

THE *Duodecimal* *Bulletin*

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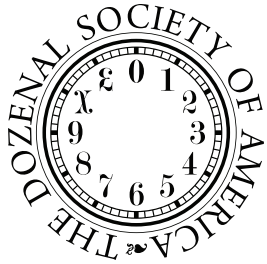


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The Dozenal Society of America

is a voluntary nonprofit educational corporation, organized for the conduct of research and education of the public in the use of base twelve in calculations, mathematics, weights and measures, and other branches of pure and applied science

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THE DOZENAL SOCIETY OF AMERICA, INC.
5106 Hampton Avenue, Suite 205
Saint Louis, MO 63109-3115

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TREASURER Ellen Tufano

EDITORIAL OFFICE

Michael T. D^e Vlieger, EDITOR
5106 Hampton Avenue, Suite 205
Saint Louis, MO 63109-3115
(314) 351-7456 editor@dozenal.com

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THE *Duodecimal* Bulletin

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president's message

This new format of the *Duodecimal Bulletin* aims to bring you, the DSA Member, greater value, both in design and content.

It is a great honor to have been elected President of the Society, one I take seriously. My goal as President is to bring enhanced value to you, the Members of this Society. We are producing the *Duodecimal Bulletin* entirely digitally, and bringing it to the web. The past issues of the *Bulletin* have been digitally archived so that these, too, will be available on the internet. Members can expect to enjoy enhanced access to the collective knowledge base represented by the full sweep of the *Duodecimal Bulletin*. We'd love to have you join us in summer 2009 in New York City for our next Annual Meeting. There are plenty of exciting things to discuss. Call me or shoot me an e-mail any time during the business day and tell me what you think, how the DSA can be a better organization. If you're in the Midwest, especially if you are visiting St. Louis, call me in advance and we can meet up. Most of all, remember that the best things start with you and your involvement in this organization. Without your thoughts and contributions, the DSA would be lacking.

A bit about who I am: I was born in Joliet, Illinois and live with my wife and 2 young children in St. Louis, Missouri. I am a Missouri-registered architect and 1993 graduate of the Illinois Institute of Technology. I am the founder of Vinci LLC, a business that specializes in construction visualization. Each day involves calculations where spans must be divided, elevations established and manipulated. Numbers play a large role in my life every day.

Ever since age thirteen, dozenals have fascinated me. Like many my age, I was "formally" exposed to the dozen as a number base in the 1970s by television's *Schoolhouse Rock*. The "Little Twelvetoos" short that aired Saturday morning indoctrinated kids on dozenal counting and multiplication. Later, computer programming in middle school introduced hexadecimal. The idea that numbers could be written a different way was fascinating. It was easy to "buy" hexadecimal, but it soon became evident that the twelves were easier to use. Feet and inches noted in dozenal became shorthand notation on my first field measurements on the job after college. Discovering the DSA and DSGB has revived and strengthened my thirst for dozenal reckoning.

I believe that dozenal is the optimum base for general human computation. It is ideally suited for computations out in the field or in the kitchen. You will deal with a $\frac{1}{3}$ cup of this or that before you'll ever deal with a fifth. In design, we are familiar with the "magic third". Our music, traditional systems of measure, our packaging all rely on the dozen. Like it or not, despite our decimal notation, we already live in a dozenal world.

This statement doesn't command the world to "convert" to duodecimals. It simply suggests that it is more convenient for general tasks. It wouldn't make sense to force dozenal for all specific situations. Specific tasks like counting bits and bytes or days in a fortnight may be better suited by bases sixteen and fourteen respectively. Today I am fascinated with higher bases like sixty. Won't you come along with me on an ascent, yes, like founders and presidents before, on F. Emerson Andrew's *Excursion in Numbers*? ❀

dozenal is the optimum base for general human computation

the DSA media report

The DSA invites its Members to contribute their thoughts regarding our "media". Members currently receive the *Duodecimal Bulletin* twice yearly, and the Society maintains a website at www.dozenal.org. As always, the *Bulletin* and the website are volunteer efforts. They thrive both through your support in the form of ideas, contributions, and membership dues.

The *Duodecimal Bulletin*. The current issue is at once a move forward in its production and a retrospective of the work of our Founders and esteemed Members, five dozen four years strong. Read about the new possibilities in "The New Digital *Bulletin*". Do you prefer an electronic version of the *Bulletin* in full color, or would you like to continue to receive the printed copies? (The DSA, at the time of writing, remains committed to providing printed copies indefinitely.)

Your ideas are always welcome. Simply submit your thoughts via e-mail if possible, especially if the input is lengthy. Do you use dozenal in real life situations? Did you see the dozen used recently in "the decimal world"? (See the photo of the products below, packaged in multiples of twelve.) Have you any thoughts about dozenal or other bases of numeration? Send your photos or diagrams. We can produce your article using your own symbols, if necessary. The *Duodecimal Bulletin* is a peer-reviewed journal of mathematics: for that reason we have Professors Schiffman and Zirkel to check the math. This is also your *Bulletin*. If you feel more comfortable chatting on the telephone, you can always call the Editor during business hours.

www.Dozenal.org. The website offers several avenues to our Society. In early January 2009, Mr. D^c Vlieger will rectify errors on the website home page. The site will then be expanded. First, the back issues of the *Bulletin* will be made available. News of meetings and Meeting Minutes can be posted online in addition to being printed in the *Bulletin*, if the Members desire, for example. Come to the meeting in summer 2009 to discuss possibilities for the website and the *Bulletin*.

In 1992, Fred Newhall (Member № 279;) assembled the fourth edition of his comprehensive dozenal index. In 2009, this index will be recreated digitally, hyperlinked to the back issues, then expanded to include later issues. We'll collaborate with the DSGB to ensure the index remains as broad as Mr. Newhall had established. Its fifth edition will be offered online in PDF and HTML form, titled the "Newhall Dozenal Index". The PDF, as with other PDFs, will be printable. The DSA website will then be as deep historically as the organization always has been, with dozens of years of thought at the touch of a button away. ❀



Dozens in a decimal world.

the new **digital Bulletin**

The Legacy. All of the written wisdom and thoughts of our predecessors has been gathered and kept safe and sound in a room in Garden City, NY since 1981.

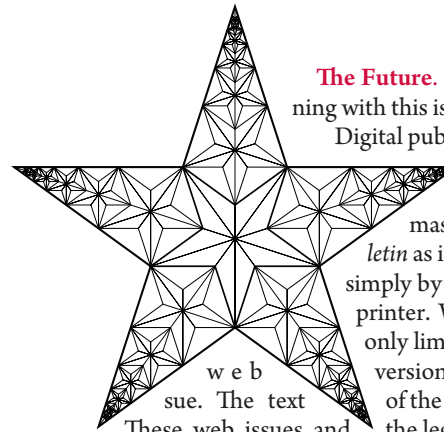
Imagine you are a member of a far flung family, whose noble and late patriarch has left you personally with all of his writings. These writings embody all the wisdom and musings of your patriarch on delicate paper, perhaps yellow and a bit less hardy than in his heyday. You've worked hard to gather all the documents, and now most of them rest in a trunk safe and sound in your attic. This trunk now contains the archived legacy of your family's patriarch.

At first glance it would seem that gathering and storing the legacy makes it safe and convenient. However, the very gathering of all these delicate documents in one place subjects them to a great deal of risk, should there be a disaster. As for accessibility, sure, if you personally needed to retrieve a document, only a trip upstairs faces you. But Uncle John or Aunt Kim would need to drive in from Chicago. Fortunately, a way is available which would both better safeguard the information contained in the documents and make that information available to interested parties both within and outside your family. The solution is digital archiving, the electronic scanning and storage of the original documents, and the posting of the resultant files on the internet.

The DSA has developed a significant body of legacy knowledge in the past issues of the *Duodecimal Bulletin* and other writings. Between January 1945 and June 2008, the *Bulletin* has published 2054; pages bearing the thoughts of our Society's Founders and Members. The full set of legacy issues fits into a small briefcase. Each issue was brought together at Nassau Community College, where one or more copies are stored in the F. Emerson Andrews Dozenal Collection (see page 13;) since 1191; (1981).

