# PI MU EPSILON JOURNAL

## THE OFFICIAL PUBLICATION OF

## THE HONORARY MATHEMATICAL FRATERNITY

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<u>VOLUME 1</u>

<u>NUMBER 9</u>

## CONTENTS

NOVEMBER                                                1953

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رسالة فى شرح ما اشكل من مصادرات
كتاب اقليدس
ثلث مقالات
تصنيف الشيخ الامام الاجل حجة الحق ابى الفتح
عمر بن ابراهيم الخيامى

بسم الله الرحمن الرحيم

الحمدلله ولى الرحمة والانعام والسلم على عباده الذبن اصطفى
و خصوصاً على سيد الانبياء محمد وآله الطاهرين اجمعين .

ان تحقيق العلوم و تحصيلها بالب. اعبن الحقيقة، مما يفترض على
طالب النجاة و السعادة الابديه و خصوصاً الكلبات و القوانين التى يتوصل
بها الى تحقيق المعاد و اثبات النفس و بقائها و تحصيل اوصاف واجب الوجود
تعالى جده و الملائكة و ترتيب الخلق و اثبات النبوة السيد المطاع بين
الخلق الآمر و الناهى ايام باذن الله تعالى بحسب طاقة الانسان .

و اما الجزئيات فغير مضبوطة و اسبابها غير متناهيه فلا تحيط بها هذه العقول.
المخلوقة اصلا وليس يعرف منها الا ما يختص بالحس و التخيل والوهم .
و الجزء من الحكمة الموسوم بالرياضى اهل اجزائها اداراكا اداراكا تصوراً و
تصديقاً معاً : اما العددى منه قاهر ظاهر جداً و اما الهندسى فلا ابكاد يخفى

First page of the printed edition of
*Discussion of Difficulties of Euclid*
by Omar Khayyam...Teheran, 1936

# NOTES ON OMAR KHAYYĀM (1050-1122) AND RECENT DISCOVERIES

R. C. Archibald, Brown University

This great poet, astronomer, mathematician, philosopher' was born near **Nishāpūr**, Persia. Only some of his works have been preserved. These are: (a) his **Rubāiyāt** (poetry), in fragmentary form, in many libraries;' (b) his algebra; (c) his discussion of difficulties in **Euclid's**

[1] **V. Minorsky**, *Encyclopaedia of Islam*, v. 3, 1936, p. **985-989**; and H. Suter, **"Djalālē"**, v. 1, 1912, p. 1006. Also W. E. Story, "Omar Khayyam as a mathematician" read at a meeting of the Omar **Khayyam** Club of America, 9 April 1918; privately printed (1919) in a little booklet (13 leaves and plates). Also G. Sarton, *Introduction to the History of Science*, (Washington, D.C.), v. 1, 1927, p. 759-761. The earliest account of Omar was believed to be in a Berlin Persian ms. written before 1155. A **german** translation is given in the article by G. Jacob and E. **Wiedemann**, *"Zu Omar-i-Chajjām,"* *Islam*, v. 3, 1913, p. 43-47. Unaware of this the original Persian and an English translation were given in E. D. Ross and H. A. R. Gibb, "The earliest account of Omar **Khayyām,"** University of London, School of Oriental Studies, *Bull.*, v. 5, 1935, p. 467-473. Here there is no reference to Omar as a poet.

[2] **C.** H. Rempis, *'Omar Chajjām und seine Vierzeiler nach den altesten Handschriften aus dem Persischen verdeutscht*. Tubingen, 1935, viii, 200 p.; this volume contains translations of 258 quatrains in various early manuscripts (1223-1474). C. H. Rempis, **"Beiträge zur Hayyām-Forschung"** Deutsche Morgenland. Gesell., *Abhandlungen,* v. XXII, 1, 1937, 219 p. This publication is devoted wholly to the Rubāiyāt. It is the monograph which won in 1935 at the University of Berlin, the state prize for a complete survey of existing manuscripts **(1436-1770),** their contents, and relation to one another.

The following work by an American mathematician may be noted: *Omar Khayyām*. The *Rubāiyāt of Omar Khayyām set forth in Meter by David Eugene Smith, based upon* a *verbatim* translation *by Heshim Hussein*. Illustrations *by Rassam-i Arjangi*. *N. Y*. Westermann, 1933, 99 p.; colored plates.

Elements; (d-f) three metaphysical tracts;' (g) a tract on the philosophy of Avicenna (980-1037). But in the literature there are references to: (h) revised and enlarged astronomical tables; (i-j) two works in the field of natural science; (k) a treati. on specific weights of silver and gold; and (l) the exactitude of the Indian method of extracting square and cube roots.

In 1934 the Iranian Government erected a magnificent new monument of white marble over the tomb of Omar Khayyām (Omar the Tentmaker — doubtless referring to the occupation of ancestors)[4]. The erection of this tomb was really indirectly due to the English poet Swinburne (1839-1909), a fact connected with an extraordinary event in literary history.

The British oriental scholar, Edward FitzGerald (1809-1883) found in the Bodleian Library at Oxford a manuscript dated 1460, 338 years after Omar's death, but containing 158 of his poetic quatrains — the Rubāiyāt. These were the basis, supplemented by other sources not by Omar, of a poetical version of 75 English quatrians by FitzGerald. In 1859 the great bookseller Quaritch published anonymously, an edition of 250 copies of these English Omar paraphrases. Reviewers took no notice of this publication, and 200 copies were put in a remainder box and sold for a penny a copy (later one of these copies was sold at auction for $8000). Rosetti and Swinburne were among the purchasers, and Swinburne triumphantly took a copy to George Meredith. Soon the new poetical work of extraordinary beauty became known to the literary world. It brilliantly reproduced the true spirit of Omar's poetry with its message of gentle pessimism into which the mystical outlook entered very little if at all.

FitzGerald brought out new editions (with 101 quotations). As a result, during the next fifty years scholars in different countries found other manuscripts of the Rubāiyāt,

[3]These are said to have been published in *Omar Monographie* von Syed Solaiman Nadvi. Bombay, 1933; I have not yet seen this volume. 'A fine picture of this tomb was published by George Sarton in "The tomb of Omar Khayyām," *Isis*, v. 29. 1938, p. 15-19; also *London Times*, 16 July 1934. See also J. Fleming, "A pilgrim to Omar's forgotten tomb," *Travel*, v. 58, 1932. p. 9-14.

some in the fourteenth century; translations of the Rubāiyāt were made into nearly all the literary languages of the world, Omar Khayyām societies were formed, and probably there is hardly an English speaking home which has not at some time had a copy of FitzGerald's Omar verses. Up to a decade ago, however, Omar was regarded by scholars as a comparatively minor Persian poet.

But within the past three years this view has been shown to be entirely wrong. Two new manuscripts of Omar's poetry have been found, and one of them dated only 85 years after Omar's death. From these Professor Arberry, of the University of Cambridge, has discovered[5] that Omar was regarded by Persians as one of their greatest poets, and that the existing quotations point to an original corpus of at least 750 quatrains.

It appears that Omar must have been prominent as a scientist when very young, because in 1074 Malik Shāh of Persia requested him as Royal Astronomer at the national observatory to consider the problem of correcting the calendar. Omar, in a committee of eight, grouped the years in cycles of 33 years, giving each common year 365 days and making every fourth year a leap-year throughout each cycle; that is, each cycle contained 8 leap-years and there was an interval of five years from the last leap-year of one cycle to the first leap-year of the next cycle. This makes the average length of Omar's solar year $365^d 5^h 49^m 5^s 45$, which is less by 6.55 seconds than the average length of the Gregorian year. But the Gregorian average year, in 1953, was too long by 27.04 seconds and therefore Omar's average year was too long by 19.49 seconds. That is one leap-year ought to be omitted from Omar's calendar every 4433 years, whereas the Gregorian Calendar ought to omit one leap-year every 3318 years. This means that Omar's calendar is about one third more accurate than the one we use today. In 1079 this reformed calendar was adopted in Persia.[6]

'A. J. Arberry, *Omar Khayyām*, A *New Version based upon Recent Discoveries*. London, 1952.
[6]For a detailed account of the calendar and era see Ginzel, *Handbuch der mathem. u. technischen Chronologie*, v. 1, Leipzig, 1906, p. 300f.

In his work at the observatory Omar greatly developed and revised existing astronomical tables – a manuscript copy of which has not yet been discovered.

As a mathematician **Omar's** rating is high because of his very remarkable work on Algebra of which we have both French and English translations of the Arabic originals.' He considered equations of the second and third degree, as our modern method of classification expresses it. But for third degree equations Omar distinguishes four principal groups:

| (1) | (2) | (3) | (4) |
|---|---|---|---|
| $x^3+bx = a$ | $x^3+cx^2 = a$ | $x^3+cx^3+bx = a$ | $x^3+cx^2 = bx+a$ |
| $x^3+a = bx$ | $x^3+a = cx^2$ | $x^3+cx^2+a = bx$ | $x^3+bx = cx+a$ |
| $bx+a = x^3$ | $cx^2+a = x^3$ | $x^3+bx+a = cx^2$ | $x^3+a = cx^2+bx$ |
| | | $cx^2+bx+a = x^3$ | |

He solves these equations by means of equations of intersecting conics. Only positive solutions are considered and not always all of these are found. Euclidean geometrical considerations are introduced throughout. From passages in this work it is inferred that Omar was the first to find the binomial expansion for a positive integral power greater than 3.

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'*L'Algèbre d'Omar Alkhayyāmī, publiée et accompagnée d'extraits de manuscrits inédits* by F. Woepeke, Paris 1851. The following English translation proposes to be a translation by D. S. Kasir of an Arabic manuscript in the D. S. Smith Library at Columbia University: The Algebra of *Omar Khayyām,* Doctoral Dissertation, Columbia University., New York, 1931. This manuscript must have been practically identical with the one used by **Woepeke.** The general reader will find Kasir's commentary of interest.

J. Tropfke, "Zur Geschichte der quadratischen Gleichungen über dreieinhalb Jahrtausend," Deutsche Math.-Ver., *Jahresb.* v. 44, 1934, p. 105-106. J. Tropfke, *Geschichte der Elementar-Mathematik.* Berlin, third ed., v. 2, 1933, p. 174; v. 3, 1937, p. 132-133; v. 6, second ed., 1924, p. 34-35. P. Lucky, "Die Ausziehung der n-ten Wurzel und der binomische Lehrsatz in der islamischen Mathematik," Math. Annalen, v. 120, p. 218. 1948.

