch dial. The bottom half of the dial might be given a darker color to indicate the night hours. Most probably the *0* would be located at the bottom of the dial, to indicate midnight, which is the beginning of the day. Noon would then be indicated by the hour hand pointing to *6* at the top of the dial, and the minute hand pointing to *0* at the bottom of the dial. The names of the most important cities might be shown around the rim of the dial, affording a direct reading of their respective local civil times.

If one faced toward the south, the hour hand would move almost exactly with the sun, indicating that one could approximate time quite readily by the sun. Conversely, the watch could be used to some extent as a compass.

TEMPERATURE

The dozenal temperature scales provide *100*° between the freezing point and the boiling point of water. There are two dozenal temperature scales: the Popular Scale, using *0*° as the freezing point, and *100*° as the boiling point; and the Scientific Scale, using Absolute Zero as *0*°.

	Centigrade Scale	Fahrenheit Scale	Scientific Dozenal Scale	Popular Dozenal Scale
Absolute Zero	-273.18	-459.72	*0*	*-289.46*
Water Freezes	0	32	*289.46*	*0*
Normal	20	68	*222.21*	*25*
Blood Heat	37	98.6	*312.7X.*	*45.3*
Water Boils	100	212	*389.46*	*100*

To convert from Centigrade to the dozenal Popular Scale, use the same methods as you would to convert any decimal number to dozenal figures. The reverse is also valid. The same procedure applies for conversions between the Kelvin, or Absolute Scale, and the dozenal Scientific Scale.

To convert from Fahrenheit to the dozenal Popular Scale, subtract 32° and decimally multiply the remainder by .8; then convert the result to dozenal figures. To convert from the dozenal Popular Scale to Fahrenheit, convert from dozenal to decimal figures, multiply decimally by 1.25, and add 32° to the result.

CURRENCY

The United Nations is but a first step toward the establishment of a Union of the peoples of the world. It begins to be clear that among the powers that will be centralized in the fed-

eral authority of that government will be the control of a world currency.

Until now there has been a trend among the nations to unify their coinages with the number base, and many currencies have assumed a decimal form. With the progress in recognition of the greater desirability of the dozenal base, the use of duodecimal currencies may be enticipated. For that reason, the units of a duodecimal currency should be considered here because they constitute one of the most essential measures, the measure of values.

So far as is known, there is no existing currency that is fully duodecimal. Some are partially so, having one or more dozenal units. In the English currency for instance, there are twelve pence to the shilling, but no other dozenal units are used.

Where decimal coinage has been adopted, the favored ratios between coins are:

Between 1.00 and .10:	1.00	.50	.25	.10
Between .10 and .01:	.10	.05		.01

There is an evident omission of one coin in the lower range. This is probably due to the desire to avoid the complications of the half-cent, or parallel unit. This omission is unnecessary in dozenel coins, and both ranges are similar and symmetrical:

Between *1.00* and *.10*:	*1.00*	*.60*	*.30*	*.10*
Between *.10* and *.01*:	*.10*	*.06*	*.03*	*.01*

As the cleerest illustration of the change from the decimal to the duodecimal currency, let us consider the change as it might apply to the coinage of the United States.

There would be no change in the statute value of the dollar. The coin itself can remain unchanged but it will contain *100* pennies. The half-dollar would equal *60* pennies, but the coin itself would remain unchanged. The quarter-dollar would equal *30* pennies, but the coin itself would remain unchanged. The dime would equal *10* pennies, but the coin itself would remain unchanged.

The nickel and the cent would need to be changed. The nickel should be reminted as the same coin in size and materiel, but as equal to *6* pennies. A new coin, similar in size to the cent, but made of transparent plastic, should equal *3* pennies. The cent should be replaced by a new coin similar in size to the dime, but made of transparent plastic. Whether this would be called the cent or the penny, or some other name, is relatively unimportant.

Of the paper money, only the dollar bill might remain as it

now is. It bears the statement of its value, as 100 cents. This might be allowable. New bills, issued in the preferred ratios indicated above, would replace the rest of our paper issues.

There may be some question whether an article, priced at one dollar a gross, would be sold at *10* cents a dozen, or a cent apiece. But there is a clear advantage in being able to arrive at the unit cost thus readily from a bulk price.

