The Dozenal Society of America
My Love Affair with Dozens
by F. Emerson Andrews*

One blizzardy afternoon in January, 1934, I sat at my home writing desk in that most productive of all mental states, having nothing pressing to do. Nearly all important thinking comes by that road. The driven mind is capable of tremendous production, but I question its quality. Galileo discovered the principle of the pendulum not during busy hours in his observatory but while idling in a cathedral, watching the chandeliers swinging. If the fable is true, no laboratory but an hour of dreaming beneath an apple tree brought Sir Isaac Newton to the mental spryness which leaped to the laws of gravitation.

The trouble with "efficient" thinking is that, in order to get ahead rapidly, it accepts the habitual without question, hastily building upon it something which may be false and is certain to be secondary. The world being flat, one cannot sail around it. Eight and 4 being 12, arithmetic must remain just as it is. Important discoveries come only when one has (or takes) the leisure to examine with a fresh and curious mind the habitual thing.

That wintry afternoon, I remembered hearing long ago, perhaps from a teacher in high school, that one could count by twelves easier than by tens. This questioned one of the few remaining things in this world of change that nearly everyone takes for granted. I tried out this half-remembered idea. Soon I found that all I needed was to invent two new numerals, one for the old quantity ten (I used the Roman X and called it dek) and another for eleven (I used E and called it el). All that afternoon papers covered with scribbled figures multiplied on my desk as unaccountably as tropical fish.

Mrs. Andrews, still an editor at Henry Holt and Company, came home at dusk to find a writer's desk covered with no writing, just a mad array of figures, some of them not even honest Arabic numerals.

"Well," she said cheerfully, "what a way to waste your time!"

I had rather intended to waste some time, but now was excited by an idea that seemed to have merit. In pretended dudgeon, I announced that these figures represented an important discovery—not, perhaps, a completely new discovery, but one that had never been adequately introduced to a possibly waiting world. I, a writer, would make this discovery known.

As a result of this rash boast, I explored the meager literature of counting by twelves—duodecimals. Fragments of duodecimals (in the sexagesimal system and elsewhere) are found among the Babylonians. A book by Simon Stevin seems to have mentioned it as early as 1585. In England, prominent proponents included Sir Isaac Pitman, who was trying to induce his shorthand students to use duodecimal counting in 1855. Thomas Leech's *Dozens versus Tens*, appearing in 1866, was the earliest substantial book on the subject in the English language. Herbert Spencer advocated the system in an article in Appleton's *Popular Science Monthly* in June, 1896, and is said to have included in his will funds to promote the duodecimal system and oppose the metric if ever the British Parliament attempts to introduce the latter. He would have been deeply distressed by the current movement to decimalize British currency. In America, a few efforts had been made looking toward duo-

F. Emerson Andrews at the Dozenal Society of America's meeting in Council Bluffs, Iowa. Dsa File Photo, 15; (17.) April 117Ɛ; (1967.).

decimal counting, including John W. Nystrom's proposal for duodenal arithmetic (the name was not happy), and Grover Cleveland Perry's pamphlet, *The American System of Mathematics* (1928). Some school arithmetics gave exercises, usually along with other possible number bases. But in the 'Thirties, few people had ever heard of the idea, much less tried it out.

In two weeks I had finished an article explaining counting by dozens, and hopefully sent it off to *Scientific American*, which seemed the logical market. In an effort to be helpful its extremely able assistant editor, Albert G. Ingalls, sent a rejection which seared my writer's soul:

Unquestionably the duodecimal system would be far superior to our decimal system … Plainly you have immersed yourself in this study for a long time [two weeks!] and lost your ability to see it as a reader would see it de novo. Few would read your article through, because it would be labor, giving most readers a severe headache…. It would take a real dabster of a writer to put it over.

Clearly, I had utterly failed as the writer which I hoped I was, and managed only to pass myself off as a mathematician, which I knew I was not. I 'phoned Mr. Ingalls, and though he assured me that even a good article would only irritate his chief, who opposed duodecimals, he agreed to go over with me what he regarded as the article's deficiencies. We did this, and I rewrote it three times; at last, reasonably content, I sent it off to another magazine, christened "An Excursion in Numbers."

