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The May Meeting of the Indiana Section

J. C. Polley (Secretary)

Mine is a voice "crying in the wilderness", the wilderness of the "wastelands" of American Education. My plea is that we rise up and cut the unimportant and repetitive from our high school mathematics courses and replace them by those topics which lead to a better understanding of college mathematics. Also, that high school mathematics teachers be told what (and in many cases how) to teach these important topics. In consequence, 84 topics desirable for prospective college students were proposed.

6. *Logistics of the computation*, by Dr. R. C. Bollinger, Westinghouse Research Laboratories.

It is the purpose of the talk to try to make clear to those having no previous familiarity with digital computing machines just what one must do to plan a computer program. The various ideas and devices necessary to the planning are illustrated by considering the programming of an actual computer routine to compute values of the Riemann Zeta function. A flow chart which expresses the organization of the computation is constructed in this, the logical analysis, stage of the planning.

7. *Arithmetic, bit by bit*, by Mrs. Aiko Hormann, Westinghouse Research Laboratories, introduced by Dr. R. C. Bollinger.

After a problem is programmed for the machine, it must be further broken down into simple arithmetic operations and then translated into machine code. This translation is comparable to the translation from one human language to another. The similarity and also the difference between the two types of translation are discussed with a few illustrations.

8. *Why doesn't it work?*, by Dr. H. C. Rice, Westinghouse Research Laboratories, introduced by Dr. M. Ostrofsky.

After a suitable emphasis on the inevitability of mistakes in programming a problem for a computer, a survey is made of the kinds of mistakes which can occur, their effect on the behavior of the computer when the program is run, and some of the techniques for finding and correcting them.

I. D. PETERS, *Secretary*

THE MAY MEETING OF THE INDIANA SECTION

The thirty-fourth annual meeting of the Indiana Section of the Mathematical Association of America was held at Purdue University, Lafayette, Indiana on May 11, 1957. Professor C. F. Brumfiel of Ball State Teachers College, Chairman of the Section, presided at both morning and afternoon sessions. There were 77 in attendance including 54 members of the Association.

The following officers were elected: Chairman, Professor C. B. Gass, DePauw University; Vice-Chairman, Professor G. N. Wollan, Purdue University Center, Fort Wayne; Secretary-Treasurer, Professor J. C. Polley, Wabash College.

Chairman Brumfiel announced that the Committee on Awards had awarded three Association medals during the year for high mathematical achievement in the Indiana Science Talent Search.

It was voted that a fall meeting be held this year on October 18 in joint session with the Mathematics Section of the Indiana Academy of Science.

Professor A. W. Tucker of Princeton University, National Lecturer for the Association, gave the invited hour address on the topic, "New Patterns in Mathematical Education."

The following short papers were presented:

1. *Mathematical instruction in Dutch high schools*, by Professor Philip Dwinger, Purdue University.

Some aspects of the teaching of mathematics in Dutch high schools were discussed, such as the subjects taught and the programs for the several final examinations. In addition, attention was called to an important report in 1954 of a committee of the Association of Mathematics Teachers, which, among other things, recommended the introduction of statistics into the program and an intuitive course in plane geometry to precede the regular course in that subject.

2. *The Council, the Association, and the Society*, by Professor C. F. Brumfiel, Ball State Teachers College.

Mathematicians recognize the need for a reorganization of high school mathematics. The content of current texts bears little relation to modern mathematics. These texts abound in gross errors, and an archaic terminology is employed. The organization which sees most clearly the need for the development of a new high school curriculum is the Council, and to effect a change the support of both the Association and the Society is needed. Changes in high school must match the changes that are occurring in colleges and universities. It is to be hoped that these three organizations will, in cooperation, persuade some of the best mathematicians to write texts on the high school level.

3. *Problems of criteria and evaluation*, by Professors M. W. Keller and C. L. Kaller, Purdue University, presented by Professor Keller.

The authors discussed some of the problems inherent in obtaining criteria for admission to and prognosis of success in graduate courses and teaching for mature individuals whose formal training was obtained approximately thirty years ago. A brief report on earlier studies was supplemented by observations based on the current experience of the authors.

4. *Classroom administration*, by Professor G. H. Graves, Valparaiso University.

Since the purposes of the class meeting are to further the student's mastery of material and to increase his ability to gain returns from study, the first essential is to see that his questions are answered, ordinarily by other students. The advantages gained by seat work, board work, and outside work handed in were contrasted. The author felt that note-taking should be discouraged since it distracts from the mental concentration required to take greatest advantage of class work.

5. *Proper cyclic elements, fine cyclic elements, and Lebesgue area*, by Professor C. J. Neugebauer, Purdue University, introduced by the Secretary.