Another mathematical work by Omar, of apparent exceptional interest, is: Discussion of Difficulties of *Euclid* of which there are copies in **Sipah-Salar** College, Teheran, and the University of Leyden. A film copy of the latter has been secured for the Library of Brown University. Attention was called to this work in an article by D. E. Smith: "Euclid, Omar **Khayyām,** and **Saccheri,"**[8] *Scripta* Mathematics, v. 3, 1935, p. 5-10. It appears that **Omar's** work includes discussion of Euclid's postulates, and it refers to treatments of ibn **al-Haytam (c.965-c.1039).** In Heath's monumental edition of Euclid's Elements, v. 1, there is a survey of results in discussion of the fifth postulate by Ptolemy, Proclus, Nasir **ed-dīn** al-Tusi (1201-**1274**) an exceptionally able Persian-born astronomer, mathematician and politician at Bagdad, John Wallis **(1616-1703),** Saccheri[9] **(1667-1733),** Lambert, and Legendre.

Nasir ed-din al-Tusi prepared a complete edition of Euclid's Elements in Arabic. This was later published with the following Latin title: *Euclidis Elementorum libri XII Studii Nassiredini,* in at least three editions (1594, 1657, 1801). The part of it dealing with Euclid's fifth postulate was translated into Latin in John Wallis, Opera, v. 2, 1693, p. 669-673. Wallis also had extensive original discussion in this connection. See Heath's Euclid, v. 1, p. 208-211. The greater part of Girolamo **Saccheri's** *Euclides ab omni naevo Vindicatus,*[9] Milan, 1733, the first work on non-Euclidean geometry, was devoted to an attempted proof of the fifth postulate. Saccheri was familiar with the discussions in this connection by Nasir **ed-dīn** and Wallis and some of his propositions are identical with those of the former, who may well have inspired him to take up the study.

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[8]**The** statement here that there is a manuscript of this work at **Bankepor,** India, appears to be incorrect. Some of the introduction of the Leyden Omar Euclidean Codex is given with commentary by G. Jacob and E. **Wiedemann, "Zu Omar-i-Chajjām,"** Islam, v. 3, 1912, p. 53-62.

[9]G. B. Halsted translated the first Book into English (Chicago, Open Court, 1920, xxx, 248 p.). The volume contains both Latin, and the English translation.

Now Smith tells us in his article that the Teheran manuscript he examined was a commentary by Nasir ed-dīn on Omar's discussion, a century earlier, of difficulties in Euclid's Elements. Hence questions which naturally arise are: Was Nasir ed-dīn's discussion of the fifth postulate practically identical with that of Omar Khayyām? If so may we properly suggest that Saccheri's work was indirectly started by Omar's? The formulation of such questions would be of little moment were not the means of possibly answering them in part, at least, recently placed at our disposal.

In 1949 Dr. E. S. Kennedy, a specialist knowing Persian fluently, and learning Arabic, was at Brown University in the department of History of Mathematics. He has since been professor of mathematics at the American University at Beirut, Lebanon. I drew his attention to Note 140 in my Outline of the History of Mathematics (1949), referring to Smith's article, and asked him to try to get a copy of the Teheran manuscript. While lecturing at Teheran on Islamic astronomy in 1951 he found that the Leyden copy of Omar's manuscript had been published in January 1936 at Teheran: *Discussion* of Difficulties of *Euclid* by Omar Khayyam. Edited with an Introduction by Dr. T. *Erani,* former lecturer in oriental rhetoric and logic at the University of Berlin. The underlined title above is of the last page; all the rest is in Persian. Of this work Dr. Kennedy sent me a copy, now in the Brown University Library. The volume contains 24 pages of commentary followed by 44 pages of Omar's work. This publication had entirely escaped all earlier mathematical bibliographers. We hope later to have a film copy of the Teheran manuscript.

Dr. Kennedy wrote me that Dr. Erani "died in jail during the reign of the late Iranian dictator, Rezah Shah, in the thirties, and that Erani is regarded in Iran as the founding martyr of the local communist party." In August 1953, Dr. Kennedy is again to join the Brown University faculty. One of his students, now at Beirut, is working on an English translation of Erani's work. A scholarly consideration of this work as well as of the Teheran-Nasir ed-dīn al Tusi manuscript may well contribute some information for answering the questions raised above.

Professor Neugebauer drew my attention to comments about Omar in Aldo Mieli's La Science Arabe, Leyden, 1938, p. 110-113. References are here given to two authors who express doubts as to the identity of the poet and the scientist, and suggest in his place two almost contemporary Persians. For one of these authors a reference is given to Mohammed Safi, "Islamic *Culture, 1934";* but in this volume there is no article by this author. The reference should have been to the 1933 volume of this periodical where on p. 586-623, is an account largely of a newly discovered biography of Omar. For the second author the reference was exceedingly vague, but finally it was identified as: Hans H. Schaeder, "Der geschichtliche und der mythische Omar Chajjām," *Zeits.* d. *Deutschen Morgenlandischen* Gesell. v. 88, 1934, p. *25*-*28*. In *Isis,* v. 44, 1953, p. 110, George Sarton writes as follows: "There is a question which Arberry does not touch. I remember my friend Myerhoff's repeated suggestions (in private letters) that the poet Omar and the astronomer were two different personalities. I pressed him to develop his argument in a special article to be published in *Isis,* but he failed to do so. It is possible that further investigations did not confirm his hypothesis."

It seems desirable to draw special attention to the year we have given of Omar's death, 1122. Most biographical references give 1123; for example: Archibald (1949), *Enciclopedia Italiana* (1935), Encyclopedia *Britannica* (1952), *Der Grosse Brockhaus* (1932), Lucky (1948), Sarton (1927), Smith (1926), Tropfke (1934), and Suter, Die *Mathematiker und Astronomen der Araber und ihre* Werke. Leipzig 1900, p. 112-113. But more recently new discoveries required that Chamber's Encyclopaedia (A. J. Arberry, 1950), Mieli (1938), and Minorski (1936) give 1132. In an important publication of a decade ago, however, only now becoming generally known, we have a thorough study which leads to the Omar dates 1050-1122 (between February 15 and March 31), which must now be accepted as the most reliable in the light of present knowledge. This publication of C. H. Rempis is *Neue Beitrage zur Chajjam-Forschung* 1. *Sagen um 'Omar* Chajjam; 2. *Die* altesten *Auszuge* aus *'Omar-e-Chajjams*

*Ruba'ijjat.* Leipzig, 1943, 54 p. Because of Professor Arberry's recent publications Rempis' discussion in part 2 can no longer be thought of as dealing with the oldest Omar **Rubāiyāt** manuscripts. I am greatly indebted to Professor Arberry for loaning me his copy of Rempis' monograph.

\*　　\*　　\*

"These pearls of thought in Persian gulfs were bred,

Each softly lucent as a rounded moon;

The diver Omar plucked them from their bed,

**FitzGerald** strung them on an English thread."

J. R. Lowell, In *a Copy of Omar Khayyam.*

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*Note added October 1953.* Dr. Kennedy enables me to make the following statement concerning the Leyden manuscript: It is in Arabic (not Persian) but **Erani's** Introduction to the printed edition is in Persian; the manuscript was written in 1252, having been copied from the original manuscript of Omar, written in part by his own hand in 1077, that is, when he was 27 years of age. The translation of the first six lines of the illustration accompanying this article is as follows: **"An** essay on the explanation of that which is difficult of the bases of the book of Euclid, in three treatises, by the Sheikh, the Leader, the Venerable, the Authority on the Truth, **Abū** al-Fath **'Umar** bin **Ibrahīm al-Khayyāmī.** In the nam of God, the Merciful, the Forgiving."

# A SUBSTITUTE FOR CRAMER'S RULE
**Marlow** Sholander, Washington University

We describe below a method of solving three linear equations in three unknowns. The generalization to n linear equations in n unknowns is immediate. Though there is nothing theoretically new in the method, it arranges the work in a way which has practical advantages.

Speaking roughly and geometrically, we replace three planes through a point by two planes through the line determined by that point and the origin.

We denote, for example, the determinant

$$\begin{vmatrix} a_1 & b_1 \\ a_2 & b_2 \end{vmatrix}$$

by $\left| a_1 b_2 \right|$. Then, given the equations:

1) $a_1 x + b_1 y + c_1 z = d_1,$

2) $a_2 x + b_2 y + c_2 z = d_2,$

3) $a_3 x + b_3 y + c_3 z = d_3,$

and assuming for the present that a unique solution exists, we form

4) $A_1 x + B_1 y + C_1 z = 0,$

5) $A_2 x + B_2 y + C_2 z = 0,$

where

$$A_1 = \left| a_1 d_2 \right|, \qquad B_1 = \left| b_1 d_2 \right|, \qquad C_1 = \left| c_1 d_2 \right|,$$
$$A_2 = \left| a_2 d_3 \right|, \qquad B_2 = \left| b_2 d_3 \right|, \qquad C_2 = \left| c_2 d_3 \right|.$$

It then follows that

$$x{:}y{:}z = \left| B_1 C_2 \right| : - \left| A_1 C_2 \right| : \left| A_1 B_2 \right|.$$

Substitution in (1) determines the necessary constant of proportionality.

The efficiency of the method is indicated by the following example. No work, except that performed mentally, is omitted.

<u>Example 1.</u>  From

$$x + y + z = 4,$$
$$x - 2y - z = 1,$$
$$2x + y + 2z = 9,$$

we obtain

$$-3x + 9y + 5z = 0,$$
$$7x - 19y - 11z = 0.$$

Hence, $x:y:z = -4:2:6 = -2:1:-3$ and $x = 2$, $y = -1$, $z = 3$.

We note these advantages of the scheme:

a) Necessary computation consists, roughly, of the evaluation of 9 second order determinants. (There are only 6 determinants if, say, $d_1 = 0$, since here (4) may be chosen as (1). Indeed, if, say, $d_1 = d_2 = 0$, only three determinants need be evaluated.

b) Each of these determinants has, as elements, coefficients placed, relative to one another, in the equations in the positions they have in the determinant.

c) No formidable complications arise when the original equations are either dependent or inconsistent. We leave the formulating of general rules to the reader. The following examples are typical (at least, of all except the relatively simple cases where two or more of the three "planes" are parallel or coincident.)