Four additional magazines would have none of it. Likely magazines with scientific readership were exhausted, but there was my boast to Mrs. Andrews. At this point I sent it to one of the most unlikely magazines, but one in which I had been previously published, *Atlantic Monthly*.

Back it came, but this time with a letter from assistant editor Edward C. Aswell, reporting that be thought it one of the most interesting articles of the year; but the *Atlantic* never had published mathematics and probably never would. Certainly he could not accept such a manuscript in the absence of the editor, Ellery Sedgwick, in Japan. But if I wished to send it back after Mr. Sedgwick returned, he personally would present it to him.

I became a reader of ship news reports. Mr. Sedgwick and my manuscript returned to Boston Unquestionably the duodecimal system would be far superior to our decimal system practically simultaneously. Soon came another letter. The *Atlantic* would publish, provided I would permit insertion of an italic paragraph warning off non-mathematical readers at the point where the article began to be less philosophy and more arithmetic. The italics went in, and the October 1934 *Atlantic* carried the "Excursion." It was an excursion in a sense I had not anticipated. Before my author's copies of the magazine arrived, letters began piling in. They were from engineers, sea captains, missionaries, sugar planters, Wall Street bankers, teachers of mathematics, lunatics. Meanwhile the *Atlantic* was getting a similar flood; wrote the Editor, "We hoped, at best, for a limited group of appreciative readers, but found instead that

X = Infinity." From a magazine which never published mathematics, it suddenly became one urging me to submit more as promptly as possible. [1]

Hendrik Willem van Loon wrote that the idea was intriguing and undoubtedly right, but he was "too old and too hopelessly set in my respect for the sacred number ten to adopt the duodecimal system." A Wall Street securities analyst invited me to lunch, sure that a person willing to examine figures unconventionally would be able to supply him with a magic formula for outguessing the Street's Depression gyrations. I did analyze extensive tables he supplied, only to find what I had guessed; over substantial periods, reversals in market direction follow precisely the same laws of chance as coin tossings: no matter how many days the market has run in one direction, the chance of a reversal the next day is still 50-50.
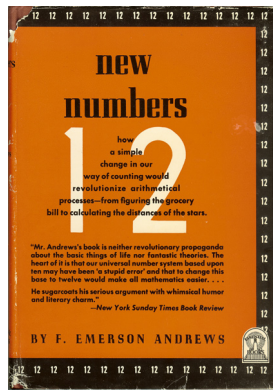
A gentleman from Portland wrote, perhaps not too seriously, that what I was proposing was really a new religion which should be called "Andrewism. With your permission I will be your prophet. The possibilities stagger the imagination." A Californian, writing in red because "the black portion of the ribbon is used up and I can't buy another," proposed that this new number system be used to reinterpret H. Davidson's work on the astronomical uses and purposes of the Great Pyramid, and be applied to a new brand of numerology.

Not all the correspondence was favorable. The most violent objection came from a lady who found my proposal blasphemous, for did I not know that the Lord had ordained counting by tens with the Ten Commandments in the Old Testament? Realizing that mathematical arguments were useless in this case, I wrote back acknowledging the presence of the Ten Commandments in the Old Testament, but stoutly affirming that in the New Testament there were the Twelve Apostles.
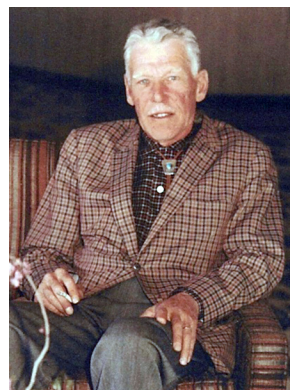
In the careful preparation of the "Excursion," I had accumulated far more material than could there be used—enough, indeed, for a small book. So I wrote the book, titled it *New Numbers*, and took it to Macmillan where I still had many friends. It came back promptly. Indeed, six publishers were unanimously uninterested. Then in early March came a letter from Samuel Sloan, of Harcourt, Brace and Company, acknowledging the uniqueness of the subject and inviting a visit. I went down, expecting at the best a reduced royalty contract, but armed with a pile of the mounting correspondence. He looked through a few of the letters and immediately offered a publishing contract. Says the Diary:

