

EUR 459.e

REPRINT

ASSOCIATION EURATOM - U.L.B. - C.N.E.N.
(European Atomic Energy Community - Université Libre de Bruxelles
Comitato Nazionale per l'Energia Nucleare)

**AGE MEASUREMENTS OF ANTARCTIC ROCKS
(QUEEN MAUD LAND)**

by

S. DEUTSCH and P. PASTEELS

1964



Euratom contract No. 004-61-10 GEAC

**Reprinted from
NATURE
Vol. 199, No. 4897 - 1963**

LEGAL NOTICE

This document was prepared under the sponsorship of the Commission of the European Atomic Energy Community (EURATOM).

Neither the EURATOM Commission, its contractors nor any person acting on their behalf:

- 1° — Make any warranty or representation, express or implied, with respect to the accuracy, completeness, or usefulness of the information contained in this document, or that the use of any information, apparatus, method, or process disclosed in this document may not infringe privately owned rights; or
- 2° — Assume any liability with respect to the use of, or for damages resulting from the use of any information, apparatus, method or process disclosed in this document.

The authors' names are listed in alphabetical order.

This reprint is intended for restricted distribution only. It reproduces, by kind permission of the publisher, an article from "NATURE", Vol. 199, No. 4 897 - 1963, 996-997. For further copies please apply to Messrs. Fisher, Knight & Co. Ltd., Gainsborough Press — Lattimore Road-St.-Albans, Hertfordshire (England).

Dieser Sonderdruck ist für eine beschränkte Verteilung bestimmt. Die Wiedergabe des vorliegenden in „NATURE“, Vol. 199, No. 4 897 - 1963, 996-997 erschienenen Aufsatzes erfolgt mit freundlicher Genehmigung des Herausgebers. Bestellungen weiterer Exemplare sind an Messrs. Fisher, Knight & Co. Ltd., Gainsborough Press — Lattimore Road-St.-Albans, Hertfordshire (England), zu richten.

Ce tiré-à-part est exclusivement destiné à une diffusion restreinte. Il reprend, avec l'aimable autorisation de l'éditeur, un article publié dans «NATURE», Vol. 199, No. 4 897 - 1963, 996-997. Tout autre exemplaire de cet article doit être demandé à Messrs. Fisher, Knight & Co. Ltd., Gainsborough Press — Lattimore Road-St.-Albans, Hertfordshire (England).

Questo estratto è destinato esclusivamente ad una diffusione limitata. Esso è stato riprodotto per gentile concessione dell'Editore, da «NATURE», Vol. 199, No. 4 897 - 1963, 996-997. Ulteriori copie dell'articolo debbono essere richieste a Messrs. Fisher, Knight & Co. Ltd., Gainsborough Press — Lattimore Road-St.-Albans, Hertfordshire (England).

Deze overdruk is slechts voor beperkte verspreiding bestemd. Het artikel is met welwillende toestemming van de uitgever overgenomen uit „NATURE“, Vol. 199, No. 4 897 - 1963, 996-997. Meer exemplaren kunnen besteld worden bij Messrs. Fisher, Knight & Co. Ltd., Gainsborough Press — Lattimore Road St.-Albans, Hertfordshire (England).

EUR 459.e

REPRINT

AGE MEASUREMENTS OF ANTARCTIC ROCKS (QUEEN MAUD LAND)
by S. DEUTSCH and P. PASTEELS.

Association EURATOM - U.L.B. - C.N.E.N.
(European Atomic Energy Community - Université Libre de Bruxelles. -
Comitato Nazionale per l'Energia Nucleare).
Euratom contract No. 004-61-10 GEAC.
Reprinted from "NATURE", Vol. 199, No. 4897 - 1963, pages 996-997.

Summary not available.

EUR 459.e

REPRINT

AGE MEASUREMENTS OF ANTARCTIC ROCKS (QUEEN MAUD LAND)
by S. DEUTSCH and P. PASTEELS.

Association EURATOM - U.L.B. - C.N.E.N.
(European Atomic Energy Community - Université Libre de Bruxelles. -
Comitato Nazionale per l'Energia Nucleare).
Euratom contract No. 004-61-10 GEAC.
Reprinted from "NATURE", Vol. 199, No. 4897 - 1963, pages 996-997.