In June, the DSA completed the process of digitally archiving every past issue of the *Duodecimal Bulletin* by scanning each page and assembling them into electronic documents. These documents are saved in Adobe's "Portable Downloadable Format" or PDF, which has served as a common internet format for 2/3 of a dozen years. The original scans are maintained in the ubiquitous JPEG format in case PDF ends up an obscure format. Today, each of the nine dozen six legacy issues and the *Manual of the Dozenal System* are digitally archived. Gene Zirkel has sent a box of original photographs used in the production of the *Duodecimal Bulletin*. Some of this material has been scanned and archived, appearing in the electronic version of this issue in full color for the first time. This does not diminish the importance of original copies, still safeguarded in New York and now partly in St. Louis. However, digital archiving does reduce the risk of concentrating the material in one location and makes possible the broadcast of the material. The entire set of back issues soon will be made available on the website, making the writings of our predecessors available to the world.

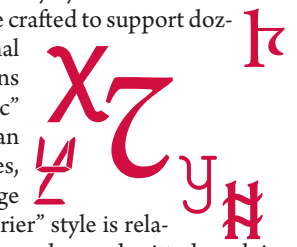
You can help. Please join us in Garden City, New York to discuss the digital archive. Help decide what to archive, and what to do with the material once it is in a more flexible format. Interested Members present at the upcoming General Meeting may receive a current copy of the archive. Members in good standing can e-mail the Editor and receive a CD-R bearing the archived back issues. This will more widely distribute the archive, better safeguarding the knowledge base from loss. Send in any original DSA documents you believe merit archiving; we're looking for *Dozenal Doings*, for example. We could use your time electronically retyping certain legacy articles. As always, you can make a difference by being present, or making a generous donation of time or funds.



The Future. The *Duodecimal Bulletin* has "gone digital" beginning with this issue.

Digital publishing gives the *Bulletin* a great deal of versatility. Every new issue will be fully produced on the computer, resulting in a digital master file. The master offers several options. We can print the *Bulletin* as it has been since inception, anywhere in the world, simply by electronically sending the appropriate files to the printer. We can publish in color or black and white, the only limitation being budget. We can produce a full color version that will be posted online beginning with this issue. The text of the web issues will be searchable in all search engines. These web issues and the legacy issues, will be made available online soon.

Dozenal literature differs from most any other writing in that one needs a set of a dozen digits to represent numbers; ten digits are insufficient. Today, we can create custom typefaces to allow us to publish dozenal figures in any system of numerals or "symbology" desired. In the past, custom type needed to be crafted to support dozenal symbologies. (See the next article for more on dozenal symbologies.) The DSA has produced typeface extensions that support several symbologies. These include the "classic" DSA or Dwiggin numerals (χ ε) and those of Isaac Pitman (τ ε). Some systems which were featured in legacy issues, such as those of Mr. Parkhurst and of Mr. Dudley George are also available in a typewriter-style typeface. This "Courier" style is relatively easy to construct. The *Duodecimal Bulletin* can thus produce submitted work in the symbology of the author, if desired. In the future, any interested party may request their particular symbology be generated by the Society for a nominal fee. Members would be offered a reduced rate.

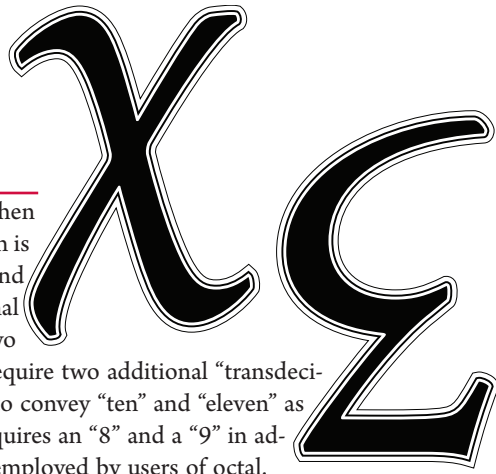


The *Duodecimal Bulletin* wields an arsenal of the latest technical and graphic software. We can employ CAD, 3D visualization, technical, and digital illustration software to produce professional graphics. The software enables us to produce clear and flexible output, such as the diagram at the top of this page, drafted by R. Beard in VOL. 3 No 3 page 10;. The software also facilitates the *Bulletin's* web publication.

As the Editor of the *Duodecimal Bulletin*, I hope the digital production of the *Bulletin* brings you, the Members of the Society, the most lucid and interesting content in the coming years. I hope to restore the legacy issues to viewership, to help increase the standing of the *Duodecimal Bulletin*, and to bring the *Bulletin* to the internet. The *Duodecimal Bulletin* remains dedicated to its Members. Without your written and financial contributions, it cannot serve. Please do not hesitate to write or call. ☀☀☀

Member Dudley George's separate identity symbology applied to the dozenal multiplication table.

going classic



One of the first considerations when one ponders duodecimal numeration is how to symbolize the “digits” ten and eleven. Those familiar with the dozenal system know that, since twelve is two units larger than ten, dozenal will require two additional “transdecimal” symbols. A symbol is needed to convey “ten” and “eleven” as digits in dozenal, just as decimal requires an “8” and a “9” in addition to the set of eight numerals employed by users of octal.

These transdecimal symbols enable the use of dozenal. Along with symbols, one needs names for the symbols in order to refer to them in writing. A convention established by the Dozenal Society of America adopts the names “dek” and “el” for the symbols signifying decimal “ten” and “eleven”, respectively. The symbols and their names give us the ability to identify numbers written in dozenal notation.

Symbology and nomenclature are fundamental tools for the user of dozenal notation. Many stumble upon dozenal long before they encounter the Dozenal Societies of America or Great Britain. Most dozenalists have devised their own symbology and nomenclature solutions. The symbols and names the dozenalist devises falls into two principal classifications, described in the 1945 article “The Opposed Principles”, *Duodecimal Bulletin* VOL. 1 № 3 page £; . The first principle is that of “Least Change”, which simply extends the dominant decimal symbology with two transdecimal symbols. For Americans and others in the West, this means extending the Hindu-Arabic set of numerals we are accustomed to in decimal usage. Perhaps for those in India or the Middle East, this would be the extension of their systems by two transdecimal numeral symbols. The second method, “Separate Identity”, involves the creation of a completely new system of symbols that may or may not have anything to do with any existing numeral set. Members have devised systems following both Principles. An example of two are included here:

Dudley George	SEPARATE IDENTITY	0 1 2 3 4 5 6 7 8 9 X Λ
Parkhurst	LEAST CHANGE	0 1 2 3 4 5 6 7 8 9 X Λ

In the 1940s, all publications required the use of movable type, either in the printing press or on the typewriter. Dies had to be cast in order to print text. So if one desired to print symbols which were foreign to the Latin alphabet, the Hindu-Arabic numerals, and around a couple dozen common signs and punctuation marks, one needed to cast the symbol as type. The Society is fortunate to have had a friend in William Addison Dwiggins, an influential, award winning, and gifted type designer of the early and mid

20th century. Mr. Dwiggins furnished designs for the DSA’s transdecimal symbols; these were employed beginning with the first issue of the *Bulletin*. Their use dominated the subsequent two dozen years. From the very first issue in January 1945, the *Duodecimal Bulletin* employed standard transdecimal symbols and names which remained consistent until just before the break in publication of the *Bulletin* in the early 1970s.

In the mid seventies, Prof. Gene Zirkel restored the *Bulletin* to publication in an age when it seemed the US telephone monopoly might provide a handy pair of transdecimal symbols. We adopted the asterisk (“star”) and octothorpe (“pound sign”) as dek and el. These symbols had the advantage in that they were rather commonly available on typewriters and later, personal computer keyboards. These could easily be set in type, without resorting to specially-crafted type. The quality of the other characters in the text could be seamlessly matched, because the character sets (ASCII) included * and #.

Today’s digital graphics software has developed to the point that enables the *Duodecimal Bulletin* to be produced entirely digitally. This method presents several advantages and opportunities (see “The New Digital *Bulletin*”, pages 5–6). This development enables the return of the classic DSA symbology, smoothly integrated into every edition from this point forward. We have decided to return to the “classic” DSA symbols, as Mr. Dwiggins devised them.