<u>Example 2.</u>  From

$$3x - 2y + z = 4,$$
$$2x - y + z = 2,$$
$$x + 3y + 4z = 3,$$

we have

$$-2x - 2z = 0,$$
$$4x - 9y - 5z = 0,$$

and $x:y:z = -18:-18:18 = -1:-1:1$. We then find no solution exists. We have, however, acquired the information that

the original planes are parallel to a line with direction numbers $-1$, $-1$, and $1$.

<u>Example 3.</u>  From

$$3x + y - z = 2,$$
$$2x + 2y + 2z = 3,$$
$$x - y - 3z = -1,$$

we have

$$5x - y - 7z = 0,$$
$$-5x + y + 7z = 0.$$

Adding the first equations in these two sets, we find

$$8x - 8z = 2.$$

Hence

$$z = x - \frac{1}{4} \text{ and } y = 5x - 7z = -2x + \frac{7}{4}.$$

## NOTE TO A PSYCHOLOGIST
### J. E. Householder, University of Arizona

In certain tests prepared by you it is required by the subject that he perceive the rule whereby a sequence of numbers is constructed and then to add the next term. The purpose of this note is to provide a general answer for all such problems.

Let $F(n)$ be any sequence of numbers whatever. ($n = 1, 2, 3, \ldots$)

Let

$$P(n) = \frac{(n-1)(n-2)(n-3) \ldots (n-k+1)}{(n-1)!}.$$

Then we have

$$P(n) = \begin{cases} 0, & \text{for } n < k \\ 1, & \text{for } n = k, k+1 \\ a \neq (0, 1), & \text{for } n > k+1 \end{cases}$$

Now if we take as our rule of construction $F(n) + P(n)$ $M \quad F(n)\}$, the results obtained will be identical with those or $F(n)$ for the first $k - 1$ terms, but the $k^{th}$ term will be M. Here M is, of course, any number we choose.

Every such problem is immediately answered, and correctly so, by any number one happens to think of.

Now it may berequired that an intermediate term of the given sequence is omitted and the tested person asked to supply the term. The above solution does not apply then. **Instead,** we can take

$$Q(n) = \left| n - k \right|! - (n - k)\left| n - k - 1 \right|!.$$

Then we have

$$Q(n) = \begin{cases} b \geq 2, & \text{for } n < k \\ 1, & \text{for } n = k \\ 0, & \text{for } n > k \end{cases}$$

where we take the usual definition of 1 for 0!. It follows immediately that $P(n)Q(n)$ is equal to 1 for n equal to k and to 0 for all other values of n. Then $F(n) + P(n)Q(n)\{M - F(n)\}$ will be identical with $F(n)$ in every one of its terms except the $k^{th}$ term which will be M. Hence, no matter how the problem is presented, we can answer it with any number we choose.

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## PROBLEM DEPARTMENT
### Edited by
### Leo Moser, University of Alberta

This department welcomes problems believed to be new and, as a rule, demanding no greater ability in problem solving than that of the average member of the Fraternity, but occasionally we shall publish problems that should challenge the ability of the advanced undergraduate and/or candidate for the Master's Degree. Solutions of these problems should be submitted on separate, signed sheets within five months after publication. Address all communications concerning problems to Leo Moser, Mathematics Department, University of Alberta, Edmonton, Alberta, Canada.

### PROBLEMS FOR SOLUTION

57. Proposed by F. L. **Miksa,** Aurora, Illinois

(a) Prove that the number representing the area of a Pythagorean triangle must end in 0, 4, or 6 when written in base ten.

(b) Prove that the number representing the product of the lengths of the sides of a Pythagorean triangle is divisible by 60.

58. Proposed by C. W. Trigg, Los Angeles City College

Unscramble each of the numbered words and phrases to obtain the names of twenty-nine mathematicians. It will be observed that the initials of the names, in order, read PI MU EPSILON JOURNAL, MATHEMATICS.

(1) REAP COIN; (2) AIM **HIS** CLUB; (3) MEN SNEER; (4) SPUN KEYS; (5) NINE TIES; (6) A PLOT; (7) NO

ALMS; (8) IN ZEBRA; (9) TALL HOPI; (10) THE GOURD; (11) SHUN A COMIC; (12) I ADJOURN; (13) OO!! DOGS; (14) WONDER DUO; (15) RED CORE; (16) PANIER; (17) BAR A CHILD; (18) MEN IN LAND; (19) MORE IN CASH; (20) SAUL IN POOL; (21) FETCH, BY HEC; (22) CROP HIS PATE; (23) OX DUE US; (24) GNOME; (25) BALE; (26) CHERISH SUN TAN; (27) FLED IN; (28) CARTON; (29) SLIT RING;

### 59. Proposed by P. Piza, San Juan, Puerto Rico

Let

$$a = 1 + 2 + 3 + 4 + \ldots + n,$$
$$b = 1^3 + 2^3 + 3^3 + 4^3 + \ldots + n^3,$$
$$c = 1^5 + 2^5 + 3^5 + 4^5 + \ldots + n^5,$$
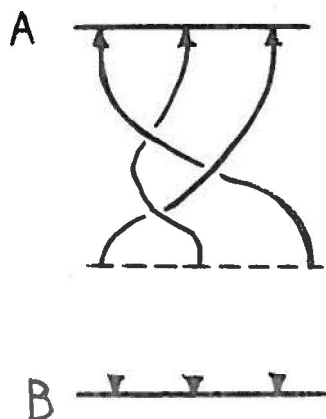$$d = 1^7 + 2^7 + 3^7 + 4^7 + \ldots + n^7.$$

And let $t_n = n(n+1)/2$ be the $n^{th}$ triangualr number.
Prove the following relation true for arbitrary n:

$$a + b + c + d = 2(t_n^4 + t_{t_n}).$$

### 60. Proposed by J. Lambek, McGill University

Three strings are tied to three pegs on a board A. They are tangled and interwoven as shown in the figure.

It is required to tie three other strings to the three free ends and attach the free ends of the new strings, which may be tangled, to the three pegs of board B, in such a way that the resultant entanglement can be combed out to give three loosely parallel strings. How can this be done?

### 61. Proposed by C. S. Venkataraman, Varma College, Trichur, South India

Prove that

$$(n!)^{1/n} \prod_{p=n} p^{\frac{1}{p-1}} \leq \left(1 + \frac{\pi(n)}{g(n)}\right)^{g(n)},$$

where $\pi(n)$ denotes the number of primes not exceeding n, and

$$g(n) = \Sigma \frac{1}{p-1},$$

p running through all primes not exceeding n.

### 62. Proposed by N. S. Mendelsohn, University of Manitoba

The members of a bridge club decided to hold a tournament to extend over several days of playing, but, as the club rooms were too small to hold all the members, the tournament was programmed so that only part of the members would be scheduled to play on any given night. In order to make the tournament as equitable as possible for the players the schedule was drawn up according to the following principles:

(a) Any two of the members were scheduled to appear together at exactly one day's play.

(b) For any two days' play there was to be one member, but not more than one, who participated in both days' play.

(c) The schedule for any day's play was to include at least four players.

(d) As a tribute to the club executives, the players scheduled to play on the first day were the president, vice president, secretary and treasurer.

How many members participated in the tournament, how many days of play were scheduled and how was the schedule arranged?

## SOLUTIONS

### 47. Proposed by the problem editor

Given a finite number of points in a plane such that any three of them may be simultaneously covered by a circle of unit radius. Show that they all may be simultaneously covered by a circle of unit radius.

#### Solution by W. Moser, University of Toronto

Consider the smallest circle covering all the points. Clearly this circle touches at least 2 points. If, however, it touches only 2 points then these points must be diametrically opposite and the circle has radius $\leq 1$. If the circle touches 3 points, then no angle of the triangle determined by these points is $> 90^0$ for then the triangle could be further contracted. But now the circle must have radius $\leq 1$, and every point is in or on it.

### 48. Proposed by Victor Thébault, Tennie, Sarthe, France

Find bases B and $B'$ such that the number 11, 111, 111, 111 consisting of eleven digits in base B is equal to the number 111 consisting of three digits in base $B'$.

#### Solution by the proposer

By the hypothesis we have

$$B^{11} + B^{10} + \ldots + B + 1 = B'^2 + B' + 1,$$

or

$$B(B^{10} + B^9 + \ldots + B + 1) = B'(B' + 1).$$

Since the left hand side is even, B must be even. Trying $B = 2$, we find $2(2^{11} - 1) = B'(B' + 1)$ and $B' = 90$. With five

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1's on the right instead of eleven we find similarly the solution $B = 2$, $B' = 5$ since $31 = 2^4 + 2^3 + 2^2 + 2 + 1 = 5^2 + 5 + 1$.

### 51. Proposed by C. W. Trigg, Los Angeles City College

Suppose D is the foot of the altitude from C, the vertex of the right angle in the triangle ABC. Show that the area of the triangle determined by the incenters of triangles ABC, ADC, BDC is $(a + b - c)^3/8c$.

#### Solution by Leon Bankoff, Los Angeles, California

Referring to the diagram, let the inradii

$$RR' = r_1, \qquad TT^* = r, \qquad SS' = r_2.$$
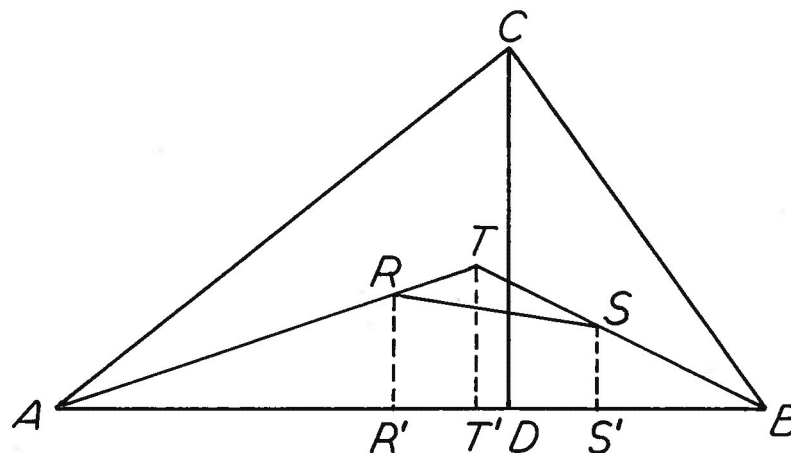


Since triangles ABT and RST have an angle in common, we have

$$(1) \qquad \triangle RST = (RT/AT)(TS/TB)(\triangle ATB)$$

Now,

$$RT/AT = (r - r_1)/r; \quad TS/TB = (r - r_2)/r; \quad \triangle ATB = rc/2.$$

Substituting these values in (1), we get

(2)
$$\triangle RST = \left(\frac{r - r_1}{r}\right)\left(\frac{r - r_2}{r}\right)\frac{rc}{2}.$$

Remembering that the diameter of the **incircle** of a right triangle is equal to the sum of the legs minus the hypotenuse, we easily derive the following identities:

(3)
$$r = (a + b - c)/2, \quad r_1 = (a + b - c)(b/2c),$$
$$r_2 = (a + b - c)(a/2c).$$

Whereupon

(4)
$$r_1 = br/c \quad \text{and} \quad r_2 = ar/c.$$

Substituting (4) in (2) and simplifying, we obtain

$$\triangle RST = r(c - b)(c - a)/2c$$
$$= (a + b - c)(c - b)(c - a)/4c$$
$$= (a + b - c)(c^2 - bc - ac + ab)/4c$$
$$= (a + b - c)(a^2 + b^2 + c^2 - 2bc - 2ac + 2ab)/8c$$
$$= (a + b - c)^3/8c.$$

For further properties of this configuration, see American Mathematical Monthly 25, 347-8, Oct. 1918.
Also solved by the **proposer.**

### 54. Proposed by F. L. Miksa, Aurora, Illinois

Given a right triangle ABC, with right angle at C, find a point P on AC so that the inscribed circles of the triangles BPC and BAP will be equal.