Summary not available.

EUR 459.e

REPRINT

AGE MEASUREMENTS OF ANTARCTIC ROCKS (QUEEN MAUD LAND)
by S. DEUTSCH and P. PASTEELS.

Association EURATOM - U.L.B. - C.N.E.N.
(European Atomic Energy Community - Université Libre de Bruxelles. -
Comitato Nazionale per l'Energia Nucleare).
Euratom contract No. 004-61-10 GEAC.
Reprinted from "NATURE", Vol. 199, No. 4897 - 1963, pages 996-997.

Summary not available.

Age Measurements of Antarctic Rocks (Queen Maud Land)

THIS communication is a report of the age measurement project carried out on rocks from the Sør-Rondane Mountains (Queen Maud Land, 23° E. to 28° E.). The rocks were sampled by Picciotto^{1,2} during the 1958 Belgian Antarctic Expedition led by Gaston de Gerlache¹. A first set of results has already been published³. The biotite strontium/rubidium ages of various eruptive and metamorphic rocks ranged from 460 to 500 million years.

Radiogenic strontium-87 is known to migrate out of biotite minerals^{4,5}. In the available samples, minerals other than biotite have been selected together with whole rocks of sufficient high rubidium/strontium ratio. Isotopic measurements on zircons were also carried out.

The analytical methods used are close to those described by Aldrich *et al.*⁶ and Tilton *et al.*⁷. The geological and

Table 1. MINERAL AND TOTAL ROCK AGES ON ANTARCTIC ROCKS (QUEEN MAUD LAND)

| Location* | Sample No. | Source rock | Mineral† | Method | Age (m.y.)‡ |
|------------------|------------|--|----------|---------------------------------------|-------------|
| Rønnesfjellet | R1a | Porphyroblastic granite of intrusive type | B | Sr/Rb§ | 480 ± 15 |
| | | | Z | ²⁰⁷ Pb/ ²³⁵ Pb¶ | 540 ± 10 |
| | | | | ²⁰⁷ Pb/ ²³⁵ U | 518 ± 20 |
| | | | | ²⁰⁶ Pb/ ²³⁸ U | 514 ± 20 |
| Nordtoppen 950 | | Granitic vein in diorite | B | Sr/Rb | 463 ± 15 |
| | | | Z | ²⁰⁷ Pb/ ²⁰⁶ Pb | 500 ± 30 |
| | | | | ²⁰⁷ Pb/ ²³⁵ U | 508 ± 20 |
| | | | | ²⁰⁶ Pb/ ²³⁸ U | 510 ± 20 |
| Nordtoppen 1100 | S9 | Gneiss xenolith in diorite | B | Sr/Rb | 475 ± 15 |
| | | | Z | ²⁰⁷ Pb/ ²⁰⁶ Pb | 550 ± 150 |
| | | | | ²⁰⁷ Pb/ ²³⁵ U | 555 ± 55 |
| | | | | ²⁰⁶ Pb/ ²³⁸ U | 555 ± 20 |
| Gunnestadbreen | | Granite of intrusive type | B | Sr/Rb | 474 ± 15 |
| | | | F | Sr/Rb | 482 ± 160 |
| | | | Z | ²⁰⁷ Pb/ ²⁰⁶ Pb | 575 ± 10 |
| | | | | ²⁰⁷ Pb/ ²³⁵ U | 524 ± 20 |
| | | | | ²⁰⁶ Pb/ ²³⁸ U | 512 ± 20 |
| Austkampene | K16 | Muscovite biotite corundum gneiss | B | Sr/Rb | 492 ± 15 |
| | | | M | Sr/Rb | 510 ± 15 |
| Strandrudfjellet | T4 | Fine-grained microcline granite (anatectic?) | B | Sr/Rb | 483 ± 15 |
| | | | F | Sr/Rb | 460 ± 90 |
| | | | WR | Sr/Rb | 500 ± 50 |
| Bautanen | A3 | Fine-grained microcline granite (anatectic?) | B | Sr/Rb | 503 ± 15 |
| | | | F | Sr/Rb | 476 ± 60 |
| | | | WR | Sr/Rb | 590 ± 60 |

* The geographical names refer to the map of the Sør-Rondane Mountains published by the Norsk Polar-institutt during 1957.

