PROCEEDINGS

OF THE

CAMBRIDGE PHILOSOPHICAL SOCIETY

VOLUME XXIV

PROCEEDINGS

OF THE

CAMBRIDGE PHILOSOPHICAL SOCIETY

VOLUME XXIV

24 OCTOBER 1927-23 JULY 1928

CAMBRIDGE AT THE UNIVERSITY PRESS

AND SOLD BY

DEIGHTON, BELL & CO., LTD. AND BOWES & BOWES, CAMBRIDGE CAMBRIDGE UNIVERSITY PRESS, FETTER LANE, LONDON, E.C. 4

1928

First printed in Great Britain at the University Press, Cambridge
Reprinted by offset-litho by
Percy Lund Humphries and Co. Ltd., Bradford

CONTENTS

VOL. XXIV

With reference to 'Transactions'

	PAGE
Arnot, F. L. The interference of light in a wedge	150
Banerji, A. C. and Varma, Rama Shankar. On tidal waves in	
canals having sinuous banks	567
Bath, F. On the quintic surface in space of five dimensions	48
— Part II. Curves on the surface	191
Browne, A. D. and Moullin, E. B. On the periods of a free-free	
bar immersed in water	400
Bruyne, N. A. de. Note on the effect of temperature on the auto-	
electronic discharge	518
Burnett, D. Directional properties of wireless receiving aerials .	521
Carter, F. W. Note on losses in cable sheaths	65
Constable, F. H. On Reichinstein's displacement principle	56
— On the present position of the theory of centres of activity in	
heterogeneous catalysis	291
— A method of generalising the law of mass action for heterogeneous	
surface reactions	307
Coxeter, H. S. M. The pure Archimedean polytopes in six and seven	
dimensions	1
Crossley, A.F. Operational solution of some problems in viscous	
fluid motion	231
— On the motion of a rotating circular cylinder filled with viscous	
fluid	480
Ditchburn, R. W. The photo-electric threshold and the heat of dis-	
sociation of the potassium molecule	320
Du Val, P. On questions of reality for twisted quartics of the first	
kind	379
Feather, N. and Nimmo, R. R. The ionisation curve of an average	
α -particle	139
Fisher, R. A. and Tippett, L. H. C. Limiting forms of the fre-	
quency distribution of the largest or smallest member of a sample	180
Fowler, R. H. Note on the theory of rotational specific heats.	280
Gaunt, J. A. A theory of Hartree's atomic fields	328
Goldstein, S. The second solution of Mathieu's differential equation	223
Grace, J. H. Extension of a set of theorems in circle geometry	10
— An involution in the complex variable	210
— Extension of a lemma of Strob	218

vi Contents

Hargreaves, J. and Malurkar, S. L. The motion of a particle in
a periodic field of force
Hartree, D. R. The wave mechanics of an atom with a non-Coulomb
central field. Part I. Theory and methods
— Part II. Some results and discussions
- Part III. Term values and intensities in series in optical
spectra
Henderson, M. C. and Watson, S. W. The number of a-particles
emitted by thorium $C+C'$
Jeffreys, H. On the structure of liquids and vitreous solids
The equations of viscous motion and the circulation theorem .
Kennedy, M. D. Two sets of conditions for expansion in a Laurent's
series
Lob, H. Note on Kühne's theorem
McCrea, W. H. The specific heat of hydrogen at high temperatures
— The specific heat of carbon dioxide—Correction
— A suggested theory of electric conduction
— A note on the hydrogen chromosphere
Malurkar, S. L. On the arc spectrum of antimony
and Hargreaves, J. The motion of a particle in a periodic field
of force
Mordell, L. J. Some applications of Fourier series in the analytical
theory of numbers
Morrison, D. M. On the formation of a gaseous helide of radium
active deposit
Mott, N. F. The classical limit of the space distribution law of a gas
in a field of force
Moullin, E. B. The lateral vibration of non-uniform bars, with
application to ships
and Browne, A. D. On the periods of a free-free bar immersed
in water
Mulholland, H. P. An asymptotic expansion for $\sum_{n=0}^{\infty} (2n+1) e^{-\sigma(n+\frac{1}{2})^2}$
Nimmo, R. R. and Feather, N. The ionisation curve of an average
a-particle
Oliphant, M. L. The effects produced by positive ion bombardment
of solids: metallic ions
Pocklington, H. C. The practical calculation of unit algebraical
numbers.
Pollard, S. A condition for inverting the order of integration in
a repeated integral
Purvis, J. E. The influence of different nuclei on the absorption spectra
of organic compounds
Robb, A. A. On the connexion of a certain identity with the extension
of conical order to n dimensions