Solution by W. H. Price, Williams College. **Williams-** town, Mass.

Let $AB = c$, $BC = a$, $AC = b$, $BP = d$, $PC = x$, and let the radii of the circles inscribed to ABP and PBC be $r_1$ and $r_2$, respectively.

In triangle BAP:

(1)
$$\text{Area} = \tfrac{1}{2}a(b - x) = \tfrac{1}{2}r_1(c + d + b - x).$$

In triangle BPC:

(2)
$$\text{Area} = \tfrac{1}{2}ax = \tfrac{1}{2}r_2(a + d + x).$$

Dividing (1) by (2), requiring that $r_1 = r_2$, and cancelling,

(3)
$$\frac{b - x}{x} = \frac{c + d + b - x}{a + d + x}.$$

Clearing of fractions, using $d = \sqrt{a^2 + x^2}$, squaring both sides, and using $c^2 = a^2 + b^2$, where helpful.

(4)
$$2x^4 - 2bx^3 + /(a^2 - ac) + x(abc - a^2b) = 0.$$

It is immediately seen that $x = 0$ is a root of (4), and one suspects that $x = b$ might be a root, also. This is indeed the case, and we can write (4) as:

(5)
$$x(x - b)(2x^2 + a^2 - ac) = 0.$$

The four roots of (5) are $x = 0$, $x = b$, and $x = \pm\sqrt{\dfrac{a(c - a)}{2}}$.

The first two roots prove to be extraneous roots of (3), and

$$x = \sqrt{\frac{a(c - a)}{2}}$$ is required position of point P.

Also solved by L. S. Grinstein, C. W. **Trigg** and the proposer.

### 55. Proposed by Pedro **Piza,** San Juan, Puerto **Rico**

Let

$$a = 1^3 + 2^3 + 3^3 + \ldots + n^3,$$
$$b = 1^5 + 2^5 + 3^5 + \ldots + n^5,$$
$$c = 1^7 + 2^7 + 3^7 + \ldots + n^7.$$

Prove that

$$(a + 6b + 3c)^2 + (7a + 13b + 4c)^2 = (7a + 14b + 5c)^2.$$

Solution by Louisa S. Grinstein, Buffalo, New York

It is well known that

$$a = n^2(n + 1)^2 /4,$$

$$b = n^2(n+1)^2 (2n^2 + 2n - 1)/12,$$

$$c = n^2(n+1)^2 (3n^4 + 6n^3 - n^2 - 4n + 2)/24.$$

When the given equation is simplified it becomes

$$(a - b)^2 + 8(b^2 - ac) = 0.$$

When the values for a, b and c, given above, are substituted in this and the result simplified, the equation is seen to be identically correct.

Note by the proposer.

Another Pythagorean equation of this type is

$$(b + 4c - a)^2 + (3b)^2 = (b + 4c)^2.$$

Also solved by C. W. **Trigg** and the proposer.

56. Proposed by the problem editor

Prove that

$$\left[\frac{1}{\frac{\pi^2}{6} - \sum_{i=1}^{n} 1/i^2}\right] = n,$$

where, as usual, [x] denotes the largest integer not exceeding **x.**

Solution by A. E. Livingston, University of Washington

It is well known that

$$\pi^{2/6} = \sum_{i=1}^{\infty} 1/i^2.$$

Hence, since $1/x^2$ is monotone decreasing for $x \geqq 1$, we have

$$1/(n+1) = \int_{n+1}^{\infty} x^{-2} dx < \sum_{k=n+1}^{\infty} 1/k^2 = \frac{\pi^2}{6} - \sum_{k=1}^{n} 1/k^2 < \int_{n}^{\infty} x^{-2} dx = 1/n.$$

Therefore

$$(1) \qquad n < \left(\frac{\pi^2}{6} - \sum_{k=1}^{n} 1/k^2\right)^{-1} < n+1,$$

from which the assertion of the problem is obvious.

Since $1/x^2$ is strictly convex for $x \geqq 1$, the left member of the inequality (1) can be improved to $n + \frac{1}{2}$. We can therefore assert that the integer nearest

$$\left(\frac{\pi^2}{6} - \sum_{k=1}^{n} 1/k^2\right)^{-1}$$

is n + 1.

Also solved by N. **Grossman** and C. S. **Venkataraman.**

# LETTER FROM THE SECRETARY-TREASURER GENERAL*

To the chapters and members of Pi Mu Epsilon:

A national meeting of the fraternity is being tentatively scheduled for Monday noon, December 28, 1953, in Baltimore, Maryland, in conjunction with meetings of the American Mathematical Society and the Mathematical Association of America that are being held at Johns Hopkins University that week. Details of the plans will be sent to the chapter secretaries early in December. Please send your name and address to the Secretary-General by December 18, if you plan to attend the luncheon.

An important item of business will be the nomination of the new general officers who will serve three-year terms beginning April 1, 1954. Article V, Section 3, of the Constitution reads in part: "Nominations shall be made by a nominating committee appointed by the Director-General, which committee shall nominate at least two candidates for each office; additional nominations may be made by the Council, a General Convention, or any chapter of the fraternity at any time before the election."

As the fraternity approaches the fortieth anniversary of its incorporation, the attention of the chapters is called to the two historical articles in volume 1, number 1, of this Journal. Some may wish to observe the anniversary date, April 27, 1954, by an appropriate historical talk.

The Nebraska Alpha chapter, installed in May 1928, has recently celebrated its 25th anniversary at a banquet on October 14, 1953, which was attended by many of its charter members, including its first director, Theodore Jorgenson. The secretary General was invited to represent the National Council and to give a talk after the banquet.

The chapters are invited to submit to the Secretary General any items of business which should be taken up at the December meeting.

Fraternally yours,

*J. Sutherland Frame,*
J. Sutherland Frame,
Secretary General

*October 19, 1953.

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## REPORTS OF THE CHAPTERS
Edited by
Houston T. Karnes, Louisiana State University

(Send reports to Ruth W. Stokes, 15 Smith College, Syracuse University, Syracuse 10, New York.)

EDITOR'S NOTE. According to Article VI, Section 3 of the Constitution: "The Secretary shall keep account of all meetings and transactions of the chapter and, before the close of the academic year, shall send to the Secretary-General and to the Director-General, an annual report of the chapter activities including programs of meetings, results of elections, etc." The Secretary-General now suggests that an additional copy of the annual report of each chapter be sent to the editor of the Pi Mu Epsilon Journal. Besides the information listed above we are especially interested in learning what the chapters are doing by way of competitive examinations, medals, prizes and scholarships. These annual reports will be published in the chronological order in which they are received.

### Alpha of Kentucky, University of Kentucky

During the academic year 1952-1953, the Kentucky Alpha chapter held six regular meetings in addition to an initiation banquet held in December. The following papers were presented:

"Report on the National Meeting of Pi Mu Epsilon, August 31-September 1, 1952" by Mr. Wilson Zaring

"Compressible Fluids" by Dr. William H. Pell, Head, Mathematics Department

'Mathematics as a Language" by Dr. Walter L. Moore, Mathematics Department, University of Louisville

"Possible Values of the Angular Momentum of a System by Symbolic Quantum Mechanics" by Dr. Thomas Hahn, Physics Department

"Quantification Theory" by Dr. John Kuiper, Psychology Department.

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At the initiation banquet, Dr. Lyle R. Dawson spoke on "Chemical Synthetics". Eight new members were initiated on this occasion.

Officers for 1952-1953 were: Director, Sherman B. **Vanaman,** Jr.; Vice-Director, Ralph **C. Brown, Jr.**; Librarian, John B. Wells, **Jr.**; Secretary, Richard H. Sprague; Treasurer, Howard W. **Burnette.**

Officers for 1953-1954 are: Director, Ralph C. Brown, **Jr.**; Vice-Director, John B. Wells, **Jr.**; Librarian, Richard H. Sprague; Secretary, Howard W. Burnette; Treasurer, Joseph B. Cornelison.

### Beta of North Carolina, University of North Carolina

The North Carolina Beta chapter held eight regular meetings during the 1952-1953 session. The following papers were presented:

"Another Method of Attacking Partial Fractions" by Mr. Frank Stallard

"Intuition and Tuition at an Institution by an Intuitionist" by Mr. Louis **McAuley**

"Installment Buying" by Dr. A. T. Brauer

"On **Godel's** Theorem" by Mr. Marion Smith.

The following officers were elected to serve for the 1953-1954 session: Director, Bob Heath; Vice-Director, Marion Smith; Secretary, Marilyn Marshall; Treasurer, George Lofquist; Awards and Scholarship Chairman, Dick Painter.

### Gamma of Missouri, Saint Louis University

The Missouri Gamma chapter held four meetings during the 1952-1953 year. The following papers were presented:

"Summation of Series" by Dr. Francis **Regan,** Head of the Department of Mathematics

"Geometry and the Imagination" by Mr. William A. Golomski

"The Foundations of Mathematics" by Rev. Lester Heider, **S. J.**

On April 8, 1953, the final meeting and the annual banquet were held. Fifty-one new members were initiated on this occasion. The guest speaker was Dr. G. Y. Rainich, Professor of Mathematics at the University of Michigan. The title of his address was: "A Mathematician's Approach to Relativity". Following the address a reception was held honoring Professor and Mrs. Rainich and the new initiates. Director William A. Golomski was toastmaster for the banquet. Among the honored guests were Professor and Mrs. Rainich and Rev. Victor Blum, **S. J.**, Associate Dean of the Institute of Technology, Saint Louis University.