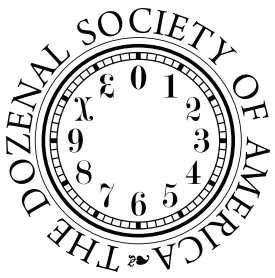
	dek	el
CLASSIC	X	£
“BELL”	*	#
PITMAN	7	£

The Dozenal Society of America and the *Duodecimal Bulletin* do not intend these symbols as standards commanded on the masses. We continue to respect a long standing policy not to espouse any particular system of symbology and nomenclature. The symbols and language each Member decides to employ remain personal decisions. We believe the best system will arise organically over time. This policy is not expected to change soon. However, in order to furnish a *Bulletin* that can discuss dozenal subjects, a common frame of reference is necessary.



The usage of “Classic” transdecimals was standard before Whole Number 41;

These symbols have a plausible origin. The “dek”, was fashioned to echo the Roman usage of X for ten. This symbol perhaps represents “two crossed arms” as Karl Menninger describes in his *Number Words and Number Symbols*. The “el” rotates the flat-topped 3 half a turn to provide a number-like symbol resembling the letter E, which stands for the English “eleven”. Though they are not as simple as some characters, they are simple enough. As conceived by Mr. Dwiggins, they have a more “numeral”-like appearance which resonates with the other figures. Their names make sense in English; we are, after all, an American organization. We are comfortable in having our international fellows decide for themselves what is best to suit their cultures and purposes. Perhaps there are better symbols, those which can be written with fewer strokes, those that may be more commonly available among the myriad “glyphs” or characters in the modern typefaces we have installed on our computers. These and other reasons aside, the Dwiggins or “classic” transdecimals remain neutral symbols, fine for the purposes of creating a common frame of reference for the *Duodecimal Bulletin*. ❖❖❖



a history of the DSA

by Gene Zirkel

Encouraged by Dr. **Tony Scordato**, past Board Chair of the Dozenal Society of America, and **Arthur Whillock**, Information Secretary of the Dozenal Society of Great Britain, I write this anecdotal history of our Society. It is based upon documents in our Archives and my personal recollections. Tony had pointed out that I was one of the last few people who knew some of the early Members of the DSA.

Some Prehistory

Note: In what follows, the dozenal fraction point (;) indicates a base twelve numeral, while a period or dot (.) is used to indicate base ten numerals. The abbreviation, WN, in *Bulletin* citations, refers to an issue's "Whole Number"

- £01; 1585. **Simon Stevin** mentions duodecimals.
- £98; 1700. **Charles XII** of Sweden investigates other number bases.
- 10X7; 1855. **Sir Isaac Pitman** urges his students of shorthand to also use duodecimals.
- 10£6; 1866. **Thomas Leech** writes *Dozens vs. Tens* containing the logs of prime numbers.
- 1103; 1875. *A New Treatise on Elements of Mechanics Establishing Strict Precision in the Meaning of Dynamical Terms Accompanied with an Appendix on Duodenal Arithmetic and Metrology* by **John W. Nystrom** is published using the unfortunate term "duodenal."
- 1120; 1896. In June, **Herbert Spencer** advocates duodecimals in *Appelton's Popular Science Monthly*.
- 1148; 1928. **Grover Cleveland Perry** authors a pamphlet, *The American System of Mathematics*.
- 1152; 1934. **F. Emerson Andrews** dallies with dozenal counting in January.



Dr. Tony Scordato and I visited the Nassau Community College's library collection of dozenal material after the 15 May 1982 Annual Meeting. Dr. Scordato was then serving as Chairman of the DSA.



F. Emerson Andrews at the 1967 DSA Annual Meeting.

Although advocates of counting in dozens existed for centuries, it wasn't until 1152; that the seeds of an organization advocating base twelve were sown. The unlikely planter was F. Emerson Andrews, an employee of a foundation and a diversified writer. Andrews had written over 2½ dozen books and countless articles including children's books, articles in *Mechanix Illustrated*, material on insurance, etc. One day, he started playing with numbers and discovered the advantages of dozenal counting. From his discoveries he penned an article which he sent to several likely publishers only to be universally rejected. Finally, in desperation, he sent it to the *Atlantic Monthly*. The editors agreed to print it provided that Andrews would insert a disclaimer halfway thru the article warning readers that what followed was mathematics.

Hence the article, entitled "An Excursion in Numbers", appeared in October, including the following:

“THUS FAR I HOPE MY LAY FRIENDS HAVE FOLLOWED ME IN COMFORT. TO PURSUE OUR EXPLORATIONS FROM NOW ON, SOME MATHEMATICAL INSTINCT IS NEEDED. PERHAPS THOSE WHO DESIRE TO TAKE THEIR EASE HAD BETTER STOP HERE, BUT I CAN PROMISE THE ONES WHO WISH TO STRETCH THEIR MINDS A BIT FURTHER THAT THEY WILL NOT GO UNREWARDED.”

Immediately upon publication, numerous messages of support started pouring in and these were forwarded to the author. Out of this correspondence a group of pioneers began a round robin of letters regarding dozenal counting. A would write to B. B would add his thoughts and pass it on to C, etc. At times they mimeographed their thoughts.

~ See our *Bulletin* WN18; VOL. 9 № 1.

An Embryonic Society

In addition to Andrews who lived in New Jersey, early writers included **George S. Terry** of Massachusetts, **F. Howard Seely** of California, **F. Morton Smith** of Massachusetts and **Charles Q. De France** of Nebraska.

- 1153; 1935. Andrews authors "Revolving Numbers" in the February issue of the *Atlantic Monthly* and "The Dark Ages of Arithmetic" in the July issue.
- 1155; 1937. Andrews' book, *New Numbers*, is published by Harcourt Brace. A British edition is published by Faber and Faber, however most of these are destroyed in a WW II air raid. **J. Halcro Johnston** publishes *The Reverse Notation*.
- 1156; 1938. Longmans, Green & Company publish Terry's *Duodecimal Arithmetic*.
- 1159; 1941. **Ralph Beard** contacts Andrews, joins the letter-writing group which he humorously dubs the "Duodecimal Society of America", and offers to help create our Society.
- 1160; 1944. Ralph Beard pushes for a formal organization. Ralph was an executive in the phone company who always signed his letters with the lighthearted "Whiskers". George Terry gives them almost 3 great gross (\$5000.) dollars (a sizeable sum in 1944!) to found and incorporate our

The Birth of the DSA

Society along with the instructions: If the Society was meant to be, this seed money would be enough to get it started. If it was spent and we went broke, then our time had not yet come. *Well here we are, more than 5 dozen years later, and we're still around.*

Ralph wrote a Constitution and By Laws which established the DUODECIMAL SOCIETY OF AMERICA as a tax exempt, non profit, educational organization. We are officially incorporated on July 16; (18.).

The Charter members and their membership numbers are:

- | | | |
|----|--------------------|-------------------------------------|
| 1; | F. Emerson Andrews | Tenafly, NJ |
| 2; | George S. Terry | 507 Main St., Bingham, MA |
| 3; | F. Howard Seely | San Francisco, CA |
| 4; | Ralph H. Beard | 20 Carlton Place, Staten Island, NY |
| 5; | F. Morton Smith | Boston, MA |

These five founders became the Board of Directors, and Carlton Place became our official address. There is no mention of Charles Q. DeFrance, so presumably he had passed away.

- 1160; 1944. **First Meeting.** On 5 April the first meeting of the DSA is held in Andrew's office in New York City. Terry is elected Board Chair and Andrews is President. Beard is elected Secretary-Treasurer and Editor of our *Bulletin*. Seely, who cannot get to NY from California is elected Vice President.

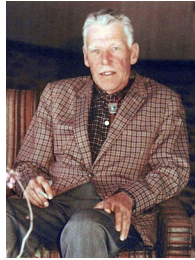
A revised edition of *New Numbers* is published by Essential Books.