As to ease in making change, there are ambiguities in any comparison. But it may be granted that there would be greater flexibility and a requirement for relatively fewer coins with duodecimal coinage in most cases. A point that should not be missed is that, with the dollar subdivided by the gross instead of the hundred, a closer determination and differentiation of price is possible.

Whether considered for a world currency or for national use, the duodecimal coinage should fit the needs and habits of the people well. There can be little argument but that this is a characteristic of the "dozen" in any application. The very origin of the dozen is attributable to its being designed to suit the customs of the people better than the ten.

Any world currency will constitute a definite contribution to world order. And the duodecimal coinage should prove most advantageous in this application.

EPILOGUE

There are many measures derived from the fundaments of size, weight, time and temperature. For convenience in use, they are defined in a great variety of ways. The units of work, force, flow, energy and momentum, for instance, would fill an extensive index, and they differ widely in size among themselves.

In this summation of the do-metric measures, no proposal for these terms is included. The bases for their determination have been presented in the foregoing fundamental units. But, since they are derived units, and as their sizes will form an important element of their practicality, it is felt that their definition should await practical application.

In designing the funadamental units of the Do-Metric System, many problems of nomenclature have presented themselves. It is beyond possibility that these have all been happily and adequately handled. Names are of secondary importance. But the units selected and defined seem in themselves relatively inescapable and ultimate.

Criticism of any of these proposals, as well as comment and suggestion, will be most welcome. One could not work long with dozenals and preserve much of an attitude of omniscience. What is most desired is the test of practical use.

In all history there has been no people to whom a natural and flexible metric system possessed equal importance, no people to whom the implications of a world standard of weights and measures offered greater opportunities than to ourselves. There has been no time when the urgency of the requirement for a unified metric system was greater than today.

As the greatest makers of tools, and the greatest users of tools that the world has ever known, to us the perfection of our most important tool, our system of weights and measures, is of the greatest importance.

Because of the importance of this problem, you should consider this proposal as addressed to you, yourself, personally. It is your comment and your criticism that will aid in eliminating the faults and omissions which you may have observed.

PEOPLE WITH TWELVE FINGERS. (Continued from Page 3)

five fingers is considered adulterous and is immediately sacrificed. If any member of the Duodecimal Society in the armed forces - of whom we have several - takes part in the recapture of Borneo, he might look up the family of the Sultan of Pontianak (Borneo) who are reported to be six-fingered, and to regard it as a mark of royal distinction.

Four fingers and an opposing thumb are doubtless efficient as a working hand, though they have resulted in a very inefficient number system. Perhaps this footnote on twelve-fingered humanity may help some of us explain counting by dozens to those incorrigibly ten-fingered folk who have never thought of the possibility of two more fingers or two more digits.

DUODECIMAL NOMENCLATURE (Continued from Page 5)

Then the numerals *00* to ℔℔ are designated as follows; some of the diphthongs used are as familiar in other tongues as those in customary use in English.

0 or *00*:	noo	*10*:	poo	*20*:	roo	etc., to	*℔0*:	moo
1 or *01*:	nah	*11*:	pah	*21*:	rah		*℔1*:	meh
2 or *02*:	no	*12*:	po	*22*:	roe		*℔2*:	mo
3 or *03*:	neh	*13*:	peh	*23*:	reh		*℔3*:	meh
4 or *04*:	noy	*14*:	poy	*24*:	roy		*℔4*:	moy
5 or *05*:	nigh	*15*:	pie	*25*:	rye		*℔5*:	my
6 or *06*:	nee	*16*:	pee	*26*:	ree		*℔6*:	me
7 or *07*:	nee-ah	*17*:	pee-ah	*27*:	ree-ah		*℔7*:	mee-ah
8 or *08*:	nee-oh	*18*:	pee-oh	*28*:	ree-oh		*℔8*:	mee-oh
9 or *09*:	nee-eh	*19*:	pee-eh	*29*:	ree-eh		*℔9*:	mee-eh
X or *0X*:	noh-oo	*1X*:	poh-oo	*2X*:	roh-oo		*℔X*:	moh-oo
℔ or *0℔*:	now	*1℔*:	pow	*2℔*:	rau		*℔℔*:	mu

Admittedly, to the present-day eye and ear this appears absurd as all innovations do; but it furnishes a panel of *100* logically formed syllables, pronounceable with little or no effort by any human on the globe, and intelligible to any other human who is familiar with its principle. Larger numbers are obviously expressable as sequences of these syllables; thus, roy-fee is *2476*. Compare this with the long-winded expression, "twenty-four-hundred and seventy-six", really a much smaller number, of course, than these digits represent duodecimally. If we adopt a system similar to that here proposed, future generations are going to laugh heartily at our present clumsy nomenclature. Let us consider some of the objections that will be raised.

