

## ABSTRACTS OF PAPERS

### SUBMITTED FOR PRESENTATION TO THE SOCIETY

The following papers have been submitted to the Secretary and the Associate Secretaries of the Society for presentation at meetings of the Society. They are numbered serially throughout this volume. Cross references to them in the reports of the meetings will give the number of this volume, the number of this issue, and the serial number of the abstract.

138. G. E. Albert: *On contiguous point spaces and their applications.*

In topologizing the class  $P^*$  of cyclic elements of a Peano space  $P$ , R. L. Moore (Rice Institute Pamphlet, vol. 23, no. 1) was led to the concept of contiguity spaces. The presence of pairs of contiguous points seems to make the theory of Moore's spaces quite complicated. In a simpler axiomatic treatment of contiguity, Theodore Hailperin (this Bulletin, vol. 45 (1939), p. 172) modified Hausdorff's neighborhood space by denying the separation axiom and defining two points as contiguous if every neighborhood of each contains the other. The symmetry of this definition implies that the relation is transitive; this should render his theory inapplicable to the study of  $P^*$ . In the present paper a neighborhood space is introduced which differs from ordinary topological spaces in essentially one respect, namely, the Hausdorff separation axiom is replaced by the unsymmetrical Kolmogoroff axiom: of every two points, at least one has a neighborhood not containing the other. If every neighborhood of the point  $x$  contains the point  $y \neq x$ , then  $x$  is said to be contiguous to  $y$ . It is the purpose of the paper to construct, on this basis of contiguity, a simple and comprehensive theory of the class  $P^*$ . (Received December 11, 1939.)

139. Garrett Birkhoff: *On a class of positive matrices.*

The paper deals with matrices of non-negative elements, the sum of the terms in every row and column being the same. It is first shown combinatorially that every such matrix is a positive linear combination of permutation matrices. Applications are then made to the theory of dependent probabilities, where such matrices occur; in particular, an ergodic theorem over arbitrary semigroups is proved—valid also for an analogous class of linear (stochastic) operators on the space  $(L)$ . (Received December 21, 1939.)

140. Nathaniel Coburn: *A characterization of Schouten's and Hayden's deformation methods.*

Another approach to deformation problems, in an  $n$ -dimensional space with a connection  $L_n$ , is given. The principal idea is that all deformations take place in the local tangent space  $E_n$  at each point of  $L_n$ . First, the laws of deformation of differential and ordinary vector fields are examined. These laws are distinct in non-Finsler space; they coincide in Finsler space. It is shown that: (1) Schouten's deformation formulas are obtained when the coordinate differential vectors and the unit affiner ( $A_\mu^\lambda$ ) of  $L_n$  are deformed by  $E_n$  parallelism; (2) Hayden's deformation formulas are obtained when the measure vectors of  $L_n$  are deformed by  $L_n$  parallelism, and the vectors of a subspace as well as the unit affiner of  $L_n$  are deformed by  $E_n$  parallelism. Finally, a