Let Q be a unit square in E_2, and, for (T, Q) a continuous mapping from Q into E_3, let $(T, Q) = lm$, $m: Q \to M$, $l: M \to E_3$ be a monotone-light factorization. For C a proper cyclic element of M, let r_C be the monotone retraction from M onto C. For $L(T, Q)$, the Lebesgue area of (T, Q), the following cyclic additivity formula subsists:

(1) $L(T, Q) = \sum L(r_C m, Q)$, $C \subset M$ (T. Rado, *Length and Area*, Amer. Math. Col. Publ., 30, 1948).

The formula (1) has been generalized and extended by the introduction of a *fine cyclic element* of a mapping (T, J), where J is a closed finitely connected Jordan region (L. Cesari, *Fine cyclic elements of surfaces of the type* γ, Riv. Mat. Univ. Parma). If J is a 2-cell, the fine cyclic elements coincide with proper cyclic elements. In the other cases a fine cyclic element constitutes a suitable decomposition of a proper cyclic element. The above concept of a fine cyclic element can be extended to Peano spaces, and fine cyclic additivity theorems similar to those in paper by E. J. Mickle and T. Rado (*On cyclic additivity theorems*, Trans. Amer. Math. Soc., vol. 66, 1949, pp. 347–365) can be established.

6. *Critical thinking values in introductory modern mathematics*, by Sister Gertrude Marie, Marian College.

Elementary phases of number theory, group theory, the algebra of classes, and modern geometries are cited as source materials for basic experience with definition, undefined terms, relationships expressed in postulates, and theorems resulting from deductive reasoning. The nature of inductive thinking is exemplified by statistical inference. Both induction and deduction are shown to fill important roles in scientific thought, while, in the symbolic formulation of logic, mathematics is identified with critical thinking in its purest interpretation.

7. *Do machines think?*, by Professor R. E. Baer, Purdue University, introduced by Professor Arthur Rosenthal.

Reference is made to papers under similar or related title by Turing, Wilkes, Oettinger, *et al.*, as well as the recent work of Hagelbarger, and Simon and Newell, and that of the Purdue Computation Laboratory. A thinking-like behavior on the part of the universal computer, barring metaphysical but not metamathematical considerations, requires emulation by the machine of both inductive and deductive behavior. The increasing degree of success of machine performance in the two directions is discussed.

8. *Order among complex numbers*, by Mr. Merl Kardatzke, student at Anderson College, introduced by Professor Gloria Olive.

This paper first orders complex numbers by a rule which does not seem to lend itself to a one-to-one correspondence between complex numbers and real numbers. In search for this relationship an analytic expression is found which can order a special set called "semi-countable complex numbers". Finally, binary numbers are used to construct a function which sets up the correspondence which is sought. In conclusion the concept of order is extended to n-dimensional space.

9. *An experiment in teaching calculus over closed-circuit television*, by Professor John Dyer-Bennet, Purdue University, introduced by Professor Arthur Rosenthal.

This paper is a brief report of an experiment conducted at Purdue University, comparing the effectiveness of teaching calculus to small groups over closed-circuit television with that of teaching large groups in lectures. Although the results have not yet been analyzed statistically, they appear to indicate that if effectiveness is measured by the sort of examination commonly used to determine grades, the two methods are about equally good.

10. *The differential*, by Professor H. L. Hunzeker, DePauw University.

The implications arising from the existence of differentials for real functions of one and of several real variables as well as for functions of a complex variable were summarized. An application for the differential of a function of a complex variable was shown in a rather direct proof of the Cauchy Integral Formula.

11. *Some additional remarks on a function defined by means of an infinite radical*, by Professor G. N. Wollan and Mr. D. M. Mesner, Purdue University Center, Fort Wayne, presented by Professor Wollan.

This paper presents some additional properties of the function $f(x)$ defined on $0<x\leqq 1$ by the relation $f(x)=\lim_{n\to\infty} f_n(x)$ where

$$f_1(x) = \sqrt{k+\alpha_1\sqrt{k}}, \quad f_2(x) = \sqrt{k+\alpha_1\sqrt{k+\alpha_2\sqrt{k}}},$$
$$f_n(x) = \sqrt{k+\alpha_1\sqrt{k+\cdots+\alpha_n\sqrt{k}}} \text{ with } n \text{ nested root signs,}$$

$n=1, 2, \cdots$, and $\alpha_n=(-1)^{a_n}$ where a_n is the nth digit in the nonterminating binary representation of x. (See this MONTHLY, vol. 63, 1956, p. 614.) The author shows that when $k>2+\sqrt{2}$, although the function has a denumerably infinite set of discontinuities and is not monotone in any subinterval, it is of bounded variation; although it has a value at each point of the interval with $f(x_1)\neq f(x_2)$ when $x_1\neq x_2$, yet the set of values of the function is of measure zero. Furthermore the derivative exists almost everywhere and whenever it exists its value is zero, but there is a nondenumerable set of points (of measure zero) at which the derivative does not exist.

J. C. POLLEY, *Secretary*