1. No provision is made, so far at least, for fractions and ordinals (one-fifth, first, etc.) Answer: This may safely be left to present usages of the different languages if the numerals are clearly pronounced and understood. In English, "roy-point-fee" could signify *24.76* clearly; one-fifth: "nah-naith"; first: "nahth". Probably for such elementary concepts as small fractions and ordinals, however, our old expressions would long continue, willy-nilly. We still speak of a "brace of pheasants" for a game-bag of two; the word "brace", so used, perhaps antedates the Anglo-Saxon.

2. The words so framed would sound Japanese. Answer: Very good indeed; despite its difficult printed and written language, that is one of the most easily spoken tongues on the globe, and with the present suicidal career of their militarists, bids fair to become a dead tongue within two generations. Incidentally, how nice it would be to have paramushiro (pah-rah-moo-shei-roe) represent the number *17 21 20 65 22*, a ten-digit duodecimal number in five easily pronounced syllables. Wouldn't this phonetic system, once mastered, vastly facilitate the transcript of long numbers from statistics or logarithm tables.

3. Numbers so spoken might be ambiguous with the words for other things. Answer: Except for one- and two-digit numbers, (therefore one-syllable), and except in Japanese or other pacific tongue, only seldom. Most European languages form too many of their words with combinations of two or more consonants, whereas in this proposed notation consonants would never be consecutive; a difference in word-structure too obvious to be mistaken. Furthermore, our present spoken numbers are more ambiguous than we realize: one and won; two, to, and too; four, for, and fore; eight and ate; these are identically pronounced pairs or triplets. Confusion never results because of the different contexts and accents with which numerals are pronounced.

One result of such a system of number-names would be the printing of large numbers in blocks of four digits, instead of three as at present, a slight improvement in compactness. Another incidental advantage: a two-syllable word would express the

year of the Christian era, - an equally short word that of the Jewish era. But an enormous advantage would be the assignment of an elternate place-name to every city on the globe. This alternative place-name could be universally pronounceable, and easily and unmistakably understood, and would furnish in those four syllables the duodecimal coordinates of the place; that is, both the meridian (thus automatically the time zone), and the latitude (or better still, the polar distance), within a nautical mile each way. In the coming era of high-speed air traffic, such place-names would be especially desirable and useful.

Before closing, it should be observed that the world has now reached a state of technical advance that will enable us, when the duodecimal movement has progressed and is supported sufficiently, to introduce and teach by radio, television and talkie, the spoken and written symbols selected for the duodecimal system most intensively. The present task of the Society is to lay the foundations soundly, and your comments on the foregoing suggestions are solicited. It might be well to have a speech-consultant review the proposed number-names and suggest changes where he deems them advisable.

UNCIAL JOTTINGS (continued from Page X)

Time. Uncial subdivision of the day, as advocated hitherto. The unit 10^{-5} day (approximately 1/3 sec.) is a convenient one to use in defining the basic units of the more complicated kinds of physical quantities, such as acceleration, force, action, power, and energy. Especially

Acceleration, whose unit it is desirable to set at something approximating the average acceleration of the earth's gravity, for otherwise any measure system will split into two - a physical system and a gravitational system - as both the English and the Metric systems have done. Making the "gee" the basic unit of acceleration will enable units of mass to be spoken of and used also as units of force, with scarcely a lifted eyebrow from the physicist. An acceleration of 118.2_{dec}cm$(10^{-5}$da$)^{-2}$ is the unit required, and accordingly the factor 118.2 cm, or some convenient approximation to it, should become the fundamental unit of

Length. Now considering the needs of the workshop - the simple ratio between the millimeter and the 10^{-3}_{unc} part of the "ell" of 118-odd cm that we desire to establish - it appears that to define a milliell as 13-19 mm (or 1 mm = 17/11 milliell) gives a very satisfactory result: an acceleration of 1 ell$(10^{-5}$da$)^{-2}$ = 980.660_{dec}cm/sec^2, a very decent approximation to the present standard value of 980.665 cm/sec^2.