> It is a strange irony that my first book is to be a work on mathematics—a subject in which I had less than no interest up to last spring. I worked nearly twenty years at novels, and they've all come back. In a few months I attack a subject essentially foreign, and have a book contract in my pocket. Well, it is an honest job, outgrowth of a real enthusiasm; and I think it is a contribution which may prove really worth while some future day.
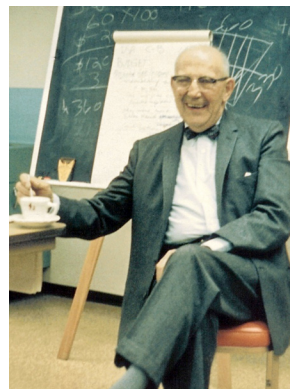
The day the book was published, 19 September 1935, Faber and Faber of London cabled an offer for a special British edition, which was issued the next year. It received excellent reviews here and abroad, and when the Harcourt edition went out of print, was republished by Essential Books in a revised edition in 1944. Meanwhile it was stimulating other books, here and

New Numbers was published three times: Harcourt, Brace & Company, NY, 1935 Farber & Farber, Ltd., London, 1936 Essential Books, NY, 1944

George Terry in 1180; *(1968.)*

Ralph Beard at the DSA meeting in Council Bluffs in 117Ɛ; *(1967.)*

abroad. In England came J. Halcro Johnston's version of how counting by dozens should be done, *The Reverse Notation* (1937). In France, Jean Essig published *Douze, notre dix futur* (1955).

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While most of the extensive correspondence was a single interchange of letters, a hard-core group gradually formed which wrote regularly for a period of years. The top keys on my typewriter were nearly worn out by letters that began "Dear Sir" but continued with substantially nothing but figures. This group usually made carbons of letters, sending to the whole small circle, and gradually began calling itself, humorously, the Duodecimal Society of America.

One member of this group was F. Howard Seely of California, who was preparing an arithmetic for duodecimals. (It was not completed at the time of his death, but portions of it have been used in a later Society pamphlet.) Another was Charles Q. DeFrance of Nebraska, who thought nothing of dealing in reciprocals of primes running to 180 places. But the most important member of this early group was the late George S. Terry, formerly a British engineer but then living in Massachusetts. He had written me only a few days after the original "Excursion" was published, expressing lively and informed interest and asking whether logarithmic tables were available in the new base. I referred him to the Leech logs, for certain primes, pointed out their inaccuracies, and expressed my belief that "no really serviceable table of twelve-base logarithms is in existence. If your interest is keen enough to support the considerable labor involved, may I suggest that you might be making a very real contribution to the future by developing such a table?"

Mr. Terry rose to the challenge. He had the Monroe Calculating Machine Company build him a machine with two extra cogs on its wheels—all a machine needs to be a perfect duodecimalian—and went to work. His monumental *Duodecimal Arithmetic* was published by Longmans, Green and Company in 1938, making available for the first time in history adequate tables of logarithms to the twelve base, trigonometric functions in terms of the duodecimal circle, and other needed apparatus.

In the year his book was published Mr. Terry, who was of course one of our carbon-copy correspondents, added to his letter of 21 September 1939 this significant paragraph:

> One other point. In recent circular letters between the four of us, "The Duodecimal Society of America" has been spoken of, with you as President and me as Treasurer. This seems to me very sound and capable of being put to a lot of use—especially as I am willing to finance it if necessary. But what is the procedure? Who are you going to elect as original members? It should publish a bulletin. You know all about that business. Should it be "The Duodecimal Society (of America)"?

Nothing happened immediately, for I was in no position to devote extensive time to what was a marginal interest. But in late 1941 Harcourt forwarded to me a letter from Ralph H. Beard, who had just read a copy of *New Numbers*. Mr. Beard, an executive of the New York Telephone Company, recognizing our "mutual interest in duodecimals," raised "certain questions":

As a result of the current war, there will probably be established an international government of some type or other. This may reasonably involve the establishment of an international coinage, new standards of weights and measures, and an integrated telephone service. All of these stress the importance of making rapid progress in the education of the public in the advantages of duodecimals.