The officers for 1952-1953 were: Director, **William A. Golomski**; Vice-Director, Paul K. Ito; Secretary-Treasurer, Sarah Williams; Faculty Advisor and Permanent Secretary-Treasurer, Dr. Francis **Regan.**

The following were elected to office for 1953-1954: Director, Paul K. Ito; Faculty Advisor and Permanent Secretary-Treasurer, Dr. Francis **Regan.** The Vice-Director and Secretary-Treasurer are to be elected in the fall of 1953.

### Gamma of New York, Brooklyn College

The New York Gamma chapter initiated sixteen students and two faculty members during the 1952-1953 session. The faculty members were: Professor Walter Cerf of the Philosophy Department and Professor Harry Malisoff of the Economics Department.

The following papers were presented before the chapter:

"Science and Mathematics in the Middle Ages" by Professor Carl B. Boyer

"Arithmetic and Geometric Means" by Professor **Dinghas** of the Mathematics Department of the Free University of Berlin. Professor **Dinghas** is now a visiting professor at Columbia University.

"Theory of Polygons" by Professor Jesse Douglas of the Mathematics Department of Columbia University and of Brooklyn College.

The following papers were presented before the Mathematics Society of Brooklyn College by students of Pi Mu Epsilon:

"Introduction to Normal Subgroups by Means of Congruence Relations" by Donald Solitar

"Calculus of Variations" by Charles Summerfield

"Probability" by Donald Solitar.

The New York Gamma chapter elects officers twice a year. The following served for the fall term of 1952: Director, Professor James J. Singer; President, Erving **Katz;** Vice-president, Allen Morton; Secretary, Claire Wasserman; Treasurer, Louis Libelo.

Those who served for the spring term 1953 were: Director, Professor James J. Singer; President, Allen Morton; **Vice-President,** Donald Solitar; Secretary, Barbara Sanders; Treasurer, Bernard Okin.

### Beta of Oregon, Oregon State College

The Oregon Beta chapter held nine meetings during the **1952-**1953 year. The following papers were presented during this period:

"Squaring the Circle" by Mr. Patric Paddock
"Theory of Numbers" by Mr. Charles Gutzler
"The Trisection Problem" by Miss Ruth Blair
"Dimensionality" by Mr. Donald Core
"Paradoxes" by Mr. Walter **Redell**
"Mathematics and Statistics" by Dr. Jerome Li
"Cayley's Absolute and the Non Euclidean Geometries" by Mr. Richard Bredemeier
"Solution of Sets of Equations by Vector Methods" by Dr. I. M. Hostetter
"Solution of Sets of Equations by Vector Methods" by Mr. Fred Bolkestein
"Integral Equations" by Dr. A. T. Lonseth
"Integral Equations" by Mr. Gene Thompson
"Fibonacci Numbers" by Mr. Vern Haggett.

The following officers were elected to serve for the 1953-1954 session: Director, Miss Elvy Fredrickson; Vice-Director, Mr. James Brown; Secretary, Miss Ruth Blair; Treasurer, Professor G. A. Williams.

### Alpha of Pennsylvania, University of Pennsylvania

The Pennsylvania Alpha chapter held seven meetings for the year of 1952-1953, including the annual banquet. The following papers were presented during the year:
"The Method of Finite Differences for the Solution of Differential Equations" by Dr. I. J. Schoenberg
"Harmonic Functions and Average Values" by Dr. Bernard Epstein
"Finite Fields" by Dr. Richard D. Schafer
"Mathematical Decision Models" by Dr. Max **Woodbury**
"Rational Triangles" by Dr. Perry A. **Caris**
An address by Dr. Pincus Schub.

On May 14, 1953, the annual banquet was held. The address was given by Dr. John R. Kline, chairman of the department of mathematics, who spoke on the subject: "The Jordan Curve Theorem".

The following were elected officers for 1953-1954: President, Lowell Zeid; Secretary, Nina Schub; Treasurer, George E. Smith.

### Beta of Alabama, Alabama Polytechnic Institute

The Alabama Beta chapter of Pi Mu Epsilon was formally installed at Alabama Polytechnic Institute on April 21, 1953, by

the Director General of Pi Mu Epsilon, Professor C. C. **Mac-Duffee** of the University of Wisconsin. The installation program included the following papers:
"Some Analogous Concepts in Physics and Mathematics" by M. Leichter
"Curves in Minkowski Space" by C. C. **MacDuffee**

The installation program also included a banquet and brief talks by Dean Roger W. Allen and Professor J. C. Eaves.

During the 1952-1953 session the following papers were presented:
"Reduction of Quadratic Forms to Canonical Forms" by Ben Fitzpatrick
"Inversion" by John Locker
"About Fifteen Minutes" by Mrs. Marjorie Higgins Fitzpatrick
"Resultants" by Paul Williams
"Basic Concepts of Modern Algebra" by Mrs. Claire Aucoin
"Bessel Functions" by Johnny Johnson
"Probability" by Howard Barringer
"Calculus of Variations" by M. M. Duncan
"On the Gamma Function" by Mrs. Katherine Holland Barringer.

The following were elected to serve as officers for the **1953-1954** year: Director, Professor W. C. Royster; President, Mr. Frank Herron; **Vice-President,** Mr. **Alex Taylor; Secretary-Treasurer,** Miss Anne Parker; Corresponding Secretary, Professor S. L. Thompson.

### Beta of Oklahoma, Oklahoma A. and M. College

Twenty-one new members were initiated by Oklahoma Beta during the 1952-1953 year. The following papers were presented at regular meetings:
"Education in Estonia and Germany" by Helmo **Raag**
"Einstein's Theory of Relativity" by Gene Marshall
"Engineering Mathematics" by Professor Herbert Scholz.

For the annual banquet two papers were presented. They were:
"Astronomy" by Dr. H. S. Mendenhall
"The Training of Mathematicians in England" by Dr. O. H. Hamilton.

The chapter sponsored a display in the Oklahoma Institute of Technology's annual Engineering and Science Exposition.

The following were elected to serve as officers for 1953-1954: Director, Bill Pruitt; Vice-Director, Norman Martin; **Secretary-Treasurer,** Lorene Young.

The following papers were presented at regular meetings of the New York Eta chapter during the 1952-1953 year:

"Pretty Patterns of Polygons or Regular Tesselations in Curved Spaces" by George W. Walker

"Celestial Mechanics" by Dr. William H. Davis of the Physics department

"Fibonacci Numbers" by Rita Mochan

"An Area Expressed as a Limit" by Mary Harrington

"Semi-Complex Graphs" by Dr. Louis Kramer

"Mathematical Developments of Some Vibration Problems" by Robert C. Kroeger

"Measure" by Dr. Daniel Orloff of the Cornell Aeronautical Laboratory.

The meeting on December 16, 1952, was a dinner. Mathematical games and recreation were enjoyed by the members.

The following were elected to serve as officers for the year 1953-1954: Director, Richard Barnes; Vice-Director, Leonard Darbee; Secretary, Joseph Siciliano; Treasurer, Thomas Harris; Faculty Advisor, Howard W. Baeumler.

### Alpha of District of Columbia, Howard University

The District of Columbia Alpha chapter held three program meetings during the 1952-1953 year and several business meetings. The following papers were presented:

"On the Nature of Mathematical Science" by Dr. Elbert F. Cox

"Different Approaches to Dimension" by Dr. George H. Butcher

"On the Construction of Tables of Mathematical Functions Used in the Determination of Orbits" by Dr. Allen A. Maxwell.

Five new members were initiated during the year. The following served as officers: Director, George H. Butcher; President, Claude Dickson; Secretary-Treasurer, Young Lee.

### Alpha of Montana, Montana State University

The following papers were presented before meetings of the Montana Alpha chapter during 1952-1953:

"Stochastic Processes" by Dr. George Marsaglia

"Equivalence Relationships" by Dr. H. Chatland

"Difference Set Problems" by Professor T. G. Ostrom

"Continued Fractions" by Dr. William Myers

"Binary Operations" by Mr. George Craft.

The annual banquet was held on April 11, 1953. Director Larry Hunter was toastmaster. On April 29, 1953, twelve new members were initiated.

The following were elected to serve as officers for 1953-1954: Director, Verne Fauque; Vice-Director, James L. Ford, Jr.; Secretary-Treasurer. Ilen Freda Egger.

### Alpha of Virginia, University of Richmond

The Virginia Alpha chapter held several meetings during the academic year 1952-1953. Eight new members were initiated at the fall initiation meeting. Papers presented were:

"Some Aspects of the Theory and Application of the Calculus of Finite Differences" by Dr. D. F. Atkins

"Vocations for the Mathematics Major" - a panel discussion led by Dr. C. H. Wheeler 111, with J. J. Greever, Jane Cather, J. S. Phillips, Janet Johnston, and T. J. Little presenting information on specific fields of activity for mathematicians.

A joint picnic was held in conjunction with the local chapter of Sigma Pi Sigma, honorary physics fraternity. Approximately 50 members and guests attended.

Officers for 1952-1953 were: President, Janet Johnston; Vice-president, Thomas J. Little; Secretary, Jane Cather; Treasurer, Frank A. Lowman; Director, Dr. C. H. Wheeler III; Permanent Secretary, Professor E. S. Grable.

The following were elected to serve as officers for 1953-1954: President, C. Ballard Pierce; Vice-president, Norma Raney; Secretary, Macon Day; Treasurer, Hector Davis; Director, Dr. C. H. Wheeler III; Permanent Secretary, Professor E. S. Grable.

### Alpha of Louisiana, Louisiana State University

The Louisiana Alpha chapter had nine meetings during the 1952-1953 year. Three of these meetings were the annual Pi Mu Epsilon Lectures.

The lectures were given this year by Professor R. H. Bing of the University of Wisconsin on February 19 and 20, 1953. His subjects were:

1) "Tame and Wild Sets in 3-Space"

2) "A Misconception Concerning Topology"

3) "The Convexification Problem".