Mass. Here we can be guided fairly well by the metric example of giving the density of water a value of some power of the numerical base in units of the system. At the same time I have allowed myself some leeway here, since the density of water changes with temperature and purity, and have used this leeway to try to insure that the new unit of pressure will work out so that the present "Standard Atmosphere" can be fairly accurately expressed in some round number. The result of these efforts to date is a compromise: let the unit of mass be defined such that one metric gram = $0.001\ 986_{unc}$ of it, precisely; then the density of water will be around 1000 unit mass/ell^3 at ordinary temperature, and the present "Standard Atmosphere", now expressed as 760 mm of mercury, will be almost exactly 8900_{unc} of the new unit of pressure. The preservation of the "Standard Atmosphere" is of some importance because of the tremendous volume of data that has been recorded in terms of it - including even the foundation of the

Temperature Scale. It happens here that the degree Fahrenheit works out quite well in uncials. Measured from a fictitious zero (a fraction, negligible for most purposes, below the Absolute Zero) equivalent to -460°_{dec} F., the icepoint is 350°_{unc} and the steampoint 480°_{unc}.

Electrical Units, offer a big field for controversy, and I have come to no definite conclusions so far. Defining the permeability of space as 10 or 10 of unit permeability, and writing Ampere's law in Heaviside's "rational" form would define units of fairly convenient size.

Units of Musical Interval, offer a very pleasant exercise for the uncial enthusiast; the octave has already been divided into twelve equal semitones. For calculations in theoretical harmony a table of logarithms to the base two in uncial notation is helpful.

William S. Crosby.

. . . . . And a letter from Corporal Dallas H. Lien, 19020859, Alaska Communication System, APO 980, Care of Postmaster, Seattle, Washington. . . . . .

I just received my copy of the Bulletin after having it trail me all over the country. I received also Mr. Seelbach's letters bringing up some interesting points in regard to word-derivatives. I have a particular interest in the word-derivatives regarding electrical development.

In regard to Mr. Seelbach's suggestion for changing the length of the foot to thirty centimeters, I think it would be a good move if it weren't for our plans to change the base. If a change is necessary, we might just as well adopt the meter and divide it up duodecimally. Although the divisions would not tie in with the decimal divisions very well. But I think it would be better than adopting a new foot. I don't, however, propose either method. But I worked out another unit which will be invaluable in radio-frequency work. I am wanting for a name to call the new unit, but I have adopted the word "mark" to use

while referring to it in this letter. It is expressed by the following formula, which is similar (but far superior) to the one used in the decimal system. The figures are duodecimal.

$$L = \frac{10^9}{f}$$

where L represents the wave-length in "marks", and f is the frequency in cycles per edo-mo day (4.17 seconds). The distance is approximately twenty-six centimeters.

This unit will be invaluable when working with radio frequencies and light waves, since the reciprocal of the wave-length in marks will always equal the frequency in trimocycles, and one is always the reciprocal of the other.

These figures are based on the approximation that three hundred megacycles is the frequency of the one-meter wave-length. When the rest of my baggage catches up with me, I will have more accurate data on the speed of light, etc., and I will work this out to a greater degree of accuracy. The length is approximately six and one half inches, which, I think, is a more convenient length than is the foot, or, moreso, the meter, even for commercial uses.

The weight of a cubic mark of water is approximately thirty-seven pounds. It can be given a name and used as the unit of weight. This unit can be the base for a far superior measuring system than is the metric system, since, with the mark for a length base, the weights and measures can be extended into the electrical and quantum measures, which can't be done with the metric system without running into some endless chain of decimal fractions. Then the fact that we're using duodecimal figures still further multiplies its efficiency.

I would appreciate any comments or new ideas, and possibly a name for the unit other than the "mark".

Dallas H. Lien.