Hence, my questions. Is there an organization for this purpose? Can you give me the address of its correspondent? Is it national or international?

If no organization exists, I would like to help, unprofessionally, in starting one…

Now the infant Society had found its organizer. Things began to move, even under the tensions of World War II. On 5 April 1944 the first official meeting of The Duodecimal Society of America was held in my office. Action was started to obtain a nonprofit charter, which states that the purpose of the Society is "to conduct research and education of the public in mathematical science, with particular relation to the use of Base Twelve in numeration, mathematics, weights and measures, and other branches of pure and applied science." Mr. Terry, who became chairman of the board, gave an initial endowment [3] of $5,000, supplemented by other gifts through the years. I was elected president, over protest; in this field my only merit, I said at our first annual meeting, is "bringing a valid and important idea to the attention of abler minds." F. Howard Seely, not able to come East because of wartime travel restrictions, was made vice-president and membership chairman. Ralph H. Beard became secretary, treasurer, and editor of *The Duodecimal Bulletin*. His services as mathematician, expert in weights and measures, indefatigable secretary, *Bulletin* editor, sometime president, and continuing board member, all without compensation, have been beyond praise these more than twenty years.

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Even before the Society was officially organized, we had an opportunity for wartime service that happens to demonstrate one of the practical uses of the duodecimal system, even at present when we have the ten-system only too literally "on our hands." I received in late 1943 this plea for aid from the Army Transport Service:

As spokesman for a group of clerks employed by the Army Transport Service, engaged in measuring cargo loaded aboard ships sailing to our armed forces and allies, we are greatly interested in your articles If you can straighten us out with a few demonstrations, it would add greatly to the speed and efficiency of our work.[2]

These clerks then described a typical problem, getting the cubic content of a package measuring 2' 6" × 3' 6" × 4' 2".

This is not the place to go deeply into the mathematics involved. It is obvious, however, that when a number system based on ten and a measuring system based on twelve inches to the foot collide, "decimals" cannot be used, and usually it is necessary to reduce the whole problem to inches, with long computations and eventual divisions by 1,728 to obtain cubic feet. We were able to show the clerks that by using duodecimal multiplication with the inches now simply duodecimals of feet (i.e., 2'6" is simply 2;6—two and six-twelfths feet)—and pointing off three places in the answer, the problem is amazingly simplified.
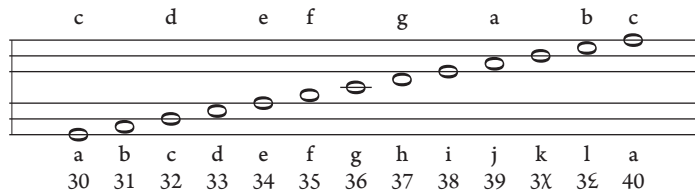
I shall do the first step, but the interested reader is invited to refer to the "Excursion" or *New Numbers* if his interest is deeper.

$$
\begin{array}{r}
2;6 \ \ \text{ft}^1 \\
\times\ 3;6 \ \ \text{ft}^1 \\
\hline
13;0 \\
+\ 76; \\
\hline
8;90 \ \ \text{ft}^2
\end{array}
$$

[Note that 6 × 6 duodecimally is 30; (three dozen), 6 × 2 is 10; (one dozen) with 3 to carry. Similarly, 3 x 6 is 16 (one dozen six). Answer, pointing off two places: 8¾ sq. ft. or 1260 sq. in.]