The annual initiation and banquet were held on May 14, 1953. Twenty-five new members were added at this time. The arrangements for the banquet were in charge of Mrs. Paul B. Brown of

the mathematics faculty. Mrs. Brown assisted Dr. Karnes with the work of the chapter this year. Mrs. Lynden B. Howell had charge of the games for the banquet. Dr. Houston T. Karnes gave the banquet address.

Several new books were added to the Pi Mu Epsilon shelf in the Mathematics Library during the year.

The following served as officers during the year: Director, Lloyd Aguillard; Vice-Director, Tildon **J.** Hebert, **Jr.;** Secretary, Jack R. Hall; Treasurer, John C. Jackson, **Jr.;** Corresponding Secretary, Professor Houston. T. Karnes; Faculty Advisor, Mrs. Paul B. Brown and Professor Houston T. Karnes.

### Alpha of Illinois, University of Illinois

During 1952-1953, Alpha of Illinois inaugurated a series of mathematical talks planned for undergraduates to give them a sampling of elementary topics from a broad range of mathematical subjects not ordinarily encountered in the early years of either engineering or liberal arts curricula. These talks were open to anyone interested, and students in mathematics courses were particularly urged to attend. During 1952-1953 six programs were held, three of them given by faculty members and three by graduate students. The following papers were presented:

"Weighing Problems" by Lester R. Ford, **Jr.**

"Network Problems" by Richard E. Priest

"Geometric Problems of the Past" by Professor Josephine M. Chanler

"Mathematical Impossibilities" by Professor Stewart **S.**Cairns

"Horse Sense in Mathematics" by Lester R. Ford, **Jr.**

"Mathematics, Statistics, and Mathematical Statistics" by Professor Jacob Wolfowitz.

On April 26, forty-three new members were initiated. On May 1, the annual banquet was held. Professor Tibor Rado made the principal address of the evening. His subject was "Rigid Surfaces".

Officers for the academic year 1953-1954 are: President, Earl **J.** Schweppe; Vice-president, Kenneth A. **Brons;** Secretary, Carol L. Stewart; Treasurer, Jack P. Tull.

### MEDALS, PRIZES AND SCHOLARSHIPS

EDITOR'S NOTE. Each chapter undoubtedly will be interested in learning what other chapters are doing along the line of prize competitions. So the editor makes the request that chapters offering prizes, scholarships, or other awards, write up their plans for such contests and submit them for publication in this journal.

The secretary of the North Carolina Beta chapter reports that mathematical books were awarded to Mr. Hugh Van Landingham and Mr. John **Trotti,** winners of the State High School Mathematics Contest for 1953.

The Oregon Beta chapter of Pi Mu Epsilon reports that for the year 1952-1953 the prize winners in their Annual Mathematics Contest were: Mr. Charles Luehr, winner of the first prize; Mr. James Brown, winner of the second prize; and Mr. Fred Bolkestein, winner of the third.

For the third year, the Alpha of Virginia chapter sponsored prize winning examinations, one for the first year mathematics students and another for students in second year mathematics. The prize winners were: Philip A. Flournoy and Patricia **McElroy** in first year mathematics and Cheng Wen, Nathan **Safian,** Hing-Cheong So, and Jack **Swanson** in second year mathematics. A total of $31.00 in prize money was awarded.

The New York Eta chapter, University of Buffalo, each year awards a prize of dues paid for one year in the Mathematical Association of America. This year the award went to Mrs. Miriam **Hayman** Brown in recognition of outstanding achievement in mathematics.

Montana Alpha chapter began the academic year with the **annaul** awarding of the Pi Mu Epsilon entrance prizes. These prizes are given to the three freshmen who place highest in an examination in mathematics. The first prize, $25, was awarded to William Lien, of Bonner; the second prize, $15, to Thomas **Gruhn,** of Fort Missoula; and William **Barrett,** of Billings, received $10.

From THE MISSOURI GAMMA NEWS we learn that Mr. Edward L. Tines, senior in the School of Arts, St. Louis University, was the winner of the James W. Garneau annual mathematics award of $25. The norms, in consideration of which the award is granted, are as follows: (1)the highest credit point average for

three and a half years of college work; (2) the results of the final comprehensive examinations; (3) service and loyalty to the University and Department.

For the second straight year, a student at Parks College, St. Louis University, won the Junior Division of the Annual Pi Mu Epsilon Prize Essay Contest. Mr. Richard Schapker was the winner. His topic for the essay was **"Georg** Cantor," and the prize was a copy of E. T. **Bell's** "Men of Mathematics."

The Louisiana Alpha chapter makes two annual awards. The Freshman Award, based on an honors examination, was won in the 1952-53 academic year by William O. **Jeansonne** of Baton Rouge, Louisiana. The Senior Award, based on the quantity of mathematics taken and the quality of work done, resulted in a tie. The winners were: Van Be Luong, Hanoi, Vietnam; Myron Hwai Hsi Yang, Hong Kong, China.

Kenneth R. Mount, of Illinois Alpha, was awarded the chapter's prize of $25 given annually to the senior most outstanding in the field of mathematics.

## ACKNOWLEDGEMENTS

## NEWS and NOTICES

### Two New Chapters

Two new chapters of Pi Mu Epsilon were added last spring, bringing the number of active chapters to fifty-six. Director General C. C. MacDuffee officiated at both of the installations.

Mrs. MacDuffee accompanied Professor MacDuffee on their motor trip to Auburn, Alabama, for the installation of the Alabama Beta chapter at Alabama Polytechnic Institute, April 21, 1953. They arrived in Auburn less than 48 hours after a tornado had struck the town, destroying at least a thousand trees and damaging many houses. (The reader will recall the destruction wrought by the series of tornadoes which swept over the country last spring.) As a result the Alabama Beta installation did not get as much attention as it otherwise would have. The installation held in a suburban restaurant was well attended and marked by cordial southern hospitality.

The **chairman** of the mathematics department, Professor W. Van Parker, was host for the occasion, and Director General C. C. MacDuffee was the installing officer. For a complete report of the Alabama Beta chapter's installation and activities for the past academic year, please see REPORTS OF THE CHAPTERS, this issue of the Journal.

Director General MacDuffee was also the installing officer for the new chapter located at **Cornell** University, now New York Theta chapter. The installation banquet was held in Willard Straight Hall on the evening of May 22, 1953. In the ceremony which followed the banquet, the Director General delivered the handsome and most impressive charter to the Chairman of the Mathematics Department at **Cornell,** Professor R. J. Walker, who accepted it in the name of the new chapter. Besides Director MacDuffee and Editor Ruth Stokes (of the official publication) two other members of the Fraternity (members of other chapters) were present and aided in the installation ceremony. These were Mrs. **Ilse** Gals and Professor Ralph P. Agnew, both of the mathematics faculty at **Cornell** University.

In Director General **MacDuffee's** address he spoke on the history of Pi Mu Epsilon, its purpose, and its benefits to the new members; and he closed his address by welcoming the new chapter into the Fraternity. Editor Ruth W. Stokes, Professor of Mathematics at Syracuse University, spoke briefly on the subject of the Pi Mu Epsilon Journal, its nature and purpose, and she

urged the new members to support their publication by submitting problems, solutions of printed problems, and writing articles for publication in their journal.

The meeting was concluded after an extremely entertaining talk, "Trigonometry without Geometry," by Professor Wallie A. **Hurwitz** of the **Cornell** Mathematics Department.

\* \* \*

Secretary-Treasurer General J. Sutherland Frame was a guest of the Nebraska Alpha chapter, Lincoln, Nebraska, October 14-15, on the occasion of the celebration of the chapter's **twenty-**fifth anniversary. He was invited to represent the National Council and to speak at the anniversary banquet. He gave an historical talk at the banquet, and at eight **o'clock** that evening he gave a talk on "Symmetry groups and their representations." (For further details of the Nebraska celebration, please see Professor Frame's LETTER printed in this issue of the Journal.)

Attention is called to two other matters presented in Professor Frame's letter: First, the national meeting of the Fraternity Monday at noon, December 28, 1953, in Baltimore, Maryland. In addition to the pleasure and inspiration members of one chapter will get from those of another at the luncheon meeting, important business will be transacted at this meeting, making attendance worthwhile to representatives from all the chapters.

Another important matter discussed in Professor Frame's open letter to the chapters and members is the forthcoming fortieth anniversary of incorporation of the Fraternity, April 27, 1954, which the chapters may wish to observe. It is suggested that for the program of the April meeting an historical talk might appropriately be scheduled.

\* \* \*

### News Items Gleaned from Chapter Reports

The Missouri Gamma chapter initiated fifty-two new members during the academic year 1952-53, bringing the total membership since the charter was granted to 686.

Gamma of New York, Brooklyn College, each semester initiates an "honorary inductee." The "honorary inductee" for the fall, 1952, was Professor Walter Cerf of the Philosophy Department. In the spring, 1953, the "honorary inductee" was Professor Harry Malisoff of the Economics Department.

A display in the Oklahoma Institute of Technology's annual Engineering and Science Exposition was sponsored by the O. A. M. C. chapter of Pi Mu Epsilon. It consisted of a demonstration of basic theories of probability and random sampling, as well as various mathematical entertainments.

Professor G. Y. Rainich of the University of Michigan delivered the third Annual James E. Case Pi Mu Epsilon Memorial Address, before the Missouri Gamma chapter. His topic was "A Mathematician's Approach to Relativity."

Professor **R.** H. Bing of the University of Wisconsin was guest speaker for the Louisiana Alpha chapter, February 19 and 20, 1953. He delivered the annual Pi Mu Epsilon Lectures. (The subjects for his three lectures are given in the chapter report in this issue of the Journal.)

Several new books were added to the Pi Mu Epsilon shelf in the Mathematics Library, at Louisiana State University, during the year.

During the year 1952-1953, a new set of By-Laws for the Illinois Alpha chapter was written and approved by the membership. At the annual banquet, May 1, the chapter had as guest speaker, Professor **Tibor** Rado, of the Mathematics Department at Ohio State University. His subject was "Rigid Surfaces."

### ERRATUM

The following erratum has been called to the attention of the editor.

In the April 1953 issue of the Journal, list of initiates of May 1, 1952, North Carolina Beta, p. 344, 3rd line from bottom of page, a name was misspelled. Correct spelling of the name is: Herbert E. Speece.

