VOL. 2•NO. 4B•1958

G. A. Miller Memorial Issue

## ILLINOIS <br> JOURNAL <br> OF

## MATHEMATICS

a quarterly journal published by the UNIVERSITY OF ILLINOIS, URBANA
edited by
REINHOLD BAER
J. L. DOOB
A. H. TAUB

GEORGE W. WHITEHEAD
OSCAR ZARISKI

## ILLINOIS JOURNAL OF MATHEMATICS

## Manuscripts

Original research papers in pure and applied mathematics intended for publication in this journal may be written in English, French, German, or Italian. They should be addressed to the Illinois Journal of Mathematics, University of Illinois, Urbana, Illinois, or to one of the editors:

Reinhold Baer, Mathematisches Seminar der Universität, Frankfurt am Main, Schumannstr 58, Germany.
J. L. Doob, Department of Mathematics, University of Illinois, Urbana, Illinois.
A. H. Taub, Department of Mathematics, University of Illinois, Urbana, Illinois.

George W. Whitehead, Fine Hall, Princeton University, Princeton, New Jersey.

Oscar Zariski, Department of Mathematics, Harvard University, 2 Divinity Avenue, Cambridge 38, Massachusetts.

All papers should be typewritten, double spaced, and the author should keep a complete copy. Bibliography and footnotes should be typed, double spaced, on separate sheets of paper.

## Proof

Authors will receive only galley proof. Proof sent to North American addresses will be accompanied by manuscript and sent by first class mail. To other addresses, proof will be sent by airmail, and manuscript will be sent only if requested. Authors are asked to return proof (and manuscript if sent) by the same class of mail that was used in sending it to them.

## Reprints

One hundred free reprints are supplied to the sole author of a paper; fifty free reprints are supplied to each author of a joint paper. Additional reprints may be purchased from Waverly Press.

[^0]Made in U.S. A.

## ILLINOIS <br> JOURNAL <br> OF

## MATHEMATICS

a quarterly journal published by the UNIVERSITY OF ILLINOIS, URBANA
edited by
REINHOLD BAER
J. L. DOOB
A. H. TAUB

GEORGE W. WHITEHEAD
OSCAR ZARISKI

## ILLINOIS JOURNAL OF

## MATHEMATICS

a quarterly journal published by the UNIVERSITY OF ILLINOIS, URBANA
edited by
REINHOLD BAER
J. L. DOOB
A. H. TAUB