Ed. Note: I would like to suggest one new practice. Instead of saying 10^9, it would be an improvement to use M^3. A moment's thought will show that both figures are identical; one refers to powers of the do, the other to powers of the mo. The major difference is that the M will immediately supply both the correct name as well as correct visualization of the quantity. Both quantities represent One Trimo. Ed.

. . And one from Jamison Handy, Jr., one of our new Aspirants. Among other things, he says:-

I long ago selected the figure 3 upside down (E when typing), and 7 upside down (L when typing) for the additional characters. However, the coincidence of our both having used el is worse for

me than if I had used entirely different characters, for my usage of them is transposed; i.e., E had meant "ten" to me. I can not take time now to go over all my old material and change. In copying an old table, I found the process likely to introduce errors unless I was painstaking and slow. So I am leaving the old stuff "as is" and am making it a point to date subsequent material, while getting accustomed to the agreed symbols. Thank you for Mr. Camp's name and address. I hope to write to him soon.

In regard to weights and measures, my proposals followed the policy of gradual, or least change. For money, I would propose modifying the British currency in either one of two ways:- either retain the ratio of twelve pence to the shilling, and erect a duodecimal currency on that base; or retain the pound, and adapt the balance of the currency, duodecimally, to conform.

Of the two, I prefer the first because it uses the pence-shilling relationship, already so deep in English culture. The principal argument for the second is, that the pound sterling is the world's primary monetary unit. I refrain from suggesting names for the new coins because I've found that the collective originality, whose fruit is slang, results in better and more natural terms than any I might individually propose.

For linear measurement, in accord with the policy of least change, I prefer the duodecimal measures based on the inch, and the foot (vide Andrews). But for scientific use, I would suggest:-

12 centimeters = ----------
144 " = 1 gauge (or gege)
1000 g = 248832 " = 1 league (2.49 km., ca 1.55 mi.)

These both use terms we already have, or can find in the dictionary. It is a fortunate coincidence that the standard railway gauge in most parts of the world is 4' 8.5", or 4' 9" (143.5 to 144 cm), thus giving a ready name to this unit.

In regard to time, rather than make-over all the watches and clocks, I was sticking to the 24 hour day (and night), but I like the freshness and consistency of the society's suggestion of a double hour, divided into 100 minutes. This makes the minute not too different from the accustomed one (i.e., 50 seconds. The minute that I suggested was only 25 seconds). As to the angular measure, we are together.

I believe you would be interested in a statement made by Rear Admiral E. L. Cochran, Chief of the Bureau of Ships, USN. He is the representative of the Navy on the American Standards Association Council. In the organ of the Council, "Industrial Standardization", for January 1945, Rear Admiral Cochran says:

> " . . much has been said in advocacy of the metric system. . . . I've been called upon to do a considerable amount of engineering work in my time, and have great

warmth for a unit that can be divided into halves, thirds, quarters, sixths, eighths and twelfths. . . "

I believe Adm. Cochran might be interested in us, on the side, if he is not already acquainted.

Jamison Handy, Jr.

. . . . Alfred Norland, creator of the Twecimal System, writes (in part and in effect) as follows:-

Just back from a trip to San Francisco, where I personally tried to introduce a proposal for change of base for International Exchange. If interested, I will send you a copy of this proposal as soon as I can get some more printed.

Coming back to our program, the unit Twelve is naturally expressed by *10*, but the name Do which you have given it is objectionable from my point of view. As an abridgement for Dozen it is perfect, but its likeness to 0 makes it unfit. We have to use some short syllable referring to the Twelve System, as in the decimal system we use Teen and Ty. If we use Do, we lay ourselves open to innumerable mistakes in conveying a number from one person to another, from mouth to ear. For instance, if one says, "three do eight" for *38*, and the number is understood to be *308*, what then?

As Teen and Ty are derived from ten in our language, I believe that Twe will fit perfectly for the Twelve System; and *11*, *12*, *21*, and *84* would be called, "Twe-one, Twe-two, Two-twe-one, and Eight-twe-four".

In order to derive symbols for ten and eleven, why not take some of the other digits and turn them over? As 3 is the lower unit, let's turn that around as the sign for ten, and the 7 for eleven. Seven and eleven seem to belong together in the American mind.

Hope that the above suggestions may be of value for our common future work.

Alfred Norland.