Music and Duodecimals

Every now and then some new application of duodecimals turns up.
An example is the proposal of a Society member, Mr. Velizar Godjevatz, for a duodecimal musical notation. He explains this notation, at length and with cogency, in his privately printed book.[4] We may briefly note that in simple piano music, for example, the curiously-named "octave" has twelve, not eight, tones, produced by seven white and five black keys. A confusing set of signs—sharps, flats, naturals, clefs—indicate which of those twelve keys is actually to be struck. As a first step in a sensible notation Mr. Godjevatz proposes a stave in which each note has its own line or space, easily identified:

c	d	e	f	g	a	b	c

a	b	c	d	e	f	g	h	i	j	k	l	a
30	31	32	33	34	35	36	37	38	39	3Χ	3Ɛ	40

The Notation Godjevatz.[5]

I am not enough of a musician to evaluate Mr. Godjevatz's proposal. But the society received from George Bernard Shaw, whose early writings were largely musical criticism, a letter warmly commending the Godjevatz notation:

Ayot Saint Lawrence, Welwyn Herts
21st October 1949

Dear Sirs:

I am much obliged to you for sending me Mr. Godjevatz's book entitled The New Musical Notation. I have read it through and followed its argument attentively. I know most of the new notations from that of Rousseau to the latest, as their inventors sent them to me because I was a prominent professional critic of music 60 years ago. I am greatly taken by Mr. G's plan. It is enormously more readable, writable, logical, graphic, and labor saving than any I can remember. Its adoption would save a world of trouble.

Wagner in his last days was still complaining that he could get nobody to transpose his clarinet parts for him. Reading music is said to be like riding: unless it is learnt in childhood it is never learnt at all. Mr. G's plan would teach people to count duodecimally with two new digits: eight nine deck ell ten; and this by itself would recommend it, as duodecimal arithmetic is a coming reform. I am no longer a reviewer; but if my valuation of the plan will help to call attention to it, you may quote this letter as much as you please.

(Signed) G. Bernard Shaw

I did not know, when the Society started, whether it would ever become large in numbers, or even survive. Certainly I did not share the belief of a few members that it should be a crusading force, or that a change in number base was in the least probable in the foreseeable future. The record has been, if anything, somewhat better than my hopes. Membership has never been large. At a meeting in Chicago in 1968 the secretary reported 166 members, from 30 different states, the District of Columbia, and seven foreign countries. The *Duodecimal Bulletin* has been published since 1945. It contains many unusual articles, often representing sound and fresh research. Number bases other than ten are now regularly taught in schools, with some emphasis on the conveniences of twelve. At latest count the Society had reprinted "An Excursion in Numbers" to a total of 60,000, chiefly to fill educational requests. The Duodecimal Society of Great Britain was formed in 1959, and I have visited in London its former secretary, Mr. Brian Bishop. I have long since given up the presidency of The Duodecimal Society of

America, and am urging younger men for its directorships. Because it runs on voluntary services, most of Mr. Terry's original endowment is still intact. For me, this detour into numbers has been a fascinating excursion, bringing unexpected sidelights, interests, and friendships. More remains to be done. For the idea is absolutely valid. Counting by dozens is better. ⊞

Notes

*   This article first appeared in the *Michigan Quarterly Review*, Volume XI, Number 2, Spring, 1972. Adapted from Mr. Andrews' then-forthcoming biography, *Foundation Watcher*.

1   Resulting in "Revolving Numbers," *Atlantic Monthly*, February, 1935, and "The Dark Ages of Arithmetic," July, 1935.

2   "An Adventure in Counting." *Mechanix Illustrated*, September, 1943.

3   "Endowment". *The Duodecimal Bulletin*, Vol. 1 №. 1, p. 4.

4   Godjevatz, Velizar, *The New Musical Notation*. Published by the Author, New York, 1948.

5   Godjevatz, Velizar. "The New Musical Notation". *The Duodecimal Bulletin*, Vol. 4 №. 2, pp. 1–5. THE DUODECIMAL SOCIETY OF AMERICA, New York, 1948.

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COMPLETE MULTIPLICATION TABLE, BASE OF 12										
	2	3	4	5	6	7	8	9	X	ε	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	2ε	34	39	42	47	50
6	10	16	20	26	30	36	40	46	50	56	60
7	12	19	24	2ε	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
ε	1X	29	38	47	56	65	74	83	92	X1	ε0
10	20	30	40	50	60	70	80	90	X0	ε0	100

The pocket multiplication table card which was inserted into a sleeve in the back of the Essential Books edition of New Numbers.