Contents vii

Rose, D. C. Some experiments on the multiple scattering of alpha particles
Searle, G. F. C. A recording gyroscope
Sharman, C. F. A dynamical method for the determination of Young's
modulus by stretching
Starr, A. T. Slip in a crystal and rupture in a solid due to shear .
Steward, G. C. On the lens interferometer
Taylor, G. I. A manometer for use with small Pitot tubes
Taylor, J. On the action of the Geiger a-particle counter
Taylor, J. and W. The high frequency electric discharge at low
pressures
Tippett, L. H. C. and Fisher, R. A. Limiting forms of the frequency
distribution of the largest or smallest member of a sample
Tschuprow, A. A. The mathematical theory of statistical methods
employed in the study of correlation in the case of three variables.
See Transactions, XXIII. No. XII.
Ursell, H. D. Note on Pauli's exclusion principle
Vaidyanathaswamy, R. On four mutually orthogonal circles .
Varma, Rama Shankar and Banerji, A. C. On tidal waves in
canals having sinuous banks
Wager, L. R. The mechanism of replacement as illustrated by meta-
somatism of the Whin Sill
Watson, S. W. and Henderson, M. C. The number of α -particles
emitted by thorium $C+C'$
Whittaker, E. T. Note on the law that light-rays are the null
geodesics of a gravitational field
Whittaker, J. M. The electron in a gravitational field
— The wave theory of the electron
Williams, E. J. Relation between mean stopping power and mean
range of eta -rays
- Some applications and implications of Duane's quantum theory
of diffraction
Wilton, J. R. The average value of an exponential function over the
lattice points of a circle
Proceedings at the Meetings held during the Session 1927-1928
Accounts, statement of, for 1927
Accounts, seasement of, for 1927
PLATES
LUAIES

FELLOWS ELECTED DURING 1927-1928

•	
Allen, R. G. D.	Har
Bath, F.	Ha
Bernal, J. D.	He
Crossley, A. F.	Ma
Dyson, Sir F. W.	Mor
Eltenton, G. C.	Mo
Feather, N.	Par
Gaunt, J. A.	Pav
Gray, L. H.	Ros
Hargreaves, J.	Rus

rper, W. R. rris, T. M. witt, D. scall, E. L. rris, T. N. tt, N. F. rrington, F. R. vate, D. C. se, D. C. shton, W. A. H. Schonland, B. F. J. Sharman, C. F. Tiskowsky, A. Ursell, H. D. Verblunsky, S. Waddington, C. H. Webster, W. L. Whittaker, J. M. Winscom, W. S.

ASSOCIATES ELECTED DURING 1927—1928

Allan, R. S.	Gilbert, F. L.
Arnot, F. L.	Grimshaw, M. E.
Bairstow, L.	Hamshere, J. L.
Balfour-Browne, J.	Harris, J. W.
Besicovitch, A.	Hill, S.
Bryan, J. M.	Hutchison, A. G.
Cave-Brown-Cave, F. E.	Kennedy, M. D.
Coolidge, H. J.	Laurence, G. C.
Dann, W. J.	Madwar, S.
Darby, H. C.	Makijama, J.
Eastham, L. E. S.	Malurkar, S. L.
Eddy, C. E.	Nordheim, L.
Eggleshaw, M. S.	O'Connor, E. A.
Francis, W. L.	Oliphant, M. L.

Petersson, H. Phadake, M. N. Radcliffe, R. Robinson, G. de B. Taylor, J. Timms, G. Walker, G. Walton, E. T. S. Wilkins, F. J. Williams, E. J. Williams, G. Wilson, G. L. Woodrow, J. W.

Hopkins Prize awards:

Ralph Allen Sampson. 1912-1915. 1915-1918. Sir Frank Watson Dyson. 1918-1921. Arthur Stanley Eddington. 1921-1924. James Hopwood Jeans.

CONTENTS.

	PAGE
The practical calculation of unit algebraical numbers. By Mr H. C. Pocklington, St John's College	471
The equations of viscous motion and the circulation theorem. By Mr Harold Jeffreys, St John's College	477
On the motion of a rotating circular cylinder filled with viscous fluid. By A. F. Crossley, B.A., St John's College	480
Slip in a crystal and rupture in a solid due to shear. By A. T. Starr, B.A., Corpus Christi College. (Communicated by Mr G. I. TAYLOR.) (With Four Text-figures)	489
The wave theory of the electron. By J. M. WHITTAKER, B.A., Trinity College	501
A note on the hydrogen chromosphere. By W. H. McCrea, B.A., Trinity College	506
The mechanism of replacement as illustrated by metasomatism of the Whin Sill. By L. R. Wager, B.A., Pembroke College. (Communicated by Mr A. Harker)	516
Note on the effect of temperature on the auto-electronic discharge. By N. A. DE BRUYNE, B.A., Coutts Trotter Research Student, Trinity College. (Communicated by Mr R. H. FOWLER.) (With One Text-figure)	518
Directional properties of wireless receiving aerials. By D. BURNETT, B.A., Clare College. (With Two Text-figures).	521
The lateral vibration of non-uniform bars, with application to ships. By Mr E. B. MOULLIN, Downing College (With Thirteen Text-figures)	531
Some experiments on the multiple scattering of alpha particles. By D. C. Rose, Ph.D., Gonville and Caius College, 1851 Exhibition	
Senior Student. (With Five Text-figures)	557
University	567
On four mutually orthogonal circles. By R. VAIDYANATHASWAMY. (Communicated by Professor H. F. BAKER)	578
Some applications of Fourier series in the analytic theory of numbers. By Mr L. J. Mordell, formerly of St John's College	585
Proceedings at the Meetings held during the Session 1927—1928 .	597
Statement of Accounts of the Cambridge Philosophical Society, from January 1, 1927, to December 31, 1927	608