## INITIATES, ACADEMIC YEAR 1951-1952
### (Continued from Vol. 1, No. 8)

#### IOWA ALPHA, Iowa State College
##### (May, 1952)

| | | |
|---|---|---|
| Raymond V. Borchers | Donald E. Gregson | Dean Ruby |
| Seth Loren Carpenter | Edgar M. Jacobs | Ralph Floyd Schauer |
| Robert Leroy **Carrick** | Dean M. Karns | Donald V. Steward |
| Burton G. Christensen | James B. **Klingler** | William J. **Swartz** |
| Adrian K. Dorsman | Elaine F. **Kratosky** | Elmer C. **Thulin** |
| **Arwin** Adelbert Dougal | Donald N. **Langenberg** | Nyle G. Utterback |
| Marion D. Forsman | Earl Wm. **McMurry** | James R. Winkelman |
| | Jack Monroe Miner | |

#### KANSAS ALPHA, The University of Kansas
##### (May 15, 1952)

| | | |
|---|---|---|
| Sally **Davidson** | Ebbe Thue Poulsen | Elbert Walker |
| George Ladner | Waldo Renich | Ronald L. **Wigington** |
| | S. D. **Sinvhal** | |

#### KENTUCKY ALPHA, University of Kentucky
##### (Spring, 1952)

| | | |
|---|---|---|
| Richard **Sprague** | George Farney | Robert D. **Haun,** Jr. |
| Carl **Berger** | Virginia **Hanly** | John R. Davis |

## INITIATES, ACADEMIC YEAR 1952-1953

#### ALABAMA ALPHA, University of Alabama
##### (December, 1952)

| | | |
|---|---|---|
| William Byatt | Richard McKinley | Cecil Eugene Robinson |
| James Lyle Kassner | James L. Okel | Frederick T. Shaver |
| Billy B. **Letson** | Patricia A. Oliver | Arthur R. Taylor |
| Richard F. **McCoart** | Jaqueline Robbert | Barbara Van **Natta** |

##### (May, 1953)

| | | |
|---|---|---|
| Gerald Herr Backer | Benjamin C. Bradley | Lou Ann Ray |
| N. L. **Balazs** | John W. Norman, Jr. | A. E. Ruark |

#### ALABAMA BETA, Alabama Polytechnic Institute
##### (April 2, 1953)

| | | |
|---|---|---|
| William T. **Archor** | Verne E. **Dietrich** | John L. Locker |
| Robert W. **Averyt** | Bailey L. **Donnally** | Annie May Morris |

| | | |
|---|---|---|
| Katherine **H.** Barringer | Ben **Fitzpatrick,** Jr. | **W.** A. **Rutledge** |
| Ruppert T. Chappelle | John M. Green | W. L. **Strickland** |
| David L. **Conley** | Robert C. Hanks | S. L. Thompson |
| Thomas W. **Curlee** | George T. Holmes, Jr. | Donald L. Wamp |
| Bernard C. **DeLoach** | William D. Jascomb | Ernest Williams |
| | David E. Johnson | |

#### ARIZONA ALPHA, University of Arizona
##### (April 29, 1953)

| | | |
|---|---|---|
| Wayne L. Arnold | Frank **J.** Keating | Theodore R. **Mullen** |
| Richard T. Dorrance | Harry G. King | Gordon M. **Petersen** |
| Louis **H.** Enloe | Bernard Marcus | William A. Ruff |
| Raymond J. **Hannapel** | Harold M. **McNair** | Fred C. Schweppe |
| Joan C. **Hosdowich** | | Richard O. Williams |

#### ARKANSAS ALPHA, University of Arkansas
##### (March 20, 1953)

| | | |
|---|---|---|
| Joel Kent Baker | David England | Betty Jo **Melton** |
| James Walter Cochran | John Malcolm Hopper | Kenneth D. Robirds |
| | David Eugene **Lashley** | |

Richard **Bandell** Homard – Initiated December 4, 1949
Alfred T. Brown – Initiated November 7, 1951

#### CALIFORNIA ALPHA, University of California
##### (Spring, 1953)

| | | |
|---|---|---|
| **Herma** Eudora Albers | George M. Masters | Leland **Sapiro** |
| William M. **Barbe** | Norton Leonard Moise | Daniel Schechter |
| Morris S. **Bureloff** | Kenneth **McGraw** Poovey | Kenneth L. Schick |
| William Robert Bush | Rudolph W. Preisendorfer | **Henri** M. Semarne |
| Edward C. **DeLand** | Donald **W.** Rankin | Walter **Wallin** |
| Sidney Morris Harmon | Irving I. Richards | James W. Warrington |
| Kenneth M. Hoffman | **Beatriz** Rossello | Linsley G. Wyant |
| Mary Kirk Janke | Roy R. **Sakaida** | Marine Fowler |

#### CALIFORNIA BETA, University of California, Berkeley
##### (Spring, 1953)

| | | |
|---|---|---|
| Anne **Alpen** | **Lampert** Koopmans | **Balkrishma Sukhatme** |
| Kurt Bing | Kurt **Kreith** | John **Weidlich** |
| Eva Kallin | Dana Scott | **Fawzi** Yaqub |
| | John Simmons | |

#### DELAWARE ALPHA, University of Delaware
##### (Spring, 1953)

| | | |
|---|---|---|
| Peter K. Baumgarten | Ronald A. Hultsch | Paul **Moser** |
| John Christian | Henry A. **Lackner** | Robert Perry |
| William A. Dean | Patricia A. Lecrone | Anton **Petrovich** |

Esther S. Gersten
Mary Joanne Heath

Mary Ann Lindale
Alvin J. Major, Jr.
W. Lysle Marshall

Janet H. Smith
Kenneth T. Smith

GEORGIA ALPHA, University of Georgia

(April 29, 1953)

Ernie Larue Anglin
Ada D. Goodman
Hughes B. Jenkins, Jr.

Barbara Jean Miley
Barbara Sue Mills
Butrus Sami Kawar

Robert L. Froemke
Lola Frances Kiser
Paul H. Speer

ILLINOIS ALPHA, University of Illinois

(April 26, 1953)

Lew Allen, Jr.
Max Beberman
Peter G. Braunfeld
Kenneth A. Brons
Ashley B. Craig, Jr.
Barbara J. Cross
Richard L. Cummins
Michael J. Eitel
Vernon J. Fowler
Robert B. Garland
Charles T. Goodhue
Mishal M. Hammodat
Robert H. Hardin
Edgar M. Haverland

Robert F. Hoyt
Leonard M. Isaacson
Carl W. Kammeyer
Robert W. Kleis
Marvin I. Knopp
Richard D. Luders
Harold J. Matsuguma
Robert L. Mieher
Frank G. Morton
Kenneth R. Mount
William M. Myers
Eugene D. Nichols
Sherwood I. Parker
John P. Rooney
Thomas C. Rowan

Chih H. Sah
John H. Sinfelt
William E. Smith
Carol L. Stewart
Mary R. Tate
Robert F. Trapp
Mary E. Tressel
Jack P. Tull
Richard W. Vook
Hermanus W. Vreenegoor
Robert R. Wiederkehr
Wendell D. Williams
Gloria E. Winkel
Fadil H. Zuwaylif

ILLINOIS BETA, Northwestern University

(Spring, 1953)

Ronald W. Anderson
James C. Bliss
Robert F. Breese
Robert E. Briney
Harmon W. Brown, Jr.
Marilyn Ceglowski
James J. Dodd
Alien B. Edwards
Barbara Lee Edwards
Raymond Ettinger
Roy Goetschel

Janet Hanssen
Janet Haswell
Alan Heckenbach
Stewart F. Hemmenway
R. Brad Herbert
Paul H. Herzing
John Hunting
John M. Iwasyk
Antonia Knauer
Paul W. Kolp
Donald A. Koss

Daniel S. Lordahl
Ronald E. Malecki
Peter McLaren
Lyle F. Mockros
Stewart I. Rosenfeld
Kenneth Sapp
Irving Starkman
Brock Stebbings
Nick L. Stevens
Dorothea J. Stinn
Eo Vaher

IOWA ALPHA, Iowa State College

(April 9, 1953)

Gordon Anderson
James R. Anderson
John Arthur
M. M. Babbar

Norman Greenlee
Ellsworth Grell
Robert Guyan
Eugene Hanson

Edward Schillmoeller
Donald Siekmeir
Thomas Throckmorton
Phil W. Trumbo

Gerald L. Baker
Mary Jane Barlow
David R. Blake
Donald C. Bohning
Gary Briley
Don Brakenseik
Margery Walkup Chifton
M. M. Christensen
John Cross
Don Curren
William R. Daniels
Jean Engler

Roger S. Hanson
Dean Karns
Jo Kegerreis
Louis Knobbe
Florence Lemley
Harold Matheson
Jack Mickle
Allen J. Morris
Anton J. Netusil, Jr.
Don L. Nordeen
William Ohlsen
Richard P. Peiper

L. J. Swartzendruber
Gerald Tuma
Richard Versteeg
G. P. Weeg
Morton Weinberg
David V. Wend
Harold R. Wiggers
Edwin Wirtz
Douglas Wixson
David T. Wood
F. R. Yett
Robert G. Leebl

KENTUCKY ALPHA, University of Kentucky

(Fall, 1952)

John M. Brabant

Thomas F. Droege
Ceslovas Masaitas

Taneko Tsubaki

(Spring, 1953)

J. B. Cornelison

C. R. Morris
P. L. Pfenningwerth

R. E. Shely

LOUISIANA ALPHA, Louisiana State University, Baton Rouge

(May 14, 1953)

F. T. Berg, Jr.
Cecil Bergeron
Weaver T. Brian, Jr.
Stephen Pool Brote
George R. Burleson
Cushman M. Cambre
Anthony James Chetta
Sarah Boyd Cook

Frederick Wms. Cummings
Francis Roy Daigle
Linforiano F. Echeverria
William Timlake
Sadie Y. Ferguson
Joseph Foster Frantz
Van H. Gilmore
Betty Groome
Ronald L. Hartman

George G. Koenig
Truett J. Lemoine
William L. Lewis
John D. Prejean
Dawn Sherburne
Curry St. Pierre
Diana Jane Wehe
Myron H. Yang

MICHIGAN ALPHA, Michigan State College

(May 5, 1953)

Floyd J. Backus, Jr.
Hedayat Behbehani
James Wm. Caltrider
Glen Wm. Culbertson
William S. Cumming
Mary Louise Ewers

Toufic N. Jildeh
Donald Kooiman, Jr.
Zigurds Levensteins
Suzanne Mare
Roman McClatcher, Jr.
Francis E. Moss
Howard R. Newcomb