- 1161; 1945. **Duodecimal Bulletin.** Ralph publishes the first issue of *The Duodecimal Bulletin*, listing more than a dozen aspirants to our fledgling Society. These included **Kingsland Camp**, FAS (Federation of American Scientists), Pvt. **William Crosby**, **Paul E. Friedman**, **H. K. Humphrey**, Cpl. **Dallas Lien**, **Mrs. Robert Lloyd**, Lt. **Eugene "Skip" Scifres**, AAC and **Lewis Carl Seelbach**, CPA - all of whom are frequently mentioned in later issues of our *Bulletin*.

Scifres, Member Number 11; and Lien, Number 14; are still active members of our Society. When Vice President Seely died, Friedman was elected to succeed him as Veep. Humphrey soon replaced Beard as Treasurer, and when he resigned, a dozen years later, Scifres was elected to that position. Seelbach and Beard created an excellent bibliography of dozenal materials which was published in our *Bulletin* in 1952 as WN 17; VOL. 8; Nº 2. **Mary Lloyd** contributed many puzzles for the enjoyment of our readers. Camp later served as President and then as Board Chair.

Terry gave F. Morton Smith credit for being instrumental in getting his *Duodecimal Arithmetic* published by Longmans, Green.

- 1163; 1947. Vice President Smith dies.

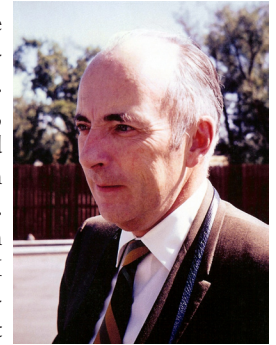


George Terry
in 1968.

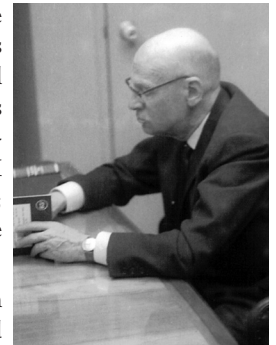
1166; 1950 or 1951. In the 1950's I was taking a course in Higher Algebra at St. John's College which included the then esoteric topic of number bases. One day, my teacher, Professor **Anthony H. Sarno**, held up a copy of the *Duodecimal Bulletin* and said something to the effect: there is even this bunch of nuts who think we should count in base twelve. Being a sophomore (that is one who disagrees with teachers) I asked for the address of the publisher. I wrote to them and received some literature including Andrews' "Excursion In Numbers" and a current *Bulletin*. I quickly became enamored by the logic of dozenal counting and proceeded to write an article entitled "I'm a Dozener" for the college Math Club's magazine, *The Mathazine*. In the meanwhile I had applied for membership in the Society. At that time Aspirants were required to pass a series of four tests in duodecimal arithmetic before they became full fledged members. I had passed the first test and was working on the second one when the *Mathazine* article came out. Upon reading it, the Society told me I was accepted, and in fact they reprinted it in WN 18; VOL. 9; Nº 1. As editor Beard stated, we like to have an elementary article in every issue.

Late 1950s. I attended several annual meetings in New York City, meeting Andrews, Terry, Beard and other notables. Meetings were sometimes held at the foundation where Andrews worked. I was present when **Charlie Bagley** was installed as President. I remember his inauguration speech. He held a copy of Andrews' book, *New Numbers*, in his hand as he spoke. There was a paper dust jacket on the book and the publishers had advertised other math books including one that praised the awkward decimal metric system. Charlie read the advertisement and then proceeded to throw the book on the floor, startling all of us, and alerting us to our new president's sense of humor.

I also met our early bibliographer, Seelbach, a man responsible along with Beard, for the three dozen plus pages of bibliography mentioned above. Another early dodekaphile giant I met was the author and astronomer Kingsland (KC) Camp. I then moved away from New York City for a number of years, and became inactive in the Society, although I often spoke of dozenals to my students and to Math Clubs.



Eugene "Skip" Scifres,
after having won the
Beard Memorial Award
13 October 1984.



H. K. Humphrey seated,
attending the 1961 Annual
Meeting at the Carnegie In-
ternational Center

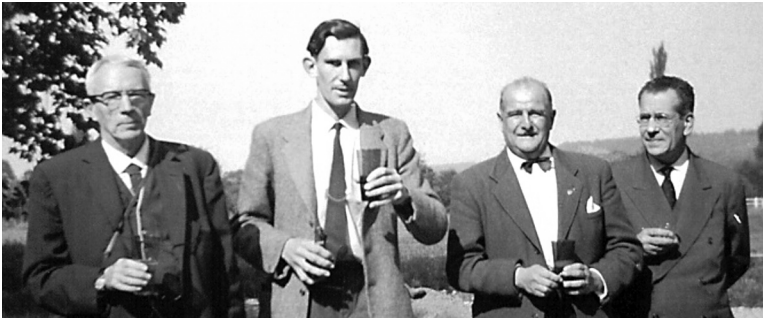


President Charles S. Bagley
in Des Plaines, (Chicago)
Illinois for the 6-9 April
1968 Annual Meeting.

Our Sister Society

During this time Ralph continued to send me the *Bulletin*, and - as I discovered years later - he personally paid my annual dues!

- 116£; 1955. **The French Connection.** *Douze, Notre Dix Futur* by **Jean Essig**, an employee of the French Government, is published.
- 1173; 1959. **Our Sister is Born.** In April a fledgling DOZENAL SOCIETY OF GREAT BRITAIN publishes its first *Newscast*. **Brian Bishop** is Acting Secretary and Editor. For the “7 pioneers”. The DSA sent copies of Andrews’ article, “An Excursion in Numbers” along with the tests they used for Aspirants to their Society and the support of Chairman Andrews, President Camp and Secretary Beard. In October they have 1¼ dozen members including **Robert B. Carnaghan** and our own Ralph Beard, and a bank balance of 345;96 shillings. Bibliographer Lewis Carl Seelbach passes away.



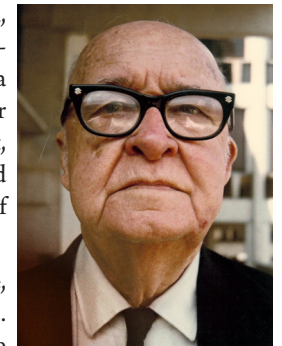
Attendees of the 1960 First International Duodecimal Conference, from left to right: Kingsland Camp, Brian Bishop, Jean Essig, and M. Baillancourt.

- 1174; 1960. **FIRST INTERNATIONAL DUODECIMAL CONFERENCE.** A Summit Meeting of dodecaphiles is held in France. M. Jean Essig of France sends an invitation to DSA’s President Camp and Brian Bishop of the DSGB to a “Summit Conference” at his estate in Normandie in late September or early October. On 23; & 24;(27 & 28.) September at his Normandie estate he hosts the representatives of the DSA and DSGB for a conference that establishes another historic landmark for duodecimals. M. Essig is author of *Douze, Notre Dix Futur*, and has actively advocated the study of the duodecimal base in many public addresses. This conference at La Herpinière, Beaumontel, Eure département, Haute-Normandie région, France, is an important event in our history. Essig consented to be Chairman of the Conference, and he delegated his secretary, **M. Baillancourt**, to act as Secretary to the Conference. ↪ See our *Bulletin*, WN 28 & 29; VOL. 14; N^o 1 & 2.
- 117X-£ 1966-1967. Henry C. Churchman publishes a series of *Dozenal Essays*.
- 117£; 1967. I returned to NY, was hired by Nassau Community College (NCC) and became active in the DSA. At the college I discovered by accident that Professor **Jim Malone** was a dozenalist, and he used a simple story of egg delivery to teach people about base twelve.
- 1180; 1968. The DSGB, scattered throughout the British isles, holds its first general meeting.



DSA General Meeting at the O’Hare Concord Motor Inn in Chicago in early April 1968. From left to right: Henry C. Churchman, Bruce A. M. Moon, Kingsland Camp, Ralph H. Beard, and Tom B. Linton.

