DEPARTMENT OF MINES.

SOUTH AUSTRALIA.

ON THE ABSOLUTE AGE OF THE URANIFEROUS GRANITE AND PRE-CAMBRIAN TILLITE IN THE CROCKER WELL AREA. (OLARY DISTRICT, SOUTH AUSTRALIA) ✱

by

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The presence of conspicuous granitic bodies is a well known geological feature of the Olary - Boolcoomata - Crocker Well area, in the north-east region of South Australia. D. Mawson, who first described these rocks, (1) pointed out their intrusive character and postulated a Pre-Cambrian age. At a later date A.W.Whittle studied these formations in the Boolcoomata area. (2) This author reached the conclusion "that much evidence suggests that the granite masses of Boolcoomata are the result of granitization rather than of intrusion". The granitization process would also have affected, according to Whittle, the (Proterozoic) tillite of the Adelaide System. If this is correct, part at least of the granite would be of a post - Pre-Cambrian age. In the last few years investigations at a regional scale have been carried out by R. C. Sprigg in the Outalpa - Ballara area (3), and by the writer in the adjoining regions of Kalability, Plumbago and Crocker Well. (4)

In these areas granite and pegmatite bodies are wide-spread, forming in fact important portions of the country rocks. This note summarises some data related to the age of the granite in the Plumbago - Crocker Well area, where the granite is clearly intrusive into an Archaean Complex of Metasediments and is unconformably overlain by Proterozoic tillite of the Adelaide System. It was therefore possible to compare clear stratigraphic relationship with age determinations (by lead-uranium ratio) which, by arrangement with the U.S. Atomic Energy Commission, have recently been carried out by Dr. J. L. Kulp, of the Columbia University, on behalf of the South Australian Department of Mines.

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THE FIELD RELATIONSHIP: The intrusive character of the granite may be admirably observed at Windamareeka Hill, some two miles northerly of Plumbago homestead, where large granitic dykes intersect at a high angle clearly defined horizons of well bedded quartzitic, epidote - rich metasediments. On the other hand the granite and its crystalline host-rocks are unconformably overlain by a very coarse tillite, which is well exposed one mile southerly of the homestead. The tillite in this area represent the base of the Adelaide System, and is undoubtedly derived from an old terrestrian moraine. It contains erratics which represent all rock types of the underlying basement - schists, quartzites, gneisses, calc-silicate rocks, as well as larger boulders of the granite intruding the crystalline complex. As no magmatic or metasomatic processes affect the tillite itself (except for scattered quartz-reefs) it was concluded that the emplacement of the granite antedated the deposition of the Adelaide System beds.

Radiometric survey and regional mapping of this area led to the discovery of uranium mineral deposits which are being investigated by the South Australian Department of Mines (5). These deposits usually occur in granite bodies, pegmatites or metasediments intensely invaded by granitic material, and in the writer's opinion they are undoubtedly related to the granite emplacement. Age determinations based on the lead-uranium ratio throw therefore much light, not only on the age of the granite, but also on the age of the overlying Adelaide System sediments, particularly of the oldest South Australian tillite.

AGE DETERMINATIONS: Dr. Kulp's age determinations were obtained from samples of "absite" (a variety of brannerite) found at Crocker Well. They gave following results:

Pb 206/U238	=	520 ±	10 million years
Pb 207/U235	=	600 ±	40 " "
Pb 208/Th232	=	585 ±	40 " "

According to Dr. Kulp these results point to a "best age" of 580 ± 30 million years.

CONCLUSIONS: Age determinations based on the lead -uranium ratio show that the uraniferous granite of the Plumbago - Crocker Well area is of Pre-Cambrian age. It is intrusive into an older highly metamorphic complex for which an Archaean age is postulated. The Adelaide System tillite, which rest unconformably on the granitic basement is in turn conformably overlain by a very thick unfossiliferous sequence culminating (in other part of the State) with fossiliferous Cambrian beds.

The Adelaide System is therefore of a Late-Proterozoic age. Its deposition would have taken place approximately between 600 and 500 million years ago.

REFERENCES

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(5) L. W. PARKIN, R. C. SPRIGG, D. KING, A. W. WHITTLE and others. Unpublished reports to the South Aust. Dept. of Mines.