GEORGE W. WHITEHEAD
OSCAR ZARISKI

## CONTENTS

Volume 2 ..... 1958
pages
Baer, Reinhold, Algebraic closure of fields and rings of func- tions ..... 37-42
-_, Closure and dispersion of finite groups ..... 619-640
Barsotti, Iacopo, Corrections to the paper, "On Witt vectors and periodic group-varieties" . ..... 608-610
———, On Witt vectors and periodic group-varieties ..... 99-110
——, Repartitions on abelian varieties ..... 43-70
Bateman, Paul T. and Grosswald, Emil, On a theorem of Erdös and Szekeres ..... 88-98
Bell, C. B., On the structure of stochastic independence ..... 415-424
Bellman, Richard, On the determination of characteristic values for a class of Sturm-Liouville problems ..... 577-585
Berger, J. M. and Lasher, G. J., The use of discrete Green's func- tions in the numerical solution of Poisson's equation ..... 593-607
Brahana, H. R., Metabelian p-groups with five generators and orders $p^{12}$ and $p^{11}$ ..... 641-717
Brahana, Thomas R., Products of generalized manifolds ..... 76-80
Brauer,R.,Suzuki,M., and Wall, G. E., A characterization of the one- dimensional unimodular projective groups over finite fields ..... 718-745
Coxeter, H. S. M., Close-packing and froth ..... 746-758
Delange, Hubert, On some arithmetical functions ..... 81-87
deLeevw, K., Linear spaces with a compact group of operators ..... 367-377
Dieudonné, Jean, Remarks on quasi-Frobenius rings ..... 346-354
Doob, J. L., Probability theory and the first boundary value prob- lem ..... 19-36
Feller, William, On the intrinsic form for second order differential operators ..... 1- 18
Fine, N. J., Classes of periodic sequences ..... 285-302
Fine, N. J. and Herstein, I. N., The probability that a matrix be nilpotent ..... 499-504
Gleason, Andrew M., Projective topological spaces ..... 482-489
Goldman, Lawrence, Lowest order equation for zeros of a homo- geneous linear differential polynomial ..... 567-576
Goldstine, H. H., Conditions for a minimum in abstract space ..... 111-123
Grosswald, Emil, with Bateman, Paul T., On a theorem of Erdös and Szekeres ..... 88-98
Grün, Otto, Automorphismen von Gruppen und Endoisomorphis- men freier Gruppen ..... 759-763
Hale, J. K., Linear systems of first and second order differential equations with periodic coefficients ..... 586-592
Hall, Marshall, Jr., Solution of the Burnside problem for exponent six ..... 764-786
Hall, P., Some sufficient conditions for a group to be nilpotent ..... 787-801
Herstein, I. N., with Fine, N. J., The probability that a matrix be nilpotent ..... 499-504
Hironaka, Heisuke, A note on algebraic geometry over ground rings: The invariance of Hilbert characteristic functions under the specialization process ..... 355-366
Hsiung, Chuan-Chin, A uniqueness theorem for Minkowski's prob- lem for convex surfaces with boundary ..... 71-75
Hunt, G. A., Markoff processes and potentials III ..... 151-213
Kan, Daniel M., An axiomatization of the homotopy groups ..... 548-566
——, Minimal free c.s.s. groups ..... 537-547
Kanwal, R. P., Propagation of curved shocks in pseudo- stationary three-dimensional gas flows ..... 129-136
Kelley, J. L., Averaging operators on $C_{\infty}(X)$ ..... 214-223
Kohls, Carl W., Prime ideals in rings of continuous functions ..... 505-536
Lasher, G. J., with Berger, J. M., The use of discrete Green's functions in the numerical solution of Poisson's equation. ..... 593-607
Levinson, N., Transform and inverse transform expansions for singu- lar self-adjoint differential operators ..... 224-235
Mac Lane, Saunders, Extensions and obstructions for rings ..... 316-345
Marcus, M., Moyls, B. N., and Westwick, R., Some extreme value results for indefinite Hermitian matrices II ..... 408-414
Montgomery, D. and Mostow, G. D., Toroid transformation groups on euclidean space ..... 459-481
Mostow, G. D., with Montgomery, D., Toroid transformation groups on euclidean space ..... 459-481
Moyls, B. N., with Marcus, M. and Westwick, R., Some extreme value results for indefinite Hermitian matrices II ..... 408-414
Nagata, Masayoshi, Existence theorems for nonprojective com- plete algebraic varieties ..... 490-498
Neugebauer, Christoph J., A fine-cyclic additivity theorem for a functional ..... 396-401
——, Local $A$-sets, $B$-sets, and retractions ..... 386-395
Porcelli, Pasquale, On the existence of the Stieltjes mean $\sigma$-in- tegral ..... 124-128
Ragab, F. M., On an identity involving Bessel polynomials ..... 236-239
Rees, D., On a problem of Zariski ..... 145-149
Reid, William T., A class of two-point boundary problems ..... 434-453
Reiner, Irving, Normal subgroups of the unimodular group ..... 142-144
Ryser, H. J., Inequalities of compound and induced matrices with applications to combinatorial analysis ..... 240-253
Suzuki, M., with Brauer, R. and Wall, G. E., A characterization of the one-dimensional unimodular projective groups over finite fields ..... 718-745
Trotter, H. F., A property of Brownian motion paths ..... 425-433
Wall, G. E., with Brauer, R. and Suzuki, M., A characterization of the one-dimensional unimodular projective groups over finite fields ..... 718-745
Wasow, Wolfgang, Solution of certain nonlinear differential equa- tions by series of exponential functions ..... 254-260
Westwick, R., with Marcus, M. and Moyls, B. N., Some extreme value results for indefinite Hermitian matrices II ..... 408-414
Widom, Harold, Equations of Wiener-Hopf type ..... 261-270
Wiegmann, N. A., The structure of unitary and orthogonal qua- ternion matrices ..... 402-407
Wielandt, Helmut, Über Produkte von nilpotenten Gruppen ..... 611-618
Wilansky, Albert and Zeller, Karl, Banach algebra and sum- mability ..... 378-385
Wolfowitz, J., An upper bound on the rate of transmission of messages ..... 137-141
-_, The maximum achievable length of an error correcting code ..... 454-458
Wos, Lawrence Thomas, On commutative prime power subgroups of the norm ..... 271-284
Zariski, Oscar, On Castelnuovo's criterion of rationality $p_{a}=P_{2}=$ 0 of an algebraic surface ..... 303-315
Zeller, Karl, with Wilansky, Albert, Banach algebra and sum- mability ..... 378-385


## GEORGE ABRAM MILLER

Born in Lynville, Pennsylvania, in 1863; died in Urbana, Illinois, in 1951.
Bachelor of Arts (1887), Master of Arts (1890) from Muhlenburg College; Doctor of Philosophy (1892) from Cumberland University. Attended lectures of Lie in Leipzig and Jordan in Paris in the years 1895-1897.

Professor of Mathematics at Eureka College, 1888-1893;
Instructor, University of Michigan, 1893-1895;
Assistant Professor, Cornell University, 1897-1901;
Assistant and Associate Professor, Leland Stanford University, 1901-1906;
Associate Professor, Professor, and Professor Emeritus, University of Illinois, 1906-1951.

Elected to membership in the New York Mathematical Society in 1891; one of the organizers of the San Francisco Section of the American Mathematical Society in 1902, and Secretary of the Section until 1906; Chairman of the Chicago Section, 1907-1909; Vice-President of the Society, 1908. One of the founders of the Mathematical Association of America, 1915; Vice-President, 1916; President, 1921. Secretary of Section A of the American Association for the Advancement of Science, 1907-1912.

Member of the London Mathematical Society, Deutsche MathematikerVereinigung, Sociedad Matematica Española; honorary life member of the Indian Mathematical Society, and of the Mathematical Association of America.

Fellow of the American Academy of Arts and Sciences; member of the National Academy of Sciences.
Doctor of Letters, Muhlenburg College.


[^0]:    The inlinois journal of mathematics is published quarterly by the University of Illinois. Entered as second-class matter June 4, 1957 at the post office at Urbana, Illinois, under the act of August 24, 1912. Office of publication, University of Illinois Press, Urbana, Ill.
    (C) 1959, Board of Trustees, University of Illinois.