- 1181; 1969. New editor **Shaun Ferguson** changes the name of the DSGB’s *Newscast* to the *Duodecimal Review*.
- 1182; 1970. A member of the DSA, Dr. **Anton Glaser** publishes *A History of Binary and Other Nondecimal Numeration*.
- 1186; 1974. 7 October. **The end of an era!** The last of our founders, Ralph Beard, dies on his way to Jacksonville, Florida to attend our Annual Meeting when his car and a Trailways bus collide. Ralph had served as an original Board Member, President, Secretary, Treasure and Editor. He was the 4th recipient of our Annual Award which has since been named in his honor. Ralph would have been 7 dozen years old 3 days later. Ralph was the prime mover in founding the DSA.
- 1190; 1980. Our Society was headed by an engineer, President **Tom Linton**. He was concerned with a dwindling membership and called the annual meeting in Denver, Colorado where two active members Gene (Skip) Scifres and former army Sgt **Henry Webber** lived. Tom invited Jim Malone and myself to attend. Trying to revitalize the Society, Tom nominated Jim as Treasurer and myself as Vice President, and of course, we both were elected unanimously (and unopposed).
- 1190; Our editor, Henry Churchman, a lawyer from Iowa, had become ill and the *Bulletin* had ceased publication. I was convinced that this vacuum was in a large part the cause of our dwindling numbers. Our membership is scattered thruout the US and, in fact, throughout the world. Most members never attend an Annual Meeting. No *Bulletin* meant for many of them no Duodecimal Society.
- Upon my return to New York, I convinced my wife, Dr. **Patricia Zirkel**, to become editor of the *Bulletin*. Although Pat is not a mathematician, she did have some experience in publishing a newsletter for a bank where she had worked previously.



Mr. Churchman in his home state of Iowa in 1968.



Jamison "Jux" Handy during the 1968 Annual Meeting in Council Bluffs, Iowa.



Dudley George in 1968.



Prof. Jay Schiffman at the chalkboard during the 1999 Annual Meeting.

A Name Change. Under editor **Don Hammond**, DSGB's *Duodecimal Review* becomes the *Dozenal Review*.

1191; 1981. **A New Publication.** The *Dozenal Review* morphs into Vol. 1, № 1 of the *Dozenal Journal*.

Shortly after this Tom Linton suffered a heart attack and passed away, and I found myself in the President's chair. Fortunately, I had two very capable people in the two most important positions of our Society: Jim as Treasurer and Pat as Editor. Pat served in this capacity for a dozen years before turning the reins over to the next editor, Professor **Jay Schiffman**.

Tom was the prime mover behind our Society's developing a duodecimal slide rule. Many other members had talked about this project, but Tom was the first to succeed in producing one. These were very popular among our members. Several members worked on the idea of a dozenal calculator without success. Calculator companies were only interested in products for mass marketing.

Consolidation of the Dozenal Collection. About this time, Vivian Linton, Tom's widow, invited us to come to Garden Grove, California and take any dozenal materials we wanted. Similarly, John Churchman, Henry's son invited us to Council Bluffs, Iowa to collect his father's papers. Pat and I along with our son **George Zirkel** traveled to Iowa and later to California. We shipped many cartons of DSA papers back to NCC where several members of the DSA volunteered to sort and store them. We discovered that among the papers stored in Churchman's barn were the papers of two dozenal greats: KC Camp and Ralph Beard. Both of them had passed away to join the Twelve Apostles, the Twelve Sons of Israel who founded the Twelve Tribes of Israel and one hundred forty four thousand mentioned in the Book of Revelation.

Camp left his papers and books to the Society, and they went to our Dozenal headquarters in Beard's home. Beard similarly left his papers and books to the Society along with one twelfth of his estate, and they went to Editor Churchman's home in Iowa. Not wishing these papers to get lost if someone happened to die and their heirs did not appreciate

their value, I arranged for the DSA Library to create a permanent Dozenal Collection of many valuable Society holdings. Later the collection was renamed the F. Emerson Andrews' Dozenal Collection.

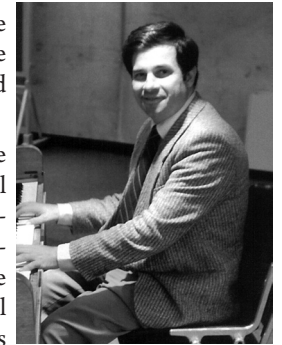
1192; 1982. Prof. **Alice Berridge** joins the DSA. Alice becomes a strong advocate and serves on several Committees. She is elected to the Board of Directors and, subsequently, to the offices of Vice President, Secretary and long standing Treasurer. Like many Treasurers before her, she serves as faithful custodian of our Society's funds until illness forces her to resign. I have long held that the Treasurer and the Editor are the two most important people in the DSA.

Because of her devotion and hard work Alice was made a Fellow of the Society. She was the recipient of the Ralph Beard Annual Award in 11XX; (2002.)

1197; 1987. Dr. **Paul Rapoport**, Professor of Music at McMaster University, Hamilton, Ontario, demonstrated his dozenal clock at our Annual Meeting. More than 2 dozen years in the making, it displays the time in our usual mode or in dozenals. However, you must know base twelve, since you can only set the time in dozenals. It shows 4 digits such as 543.6 indicating 5 twelfths of a day (2 hour units) 4 twelfths of 2 hours (X; minute units) 3 twelfths of dek minutes (5/6 of a minute - approximately 1 minute units) and 6 twelfths of that (4;2 second units) or 10:42:55 AM. To see this, consider that 543;6 times 5/6 of a minute yields 456;£ minutes after midnight. Divide this by 5 dozen (50;) minutes per hour obtaining X;87 hours. (That's ten AM plus 0;87 hours.) Multiply 0;87 hrs by 50; mins/hr to get 36;£ minutes, or 3½ dozen minutes plus 0;£ of a minute. Finally 0;£ minutes times 50; secs per min equals 47; Secs. (See "The Dozenal Clock" in our *Bulletin*, WN 5£; VOL 31; № 3; PP 10-14;)

11X7; 1999. **Our First Website.** Our Society announced that we were soon to have our own web page. Thru the efforts of two students, **Chris Harvey** & **Christina D'Aiello-Scalise**, **John Earnest** of NCC and Dr. **John Impagliazzo** of Hofstra University the site was up and running in the following year.

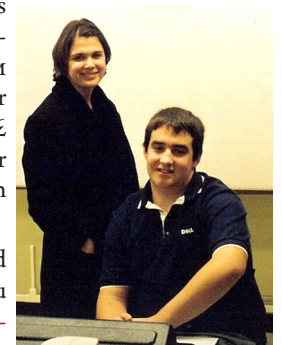
The Math and Computer Science Department of NCC generously hosted the DSA website.



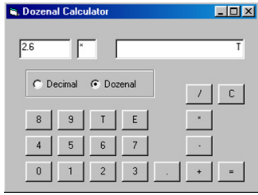
Dr. John Impagliazzo tickles the keys at the 1985 Annual Meeting at NCC.



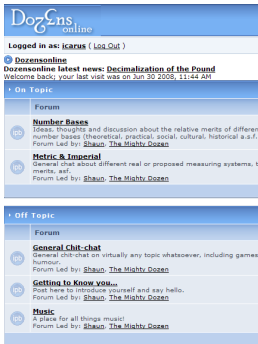
Prof. Alice Berridge following the 1997 Annual Meeting at NCC.



Christina D'Aiello-Scalise and Chris Harvey at work on the DSA website.



Screenshot of Harvey Kramer Hawks' 2002 Dozenal Digital Calculator.



Partial screenshot of the DozensOnline chat room.

A Dozenal Forum. An email conversation among Brian Bishop, Robert Carnaghan, Shaun Ferguson of the DSGB and myself resulted in Shaun encouraging **Brian Parry** to create a dozenal forum (chat room) at <http://s13.invisionfree.com/DozensOnline/index.php>.

That inspired a web search for “duodecimal” which yielded about 36,600;(73,440.) hits. It included items such as:

<http://base12.org> or, why God really should've given us six fingers, and “Base Eight And other math for people who are missing fingers” retrieved at <http://www.ncsu.edu/felder-public/kenny/papers/bases.html>. ❖❖❖

Editor's note:

The following six pages summarize the history of the Dozenal Society of America in the form of timelines and lists. These have been updated as of August 2008. If you discover errors or omissions please contact the Editor.