Robert Pressley
Robert Pung
John W. Rood
David Stauff
Baba Telischi
Dan Waltz

MISSOURI ALPHA, University of Missouri, Columbia

(May 1, 1953)

William Robert Abel
Walter T. Buchanan

Joan Henley
Charles F. Kircher

Max C. Richardson
Donald V. Roach

Robert Clark Bueker
Wayne Thomas Cooke
James K. **Crossman**
Richard Joseph Defeo
Margaret C. **Ernst**
Leonid **Govoruhin**

Roger Lee Mell
Hal V. Miller
Harold Wayne Moore
Arnold **Eastman** Mohn
Rosetta V. **Pedicini**
Harold Wayne Peters
C. John Renken

George F. Schwaebe
Fay D. **Shepard**
James N. Smith
Kenneth E. Smith
Allen N. Wollscheidt
John **R.** Ziercher

### MISSOURI GAMMA, St. Louis University

(April, **1953**)

Max D. **Beasley**
James L. Boone
Richard **J. Boushka**
Robert J. Boyles
Richard **Bredeman**
Roy G. **Brereton**
Henry **Bugg**
Richard Conger
Joseph E. Davison
Carolina Del Mar
Edward **Diemer**
Gerard **Dobrindt**
Francis **Doerr**
Joan Fencl
Michael Forrest
William Fuhrman
Jane Frances **Furrer**

Richard Gelm
Louis J. Grimm
Herbert **R. Grumann**
Betty Webb Haney
Richard Hanna
**Winfield** E. Hartford
Carl **H.** Hayn, S. J.
Mary Jo **Herrmann**
Sr. Mary B. Hudson
John Hull
Willard **Innis**
Santo Italia
Charles D. Joerger
Dale **Kalkbrenner**
Eugene G. **Klein,** Jr.
James **Kovarik**
John E. Lange

Joseph Leto
J. James **Malone**
Ronald M. Naumer
Morris Post
Nancy Raupp
Bernard Rice
Barbara L. **Riley**
Victoria A. **Ritayik**
Richard Russell
Betty J. Ruthmeyer
Raymond J. Schneider
Thomas **Stanton**
Edward Tines
Leo Voegtli
Florence **Waddock**
Ruthmary Waterstreet
Joseph **Wiskirchen**

### MONTANA ALPHA, Montana State University

(Spring, **1953**)

Robert S. **DeZur**
Ilen Freda **Egger**
James L. Ford
Jo Ann Grundstrom

Jerry Holland
Audrey Linscheid
Patricia Pearl Lovely
Theodore Mueller

Joyce **Pikkula**
James Ryan
Verne Tauque
Gerene Wilson

### NEBRASKA ALPHA, University of Nebraska

(March **31, 1953**)

Gerald Wm. **Eriksen**
Donald Paul **Geesaman**
E. Gordon **Kruse**

Stanley S. Leese
Jack G. **Stiehl**
Donald **H. Trahan**

Donald A. Wenz
John **M. Whitlock**
Gene A. **Yost**

### NEW HAMPSHIRE ALPHA, University of New Hampshire

(Date of initiation not given)

Richard W. **Bradt**
Thomas S. **Crowther**
**Jarl** A. **Elmgren**
Dorothy A. Gaam

Richard S. Guyette
**James F. Hogan**
Frederic A. Johnson
Eleanor **Killam**

**Armond R.** Lamontagne
Ronald L. Lavoie
John L. **Rodda**
Alfred Weissberg

### NEW YORK BETA, Hunter College

(Spring, **1953**)

Patricia Batting
Joan Brady
Frances **Flagg**
Helen Galbavy

Joan **Guttlieb**
Barbara Leitzell
Helen Mau
Helen **Paisner**

Ellen Praus
Samya Roth
**Lillian** Scott
Sandra B. Stone

### NEW YORK GAMMA, Brooklyn College

(Spring, **1953**)

Fred Gross
Ernest **Hirsch**

Ruth **Machnikoff**
Martin Schechter

Aaron Stein
Frieda Zames

### NEW YORK EPSILON, St. Lawrence University

(Spring, **1953**)

William C. **Dixon**

Ellen **R.** Keenholts
Jack J. Kinney

Janet L. Pembleton

### NEW YORK ETA, University of Buffalo

(May 4, **1953**)

Paul Archambeau
Philip Archer
Richard Barnes
Leonard Darbee
Gordon Derek
**Domonic** Falsetti
Mary **Harrington**

Thomas Harris
Dr. Louis Kramer
William **Machanian**
Carl **Markello**
Frank **Micale**
Sheleen Pohl
Robert Scamurra

Louis F. Scholl
Richard Schroth
Paul Sheehe
Joseph Siciliano
Jacqueline **Szynski**
George Vlay
Dorothy **Webber**

### NORTH CAROLINA ALPHA, Duke University

(May 14, **1953**)

Charlotte Ethel **Belland**
Deborah Berry
**Moritz Bukowitz**
Raymond Francis Burke
Donald B. Chesnut
Scott William Chllton
Barbara Jean Davis
Sallie Jane **Demorest**

David **Powley DeWitt**
Rhett T. George, Jr.
Norman James Hart
William B. Huntley, Jr.
**Norwood** J. King
Vadim **Zoran** Milovanovic
Francis Clemens Neuhaus
Ray Mortimer Olds
John B. Parkerson

Herman **Postma**
Kedar D. **Pyatt,** Jr.
James **R.** Ransom
John Lee Schmitt
Margaret A. **Skorvage**
Perry M. Stewart
Daniel Noe Tucker
Guy F. **Woodlief,** Jr.

### NORTH CAROLINA BETA, University of North Carolina

(March **5, 1953**)

Julius Hunter Ballew
Mary Thomas Battle
Robert **H.** Brunelle
Earl Louis Diamond

Seymour **Geisser**
Robert W. Heath
John Payne Jackson
**Hilbert Levitz**

George W. **Lofquist**
Marilyn L. Marshall
James H. **McIntyre**
Ancel C. **Mewborn**

### OHIO ALPHA, Ohio State University

(June 2, 1953)

| | | |
|---|---|---|
| Attwell Mason **Adair** | David Arthur **Foulser** | William T. **Pellow** |
| Henry **M. Beisner** | Donald W. **Friedman** | Mary A. **Radziewicz** |
| Leonard C. Brown | Harvey M. **Hanson** | **Phyllis Rubin** |
| Thomas W. Buttery | James Edward **Hopson** | Jerome C. **Shiloff** |
| William C. Davis | William W. Hunt | William S. Tulloss |
| Harold Nick **Dawirs** | Shen Lin | **Geert** de **Vries** |
| Joseph William Duch | Takizo **Minagawa** | Robert B. **Weiser** |
| Michael **J.** Duggan | Louise F. **Overton** | William L. Zabriski |

### OHIO BETA, Ohio Wesleyan University

(May 6, 1953)

| | | |
|---|---|---|
| John M. Funderburg | Leon Royce **McCulloh** | John R. Stewart |
| Philip Ralph Kepner | John Harold Miller | **Valdis** L. **Pareizs** |
| | J. Stewart **Petersen** | |

### OHIO **GAMMA.**, University of Toledo

**(Spring, 1953)**

| | | |
|---|---|---|
| Melvin Batch | John Richard **Engel** | Roy **M. Robison** |
| Harry F. Cosway | | David L. **Steinem** |

### OHIO DELTA, Miami University

(April 13, 1953)

| | | |
|---|---|---|
| Paul E. Collier | Dorothy Harris | Thomas Segers |
| William Hargraves | David Murray | **Arlyn** E. **Unzicker** |

### OKLAHOMA ALPHA, University of Oklahoma

(Spring, 1953)

| | | |
|---|---|---|
| John R. **Borden** | Leo Harmon | James P. **Lipp** |
| Virginia Flanagan | Edwin R. Harris | Glenn E. Seay |
| Lee Royce Gallagher | Jasper A. Jackson, Jr. | Monte G. Smith |

### OKLAHOMA BETA, Oklahoma A. & **M.** College

(May 3, 1953)

| | | |
|---|---|---|
| Fred Capalongan | Keith **Hinchey** | John Rice |
| Dale **Ewy** | **Parala Kleinhofs** | Gordon Smith |
| Philip **Hansen** | Charles Mader | Yoroslaw **Stachiw** |
| Frank **Hedges** | | Bill Vaughn |

### OREGON ALPHA, University of Oregon

(Spring, 1953)

| | | |
|---|---|---|
| Gerald **Alexanderson** | Douglas Hunt | John **Ranlett** |
| Grenfell **Boicourt** | George Lerch | Don Rotenberg |

| | | |
|---|---|---|
| Winston Cozine | Robert Moursund | Barbara Thompson |
| Richard **Dillon** | Gerald **Ohlsen** | Thomas Warnock |
| Jack Goebel | | Karen J. Warren |

### OREGON BETA, Oregon State College

(May 25, 1953)

| | | |
|---|---|---|
| Alfred O. Anderson | Y. **H.** Inami | George **Neilson, Jr.** |
| Robert A. Bennett | Harold P. **Mahon**, Jr. | Donald L. Pope |
| James E. Chambers, Jr. | Donald N. **Monton** | Richard L. Perry |
| John **H.** Duis | | Edward E. Thompson |

### PENNSYLVANIA ALPHA, University of Pennsylvania

(March 20, 1953)

| | | |
|---|---|---|
| Jack **Huang** | Theodore **Kircher** | George E. Smith |
| | Joan **McCarte** | |

### VIRGINIA ALPHA, University of Richmond

(October 27, 1952)

| | | |
|---|---|---|
| Hector Davis III | C. **Ballard** Pierce | John L. Reynolds |
| Macon Day | Norma Raney | J. T. Scott |
| John J. Greever in | | **William** R. **Wooten, Jr.** |

### WISCONSIN ALPHA, Marquette University

(May 16, 1953)

| | | |
|---|---|---|
| Robert Benolken | Sr. Mary Corona, O.S.F. | Anne **Riedman** |
| Norma Jean Cloos | **Mardell** Sue **Miskowski** | Richard Schwaller |
| Sr. Joseph Marie, O.S.F. | | George Webster |

# Thanksgiving

Thanksgiving is the **season** when we give thanks for our security and our harvests—in fact, for all our blessings. Victor Peppier recognizes the blessing of security in this striking Thanksgiving photo, for included in the symbol of a bountiful harvest is the Savings Bond—and Bonds are the harvest of steady Payroll Savings through the year.