† B, Biotite; M, muscovite; F, feldspar; WR, whole rock; Z, zircon.

‡ $\lambda_{87Rb} = 1.39 \times 10^{-11}$ yr.⁻¹, rubidium-87 = 0.283 g/g rubidium.

§ Common strontium ⁸⁷Sr/⁸⁶Sr = 0.709 (measured on calcic feldspar from Bautanen granite).

¶ $\lambda_{235U} = 1.54 \times 10^{-10}$ yr.⁻¹, $\lambda_{238U} = 0.72 \times 10^{-10}$ yr.⁻¹.

petrographic descriptions of the Sør-Rondane Mountains have been published by Picciotto *et al.*⁸ and Michot^{9,10}.

The new results, given in Table 1, confirm the existence of a magmatic and metamorphic activity, roughly 500 million years old (between 460 and 600 m.y.). No greater ages have been found in this region.

The small, but systematic, discordance between the younger biotite ages and the older whole rock and zircon ages seems to be significant. It follows a pattern already described in the literature¹¹.

In the present case, our tentative interpretation is as follows: the emplacement of the intrusive-type granites (Nordtoppen, Romnoesfjellet and Gunnestadbreen) and the differentiation of the fine-grained 'anatectic' granites occurred between 500 and 600 million years ago. A distinct phase of the geological evolution of this region might have happened around 480 m.y. ago; it could correspond to an uplift of the rocks into a superficial zone where radiogenic strontium-87 diffusion has stopped, according to the views of Hurley *et al.*⁵. An alternate interpretation would be to assume, at this time, a retro-morphose mesozonal episode. Evidence of such a retro-morphose has been observed in thin sections^{9,10}.

We thank Drs. J. Michot and E. Picciotto for stimulating discussions.

This work was supported by the Belgian Institut Interuniversitaire des Sciences Nucléaires and the Centre National des Recherches Polaires. It was carried out under contract Euratom-Université Libre de Bruxelles (U.L.B.)—Comitato Nazionale per l'Energia Nucleare (C.N.E.N.) No. 013-61-7 AGEC.

P. PASTEELS

Aspirant du Fonds National de la Recherche Scientifique.

SARAH DEUTSCH

Chercheur de l'Institut Interuniversitaire des Sciences Nucléaires,

Service de Géologie et Géochimie Nucléaires,
de l'Université Libre de Bruxelles.

¹ Picciotto, E., *Nature*, **186**, 740 (1960).

² Picciotto, E., *Ciel et Terre*, **77**, 126 (1961).

³ Deutsch, S., Picciotto, E., and Reinharz, M., *Nature*, **191**, 1286 (1961).

⁴ Tilton, G. R., Wetherill, G. W., Davis, G. L., and Hopson, C. A., *Bull. Geol. Soc. Amer.*, **60**, 1469 (1958).

⁵ Hurley, P. M., Hughes, H., Pinson, jun., W. H., and Fairbairn, H. W., *Geochim. and Cosmochim. Acta*, **26**, 67 (1962).

⁶ Aldrich, L. T., Davis, G. L., Tilton, G. R., and Wetherill, G. W., *J. Geophys. Res.*, **61**, 215 (1956).

⁷ Tilton, G. R., Davis, G. L., Wetherill, G. W., and Aldrich, L. T., *Trans. Amer. Geophys. Union*, **38**, 360 (1957).

⁸ Picciotto, E., Michot, J., and Michot, P., *Bull. Soc. Belge Géol.*, **69**, 211 (1960).

⁹ Michot, jun., J., *Ann. Soc. Géol. Belgique*, **85**, B, 87 (1961).

¹⁰ Michot, jun., J., *Ann. Soc. Géol. Belgique*, **85**, B, 151 (1962).

¹¹ Wasserburg, G. J., Wetherill, G. W., Silver, L. T., and Flawn, P. T., *J. Geophys. Res.*, **67**, 4021 (1962).

CDNA00459ENC