Prof. Gene Zirkel's article includes an Appendix which includes some thoughts compiled from notes from Brian Bishop, Shaun Ferguson, and Robert Carnaghan. This Appendix covers some of the history of the Dozenal Society of Great Britain. It will be published in the next issue, WN 98; VOL. 4X № 1. ❖❖❖

Bulletin WN 80; VOL 40; № 1; informs its readers that the DSA has an email address.

11XX; 2002. **The Dozenal Digital Calculator.** Harvey Kramer Hawks produced a dozenal calculator, offering its use to the DSA. Harvey's calculator performed the four arithmetic functions in either decimals or dozenals.

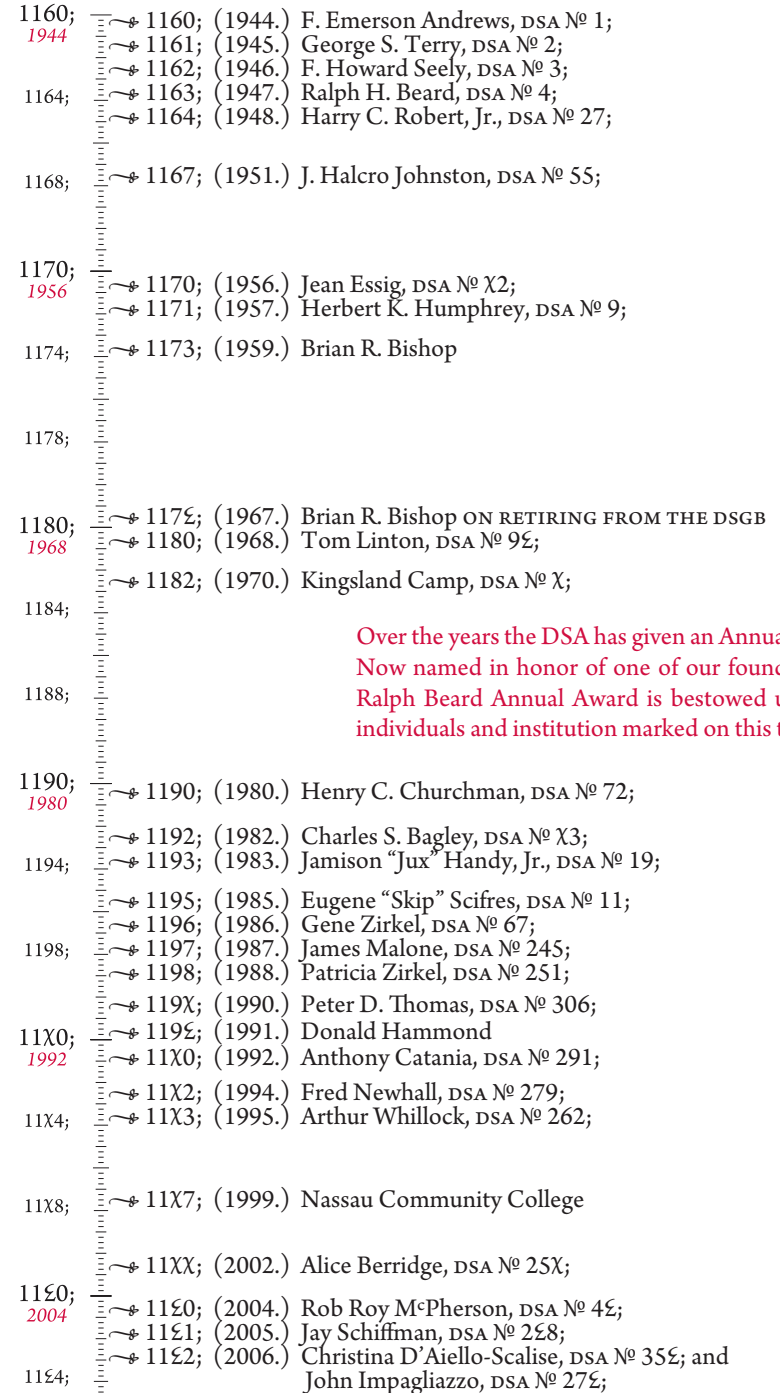
11£0; 2004. **Michael Punter** of England came up with a wonderful little calculator for your computer. It is easy to download and a joy to have. It includes logs and trig functions and has a memory. The logs work in base 10, whether that symbol represents a dozen or a ten. The trig works with four different angular measures: degrees, radians, a full circle and a semicircle. This latter unit is from Tom Pendlebury's excellent work, *TGM: a Coherent Dozenal Metrology Based on Time, Gravity & Mass* wherein one zeniPi (1 twelfth of π) is equivalent to 13; (15.) degrees.

11£1; 2005. **A Second Website.** Dr. John Impagliazzo, Jay, Christina and myself work with some professionals to establish our current website, www.Dozenal.org.

❖❖❖❖❖

Do you know of a friend who would appreciate a sample copy of our *Bulletin*? Just send us his or her name and address and we'll be happy to oblige.

TIMELINE OF BEARD AWARD RECIPIENTS



Over the years the DSA has given an Annual Award. Now named in honor of one of our founders, The Ralph Beard Annual Award is bestowed upon the individuals and institution marked on this timeline.

HONORARY MEMBERSHIP

The DOZENAL SOCIETY OF AMERICA has elected several people to Honorary Membership. This is a list of Honorary Members and their Membership Numbers.

I. V. Colonna Valevsky	£7;	Arthur Whillock	262;
Bruce A. M. Moon	1X7;	Shaun Ferguson	287;
Dr. Anton Glaser	1££;	Isaac Asimov	293;
John Earnest	250;	Donald Hammond	373;
R. B. Carnaghan	259;	Chas W. Trigg	374;

LIFE MEMBERSHIP

Generous donors have contributed to the DOZENAL SOCIETY OF AMERICA and have been awarded Life Membership. They are listed here with their Membership Numbers.

Kingsland Camp	χ;	George Zirkel	253;
Eugene "Skip" Scifres	11;	Mrs. F. Emerson Andrews	257;
Albert S. De Valve	32;	Neela Lakshmanan	271;
Paul Adams	40;	Walter Berkmann	276;
Gene Zirkel	67;	John Impagliazzo	27£;
Henry C. Churchman	72;	Jerry Spellriyter (G. Brost)	294;
Thomas H. Goodman	£6;	Paul Schumacher	2X6;
Nelson B. Gray	£9;	Charles Ashbacher	2£8;
H. K. Baumeister	140;	George P. Jelliss	316;
Richard T. Trelfa	159;	Mary Newhall	321;
William H. Leonhardt	18X;	John Steigerwald	325;
James M. Dixon	206;	James McElhatton	337;
Erich Kothe	210;	Michael T. D°Vlieger	34£;
Miriam Bagley	243;	Christina D'Aiello-Scalise	35X;
Arby Talley	249;	Courtney B. Owen	360;
Patricia Zirkel	251;	Chris Harvey	367;

~ → We Depend on You ← ~

Annual dues are due as of 1 January. If you forgot, please forward your check for only one dozen dollars to Treasurer Ellen Tufano, 95 Holst Drive West, Huntington NY 11743-3939, USA. Student dues are \$3. As you know, our continued work depends very much upon the tax deductible dues and gifts from our Members.

~ → Our British Associates ← ~

THE DOZENAL SOCIETY OF GREAT BRITAIN

www.Dozenalsociety.org.uk

FELLOWS OF THE SOCIETY

The DOZENAL SOCIETY OF AMERICA has designated certain persons FELLOWS OF THE SOCIETY. This is a list of these persons and their Membership Numbers.

