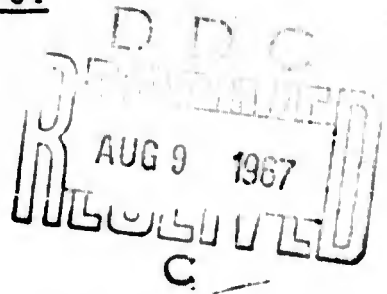


# AFOSR 67-1715

## FINAL SCIENTIFIC REPORT ON AF-AFOSR 159-64

October 1, 1964-September 30, 1966

### Research Accomplished



#### a) Atomic Mass Determinations

We have completed our study of neutron separation energies in the region between the  $N = 82$  and  $N = 126$  shells. This work formed the basis for three Ph.D. theses presented to McMaster University by J. D. Macdougall, W. McLatchie and S. Whineray. Some of this material has been published but the greater part of it is still in preparation for publication. The overall picture, however, will be presented for the first time to the Third International Conference on Atomic Masses, to be held 29 August-1 September 1967, that is in about one month's time. The details of this work will be submitted to AFOSR in due course in the form of material submitted for publication in an appropriate journal.

A new instrument possessing complete second-order double-focussing properties has been constructed and tested in a preliminary way. Although AFOSR funds were not used in the physical construction of this instrument, several of those who received AFOSR monies in the form of graduate assistantships, postdoctoral fellowships, et cetera, have contributed to the planning of this instrument and this important contribution will be acknowledged when the description of the instrument is published. Although only one-third the size of our large mass spectrometer, the new one has already achieved a resolving power comparable with that of the larger one. And, in addition, we expect a significant improvement in the intensity of the ion beam.

#### b) Stopping Cross Sections for Low Energy Atoms

Work in this area has served as the basis for a Ph.D. thesis presented a year ago by J. R. Macdonald to McMaster University. In this work, which is also being written up for publication, a study was made of the charge states of low energy atoms emerging from thin films of material and some rationalization has been given for the experimental results.

### Publications Creditable to Grant

- a) Some Low-Energy Atomic Stopping Cross Sections. Can. J. Phys. 43, 275 (1965) (with J. H. Ormrod and J. R. Macdonald).
- b) The Shape of the Mass Surface in the Region of 90 Neutrons. Congress International de Physique Nucleaire, Vol. II, (1964) (with R. C. Barber, B. G. Hogg, J. D. Macdougall, W. McLatchie and P. Van Rookhuyzen).

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- c) Stopping Cross Sections in Boron of Low Atomic Number Atoms with Energies from 15 to 140 keV. Zeitschrift für Naturforschung, 21A, 130 (1966) (with J. R. Macdonald and J. H. Ormrod).
- d) Precise Atomic Mass Differences involving Isotopes of Nd, Sm, Cd, and Pb. Zeitschrift für Naturforschung, 21A, 63 (1966) (with J. D. Macdougall, W. McLatchie, and Scott Whineray).

Respectfully submitted,

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Principal Investigator

University of Manitoba,  
July 1967

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13. ABSTRACT  <b>Neutron binding energies in the region <sup>N-82 and N-126</sup> 82-N-126 have been studied by mass spectroscopic techniques. A new second-order double focussing mass spectrometer has been constructed. The charge states of low energy atoms emerging from thin films have been investigated. THE STUDIES ARE VERY BRIEFLY SUMMARIZED, AND A LIST OF REFERENCES IS INCLUDED.</b>		

14. KEY WORDS	LINK A		LINK B		LINK C	
	ROLE	WT	ROLE	WT	ROLE	WT
<p>Atomic mass determinations</p> <p>Second-order double-focussing properties</p> <p>Stopping Cross sections for Low energy atoms</p>						