therefore, be enough interstitials to construct the defects postulated.

As an alternative approach, we regard the grain boundary as a sink or gutter for interstitials, and we assume that free clusters do not occur in fine-grained material of the type studied. If the vacancies are dispersed throughout the lattice as immobile singles and their concentration is n_0 per lattice atom, and if we assume that the rates of reaction between the mobile interstitials and (*a*) the vacancies and (*b*) the crystallite boundary are proportional to the perimeter of the vacancies and of the boundary respectively[5], we deduce that:

$$dn_0/dt = cL_a/n_0L_a^2$$

where c is a constant of order unity, L_a is the crystallite size measured in units of 1·62 Å (the mean diameter of a graphite atom), and where t represents dose in units of 10^4 MWD/Ate, this being the dose in which all lattice atoms are displaced on the average once by the irradiation. Integrating, we obtain $n_0 = (2ct/L_a)^{1/2}$. The phonon-scattering cross-section of a vacancy is of the order of its geometrical cross-section[6], so the corresponding mean free path, L_v, is of the order of $1/n_0$ atoms. The thermal resistivity is therefore represented theoretically by:

$$\frac{1}{K} = \text{const.}\left(\frac{1}{L_a} + \frac{1}{L_v}\right) = \text{const.}\left(\frac{1}{L_a} + (2c)^{1/2}\frac{t^{1/2}}{L_a{}^{1/2}}\right)$$

The experimental results of Mason and Knibbs[1] can be represented well enough by:

$$\frac{1}{K} = 1{,}040\left(\frac{1}{L_a} + \frac{t^{1/2}}{L_a{}^{1/2}}\right) \quad (K \text{ in c.g.s.u.})$$

which is of the required form. By comparison, $c = 0{\cdot}5$. This value is satisfactorily near unity; I shall not discuss it further here, as it includes various factors the theoretical value of which it is difficult to estimate accurately.

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R. L. Woolley

Central Electricity Generating Board,
Berkeley Nuclear Laboratories,
Berkeley, Gloucestershire.

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GEOLOGY

New Isotopic Age Measurements from the McMurdo Sound Area, Antarctica

Subsequent to the publication[1,2] of potassium/argon dates from basement rocks of the McMurdo Sound area, a few additional dates have been obtained. As shown in Table 1, the potassium/argon dates now available represent a variety of igneous and metamorphic rock types. Each reported date is based on an average of two or three determinations of radiogenic argon content.

Table 1. Potassium/Argon Ages from the McMurdo Sound Area*

Sample No.	Rock type	Mineral dated	Age (× 10⁶)	Reference	Location
ATZ-1	Monzonite gneiss	Biotite	425 ± 15	1	77° 40′ S., 162° 45′ E.
ATZ-2	Lamprophyric dyke	Biotite	458 ± 20	1	77° 40′ S., 162° 45′ E.
ATZ-3	Marble	Biotite	500 ± 20	1	77° 26′ S., 163° 48′ E.
GD-1	Paragneiss	Biotite	500 ± ?	2	77° 24′ S., 163° 40′ E.
P-1	Diorite	Biotite	496 ± 15		77° 25′ S., 163° 50′ E.
P-2	Basic dyke	Biotite	524 ± 15		77° 25′ S., 163° 50′ E.
AS-1	Lamprophyric dyke	Biotite	520 ± 30		77° 43′ S., 162° 40′ E.

* Except for *GD*-1, determinations were carried out by Geochron Laboratories, Inc., Cambridge, Mass., and constants used were: $\lambda_\beta = 4{\cdot}72 \times 10^{-10}$/year and $\lambda_e = 0{\cdot}585 \times 10^{-10}$/year and $^{40}K/K = 1{\cdot}22 \times 10^{-4}$ g/g.

A comparison of samples *ATZ*-3 and *P*-2 emphasizes the importance of realizing that the potassium/argon ages are interval estimates. The central figure for *ATZ*-3, a marble sample, is 500 m.y. The corresponding figure for *P*-2 is 524 m.y. In this case, field observation reveals that the basic dyke cuts the marble, shows no sign of post-intrusion metamorphism, consequently is younger than the marble. Consideration of the reported intervals reveals that the dyke may be as much as 11 m.y. younger than the marble without contradicting the potassium/argon determinations.

The reported ages suggest that there may actually have been two distinct periods of activity: (1) Late Cambrian–Early Ordovician (510 ± 25 m.y.) metamorphism of previously existing sediments, accompanied by the intrusion of certain igneous systems; (2) Late Ordovician–Early Silurian (440 ± 25 m.y.) intrusion of later systems. Observations by McKelvey and Webb[3] and Allen and Gibson[4] in Wright Valley and Victoria Valley respectively also suggest that the basement intrusives of the McMurdo Sound area may be divided into two groups of slightly different ages (Table 2). Present results tend to strengthen this hypothesis.

Table 2. Tentative Correlation of Marble Point with Wright Valley Intrusives

	Pearn (1963)	McKelvey and Webb (1962) Wright intrusives
Late Cambrian	Brewer Hill granite	Dais granite
	Bill Hill granodiorite	Theseus granodiorite
(*P*-2)	Bill Hill 'trap'	Loke microdiorite
(*P*-1)	Surko Creek diorite	(No apparent equivalent)
		Victoria intrusives
Ordovician	Surko Creek granite	Vida granite
	Surko Creek and Air Strip 'trap' dykes	Vanda lamprophyres

The Marble Point locality has recently been examined in some detail[5], and the intrusive units recognized by McKelvey and Webb in the Wright Valley area have been tentatively identified. It is likely that some of the intrusives of Taylor Valley also are referable to the two groups of McKelvey and Webb.

From Antarctica in general there have been more than 65 isotopic dates reported in the 450–550 m.y. range[6]. An extensive period of metamorphism–plutonism occurred during early Palæozoic time with a peak of activity indicated in lower Ordovician. The geographical distribution of 400–550 m.y. dates extends over the entire peripheral area of eastern Antarctica from the Conrad Mountains (72° 00′ S., 9° 30′ E.) to Cape North (70° 40′ S., 165° E.) and south to McMurdo Sound Region, Victoria Land. Such distributions suggest that a widespread period of severe orogenic activity affected the whole eastern Antarctic region about 450–550 m.y. ago.

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William C. Pearn

Department of Statistics,
Kansas State University,
Manhattan, Kansas.

Ernest E. Angino

Department of Oceanography and Meteorology,
Texas A and M University,
College Station, Texas.

Duncan Stewart

Department of Geology,
Carleton College,
Northfield, Minnesota.

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