Kingsland Camp	χ;	B. A. M. Moon	1X7;
Eugene "Skip" Scifres	11;	Dudley George	238;
Dallas H. Lien	14;	Angelo Scordato	24X;
Jamison "Jux" Handy, Jr.	19;	John Earnest	250;
Robert R. McPherson	4£;	Patricia Zirkel	251;
J. Halcro Johnston	55;	Alice Berridge	25X;
Velizar Godjevatz	56;	Arthur Whillock	262;
Gene Zirkel	67;	Fred Newhall	279;
Henry C. Churchman	72;	Kathleen McKiernan	284;
William C. Schumacher	84;	Anthony Catania	291;
Charles S. Bagley	X3;	Jay Schiffman	2X8;
I. V. Colonna Valevsky	£7;	Barbran Smith	2X£;
Nelson B. Gray	£9;	Christina D'Aiello-Scalise	35X;
George S. Cunningham	107;	Chris Harvey	367;
Theodore Baumeister	140;		

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Ralph Beard & Mr. Corr with Tom Linton EXECUTIVE SECRETARY	Prof. Carmine D ^e Santo
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Henry C. Churchman	Jamison "Jux" Handy, ASSOCIATE EDITOR
Dr. Anton "Tony" Glaser	

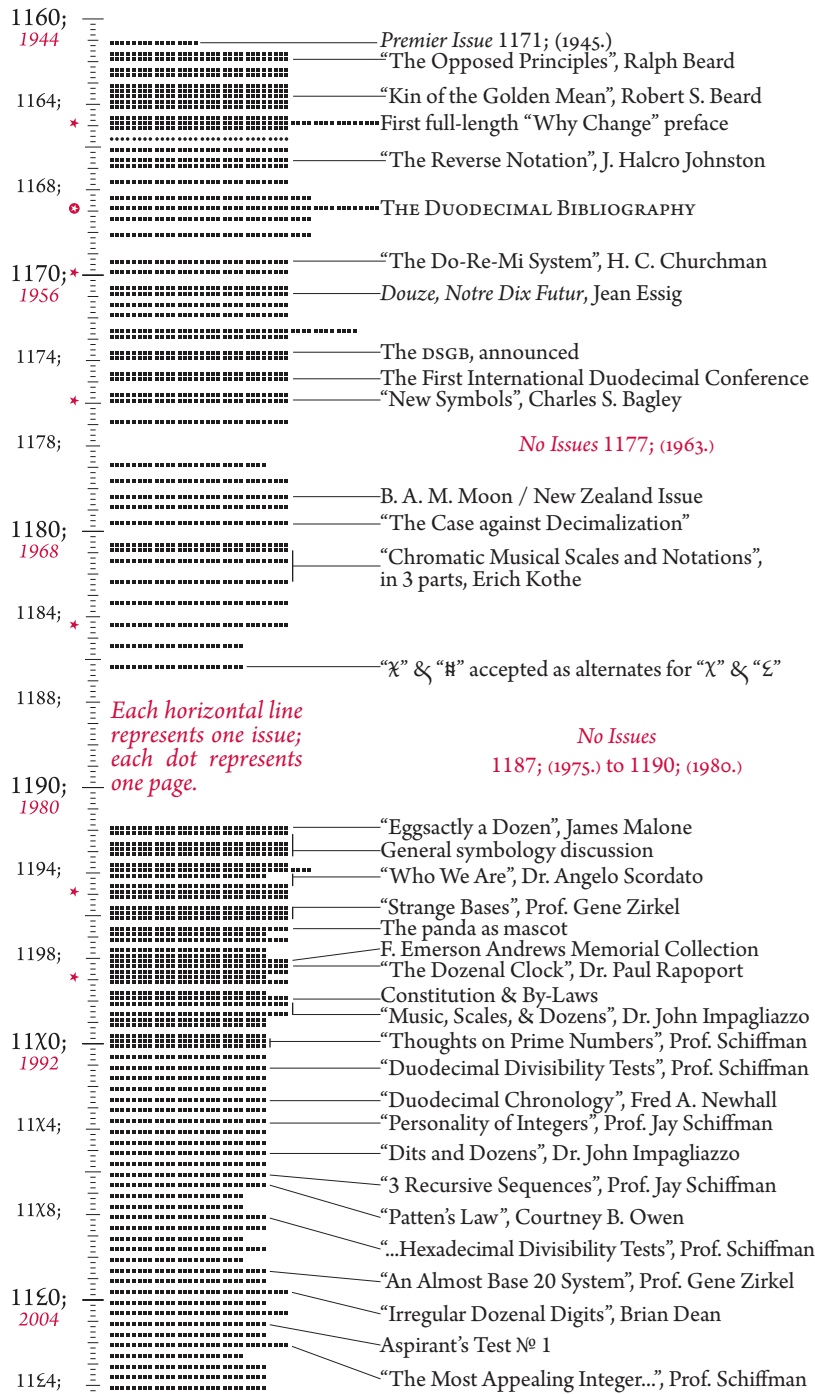
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Jay Schiffman, Gene Zirkel, ASSOC. EDITOR, Patricia Zirkel GRAPHICS EDITOR
Michael T. D^e Vlieger

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Vivian Linton	

DUODECIMAL BULLETIN TIMELINE



problem from last issue:

In our last issue we presented the following beautiful mathematical symmetry asking, "Can you find a similar pattern in base twelve?"

$$\begin{aligned}
 1 \times 9 + 2 &= 11 \\
 12 \times 9 + 3 &= 111 \\
 123 \times 9 + 4 &= 1111 \\
 1234 \times 9 + 5 &= 11111 \\
 12345 \times 9 + 6 &= 111111 \\
 123456 \times 9 + 7 &= 1111111 \\
 1234567 \times 9 + 8 &= 11111111 \\
 12345678 \times 9 + 9 &= 111111111 \\
 123456789 \times 9 + 10 &= 1111111111
 \end{aligned}$$

≈ CONTINUED ON PAGE 23; ≈



the mailbag



Mr. Trevor de Clercq, Member number 388; writes:

» Prof. Zirkel,

Thanks for the personal e-mail. I found your organization because I had been scouring the web for alternative ways of notating base-12 numbers. I think the actual link was on Wikipedia's page for the duodecimal system.

Two main systems seem to be in use with music theory for notating "dek" and "el":

- 1) "T" and "E" or
- 2) "A" and "B". Neither system works for me since A, B, and E all imply notes in the musical scale, and T is often used to refer to a transposition. Using either of these systems, it's easy to get confused as to whether one had written down a note name or a pitch class or a transposition.

I read the article on your web site about notational systems. The star and pound sign method seems interesting. Unfortunately, the star and pound symbols don't hold up too well when made smaller, which is important since the numbers "dek" and "el" often get used as subscripts in music theory. I've been thinking about "X" and "L" as alternatives, but for me the verdict is still out, as it seems to be for a lot of folks.

I do regret not having been schooled in a base-12 system. It is obviously far superior to the decimal system. With all the effort that has/had been put into changing over to the metric system, I wonder if it would have been better to keep the English units and instead change over the base of the number system itself.

☞ Cheers, Trevor de Clercq
 Graduate Student, MA/PhD Program in Music Theory
 Eastman School of Music, Rochester, NY ☺☺☺

» Trevor,

Dwiggins dek and el [X E] are not on the standard keyboard. Our new president is designing a type face for them which would be available to members for their computers.

Currently I think either Greek Chi (χ) and Xi (ξ) or a script font such as Banner or Di might work. ☞ Gene Zirkel ☺☺☺

Mr. Brian Hetrick wrote in regarding Unicode points for transdecimal numerals. (Unicode is a computer-industry standard where text written using characters, symbols, or letters, “glyphs” can be displayed and manipulated consistently across all computer platforms and software environments that support the standard.)

>>Hi,

I was planning dozenal conversions for a computer program when it occurred to me that I had no idea what the code points for dozenal digits are in Unicode. After some time spent searching through Unicode code sets and the web, I admitted defeat: I cannot find them, for either British or American usage. Can you tell me where I might find this information?

It may be there are none. In that case, they should be added. Since Unicode has entire alphabets for languages with about 50 speakers, I suspect there can be no real objection to including glyphs used by thousands of persons.

↪ Thanks, Brian Hetrick ☺☺☺

>>Brian,

The Unicode specification (to my knowledge) does not have code points for dozenal digits outside of J.R.R. Tolkien’s fictional languages. See the DozensOnline chat room’s topic, under “Number Bases” on page 4 of the topics, “Unicode” (<http://z13.invisionfree.com/DozensOnline/index.php?showtopic=115>) regarding a similar idea which some dozenal enthusiasts brought up in 2006.