. . . . We have a letter of Kingsland Camp's on symbology, that we are unable, at this time, to satisfactorily reproduce. The subject, itself, is of the first importance, and Mr. Camp's letter contains a number of constructive ideas. We can assure you that this is but a pleasure deferred, and that means will be found to adequately handle this phase of our problem. Meanwhile, we would like to receive other original ideas for symbols designed for the complete separation of duodecimal identity. . . . Due to unanticipated delays, this number of the Bulletin will not arrive until the latter part of July, or first of August. . . . In order that the September issue may reach you in September we will have to use an earlier dead-line. . . . Will you please submit any material you may have for that issue immediately. . . . We will be grateful.

H O W T O C O U N T B Y D O Z E N S

Our common number system is decimal - based on ten. The dozen system uses twelve as the base. This requires two additional symbols: *X*, called *dek*, is used for ten, and *Ɛ*, called *el*, is used for eleven. Twelve is written *10*, and is called *do*, for dozen. The quantity *one gross* is written *100*, and is called *gro*. *1000* is called *mo*, representing the meg-gross, or great-gross.

Modern numeration employs one of the greatest of man's inventions, the zero - symbol for nothing. It permits the use of place values. In our customary counting, the places in our numbers represent successive powers of ten; that is, in 365, the 5 applies to units, the 6 applies to tens, and the 3 applies to tens-of-tens, or hundreds. Place value is even more important in dozenal counting. For example, *265* represents *5* units, *6* dozen, and *2* dozen-dozen, or gross. This number would be called *2 gro 6 do 5*, and, by a coincidence, represents the same quantity normally expressed as 365.

Place value is the whole key to dozenal arithmetic. Observe the following additions, remembering that we add up to a dozen before carrying one.

94	*136*	Five ft. nine in.	*5.9'*
31	*694*	Three ft. two in.	*3.2'*
96	*3Ɛ2*	Two ft. eight in.	*2.8'*
19Ɛ	*1000*	Eleven ft. seven in.	*Ɛ.7'*

You will not have to learn the dozenal multiplication tables since you already know the 12-times table. Mentally convert the quantities into dozens, and set them down. For example, 7 times 9 is 63, *which is* 5 dozen and 3; so set down *53*. Using this "*which is*" step, you will be able to multiply and divide dozenal numbers without referring to the dozenal multiplication tables.

Conversion of small quantities is obvious. By simple inspection, if you are 35 years old, dozenally you are only *2Ɛ*, which is two dozen and eleven. For larger numbers, keep dividing by 12, and the successive remainders are the desired dozenal number.

12) 365
12) 30 + 5
12) 2 + 6
0 + 2 Answer: *265*

Dozenal numbers may be converted to decimal numbers by setting down the units figure, adding to it 12 times the second figure, plus 12^2 (or 144) times the third figure, plus 12^3 (or 1728) times the fourth figure, and so on as far as needed. Or, to use a method corresponding to the illustration, keep dividing by *X*, and the successive remainders are the desired decimal number.

Fractions may be similarly converted by using successive multiplications, instead of divisions, by 12 or *X*.

Numerical Progression

1	One		
10	Do	.1	Edo
100	Gro	.01	Egro
1,000	Mo	.001	Emo
10,000	Do-mo	.000,1	Edo-mo
100,000	Gro-mo	.000,01	Egro-mo
1,000,000	Bi-mo	.000,001	Ebi-mo
1,000,000,000	Tri-mo	and so on.	

Multiplication Table

1	2	3	4	5	6	7	8	9	X	Ɛ	10
2	4	6	8	X	10	12	14	16	18	1X	20
3	6	9	10	13	16	19	20	23	26	29	30
4	8	10	14	18	20	24	28	30	34	38	40
5	X	13	18	21	26	2X	34	39	42	47	50
6	10	16	20	26	30	36	40	46	50	56	60
7	12	19	24	2X	36	41	48	53	5X	65	70
8	14	20	28	34	40	48	54	60	68	74	80
9	16	23	30	39	46	53	60	69	76	83	90
X	18	26	34	42	50	5X	68	76	84	92	X0
Ɛ	1X	29	38	47	56	65	74	83	92	X1	Ɛ0
10	20	30	40	50	60	70	80	90	X0	Ɛ0	100