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THE AUSTRALIAN NATIONAL UNIVERSITY

School of General Studies

DEPARTMENT OF THEORETICAL PHYSICS

ANNUAL REPORT - 1964

Academic Staff.

Professor H. A. Buchdahl, Dr. L. J. Tassie.

Dr. Tassie left at the beginning of December to spend a year's study leave at the University of Indiana, as Visiting Associate Professor. A new lecturer, Dr. Mark Andrews, was appointed, to take up his position early in 1965.

Teaching.

Student enrolments and examinations are set out in the following table:-

	Enrolled	Examined	Passed
Theor. Phys. III	4	4	4 (1HD,1C,2P)
Theor. Phys. IV	1	1	1 (H 1)
M.Sc. Qual.	1	0 (W)	-
Ph.D.	1	-	-

Some of the 4th year lectures were also attended by people from the I.A.S., whilst, conversely, Professor Peaslee of the Department of Theoretical Physics, I.A.S., gave a course on Elementary Particles during the second term.

Research.

Solutions of the field equations of general relativity theory which are analogues of the kind of solutions of the Newtonian theory considered in classical astrophysics are notoriously scarce. A solution of this kind was found and published. (Buchdahl)

The electron excitation of vibrational and rotational energy levels in deformed nuclei was treated, relevant calculations being carried out on the University's IBM 1620 computer. (Tassie, in collaboration with A. Reiner, of the Weizmann Institute, Israel)

A variety of general problems connected with optical aberration coefficients of any order was investigated. A paper embodying the results of this work (the twelfth of a series) was accepted for publication. (Buchdahl)

The gauge-invariant description of symmetry properties of physical systems previously considered only in the context of classical mechanics was extended to non-relativistic quantum mechanics. A paper covering this work has been accepted for publication. (Buchdahl and Tassie)

A great deal of time was spent on the revision of the manuscript of a book referred to in last year's report, this manuscript having in the mean time been accepted for publication by the Cambridge University Press, as one of the 'Cambridge Monographs in Physics'. (Buchdahl)

Mr. W. Bertram, an Honours student, examined the elastic scattering form factors according to the harmonic oscillator shell model, using the University's IBM 1620 computer.

Other Activities.

Professor Buchdahl attended the annual meeting of the Australian Mathematical Society in Adelaide. He also contributed the article on Thermodynamics in the Encyclopedia of Physics being published by the Reinhold Publishing Corporation.

Publications.

Buchdahl, H. A. -

"A relativistic fluid sphere resembling the Emden polytrope of index 5". Astrophysical Journal, November 1964.

Tassie, L. J. and Buchdahl, H. A. -

"Gauge-invariant theory of symmetry . II." Australian Journal of Physics. 1964.

Tassie, L. J. -

"Gauge invariance and localizability in electromagnetic theory". Phys. Rev., 133, B1351, 1964.

Tassie, L. J. -

"Canonical quantization of the Schrödinger equation". American Jour. of Physics, 32, 609, 1964.

H. A. BUCHDAHL
Professor of Theoretical Physics