There are plenty of reasons why dozenal code points do not exist. The most significant two reasons are:

1. The pure dozenal radix does not yet enjoy widespread societal usage, even though there are plenty of instances where 12 plays a role (measure and packaging, just to name two).
2. There is no societally-established standard dozenal symbology or nomenclature. The Dozenal Society of America may employ dozenal transdecimal digits but does not establish any set as “standard”. The Dozenal Society of Great Britain has perhaps more closely associated themselves with Issac Pitman’s symbols, but I don’t think they establish these as standard dozenal symbols. I suppose for the Unicode Consortium to create code points, dozenal transdecimal symbols would need to be established formally and exercised in wider society.

↪ Hope this helps...Michael T. D^e Vlieger ☺☺☺



From left to right, John Impagliazzo, Jay Schiffman, Christina D’Aiello, and Gene Zirkel enjoying the 5 April meeting in Garden City, NY. Gene is chatting with Michael D^e Vlieger.

minutes **SPRING MEETING** **5 APRIL 2008**



April 5; 11^h4; (2008.)
Nassau Community College
Garden City, NY 11530

In attendance: Board Chair Jay Schiffman, Secretary Christina D’Aiello, Board Members: Alice Berridge, John Impagliazzo, Gene Zirkel, and President and Editor Michael D^e Vlieger (via conf. call from St. Louis).

The meeting was called to order at 3:00 by Board Chair Jay Schiffman in the Old Student Center at the College. Minutes of the October 11^h3; Board Meeting were accepted as printed in our *Bulletin*.

Jay reported that he has had a very busy year. He said that he is very happy with Mike’s assumption of the President’s role and knows he will do a great job as editor of our *Bulletin*.

Gene reported that John Earnest is retiring as Vice-President. In thanksgiving for his service to the Society it was proposed that he be made an Honorary Member of our Society. This was approved and a certificate of Honorary Membership has been presented to John. He and his wife had been invited to dinner and a play with us following the meeting.

The Board Meeting was adjourned and the Annual Membership was opened by Jay, who requested that in Mike’s absence Gene chair the meeting. Gene accepted.

Mike wants proof readers, and Jay, Christina, Alice, and Gene volunteered. Other members are asked to volunteer.

As postage continues to climb, we want to try to eliminate dues-are-due letters. We will work to obtain accurate email addresses for as many members as possible. We will also use both our website and our Bulletin for dues reminders.

Christina presented Gene with a DVD made from our old VCR of various members’ past meeting presentations. She still wants to add some introductions to the disk. They then could be used for school math clubs and other presentations.

Members examined the numerous mock-ups that Mike had forwarded as possible formats for the *Bulletin*. We were mightily impressed with his efforts, and expertise. Editor Mike had asked us to consider his various ideas for the production of the *Bulletin* and to give him our thoughts and comments.

We spent the remainder of the meeting discussing Mike’s ideas and the result was a 4 page report to him with our comments and suggestions re the *Bulletin*. One decision we made was that the center of the new front cover would change each issue. It would be at the Editor’s discretion - maybe relevant to primary article. John suggested that the Editor “Go Wild” in that space.

The meeting was adjourned at 5:00 PM.

Most of those present retired to a nearby restaurant for dinner and fellowship and then we enjoyed a play at a nearby theater.

Respectfully submitted by Alice Berridge for Secretary Christina D’Aiello ☺☺☺

½ = 0;6 or 0.5

⅓ = 0;4 or 0.33333...

¼ = 0;3 or 0.25



solution from page 20;

$$\begin{aligned}
 1 \times \xi + 2 &= 11 \\
 12 \times \xi + 3 &= 111 \\
 123 \times \xi + 4 &= 1111 \\
 1234 \times \xi + 5 &= 11111 \\
 12345 \times \xi + 6 &= 111111 \\
 123456 \times \xi + 7 &= 1111111 \\
 1234567 \times \xi + 8 &= 11111111 \\
 12345678 \times \xi + 9 &= 111111111 \\
 123456789 \times \xi + \chi &= 1111111111 \\
 123456789\chi \times \xi + \xi &= 11111111111 \\
 123456789\xi \times \xi + 10 &= 111111111111
 \end{aligned}$$

In fact, the general pattern for any base is:

$$\{123\dots n\} \times \alpha + (n+1) = \{111\dots 1_{n+1}\} \text{ where:}$$

b = the base, $\{...rst\}$ = the number $t + sb + rb^2 + \dots$,
 $...rst$ is a string of digits
 $aaa\dots a_k$ is a string of k a 's,
and n varies from 1 to $(b-1)$



Here is another pattern. Can you find a similar pattern in base twelve? Can you generalize it to work in any base? The solution will appear in our next issue. ❄️

$$\begin{aligned}
 1 \times 1 &= 1 \\
 11 \times 11 &= 121 \\
 111 \times 111 &= 12321 \\
 1111 \times 1111 &= 1234321 \\
 11111 \times 11111 &= 123454321 \\
 111111 \times 111111 &= 12345654321 \\
 1111111 \times 1111111 &= 1234567654321 \\
 11111111 \times 11111111 &= 123456787654321 \\
 111111111 \times 111111111 &= 12345678987654321
 \end{aligned}$$

~ → **Symbology & Nomenclature** ← ~

The DSA does NOT endorse any particular symbols for the digits ten and eleven. For uniformity in publications we use Dwiggins dek (χ) for ten and his el (ξ) for eleven. Whatever symbols are used, the numbers commonly called “ten”, “eleven” and “twelve” are pronounced “dek”, “el” and “dough” in the duodecimal system.

When it is not clear from the context whether a numeral is decimal or dozenal, we use a period as a unit point for base ten and a semicolon, or Humphrey point, as a unit point for base twelve. Thus $\frac{1}{2} = 0;6 = 0.5$, $2\frac{2}{3} = 2;8 = 2.6666\dots$, $6\frac{3}{4} = 6;46 = 6.375$ ❄️

featured figures

basic operations



In honor of the transition to the “classic” transdecimal numerals, we are publishing fresh dozenal addition and multiplication tables. To use the addition table, simply find the first addend at the top, then the second on the left. Trace the row of the second addend until it’s within the column of the first, and you’ve found the sum of the two. Example: add 6 and 9. Finding the “6” at the top and “9” and the left, trace the “9”-row until directly under the “6” at top. The sum is “13”, one dozen three. To multiply, find the first factor at the top of the multiplication table, then

0	1	2	3	4	5	6	7	8	9	χ	ξ
1	2	3	4	5	6	7	8	9	χ	ξ	10
2	3	4	5	6	7	8	9	χ	ξ	10	11
3	4	5	6	7	8	9	χ	ξ	10	11	12
4	5	6	7	8	9	χ	ξ	10	11	12	13
5	6	7	8	9	χ	ξ	10	11	12	13	14
6	7	8	9	χ	ξ	10	11	12	13	14	15
7	8	9	χ	ξ	10	11	12	13	14	15	16
8	9	χ	ξ	10	11	12	13	14	15	16	17
9	χ	ξ	10	11	12	13	14	15	16	17	18
χ	ξ	10	11	12	13	14	15	16	17	18	19
ξ	10	11	12	13	14	15	16	17	18	19	1 χ

Figure 1 ≈ The Dozenal Addition Table.

locate the second factor in the leftmost column. The cell which lies at the intersection of the row of the second and the column of the first factor is the product of the factors. Example: multiply χ times 7. Find “ χ ” in the top row and “7” in the leftmost column. Tracing the row where “7” appears in the leftmost column until it intersects the column headed by “ χ ” yields a product of “5 χ ”, five dozen ten.

Enjoy! ❄️

❄️❄️❄️ **Think TWELVE:**

Twelve = 10; = do

1	2	3	4	5	6	7	8	9	χ	ξ	10
2	4	6	8	χ	10	12	14	16	18	1 χ	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	χ	13	18	21	26	2 ξ	34	39	42	47	50
6	10	16	20	26	30	36	40	46	50	56	60
7	12	19	24	2 ξ	36	41	48	53	5 χ	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
χ	18	26	34	42	50	5 χ	68	76	84	92	χ 0
ξ	1 χ	29	38	47	56	65	74	83	92	1 χ 1	ξ 0
10	20	30	40	50	60	70	80	90	χ 0	ξ 0	100

Figure 2 ≈ The Dozenal Multiplication Table.

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