The quantities N and σ refer to the number of molecules per unit volume and their cross-section for absorbing the disruptive radiation respectively. The cross-sections σ_1 , σ_2 and σ_3 will be equal in the conditions we have specified. As both ^{17}O and ^{18}O are very rare species compared with ^{16}O , the exponentials in the numerators of both dissociation ratios can be closely approximated by the expression $1 - N\sigma L$.

The consequence is that the initial dissociation ratio Q_2/Q_3 is just N_2/N_3 and the initial production rates of ozone molecules containing ^{17}O and ^{18}O will be nearly proportional to the amounts of those isotopes originally present, whereas the abundance in ozone of ^{16}O will be relatively less because of the greater shielding by the species $^{16}\text{O}_2$. The shielding thus produces samples on the line of slope 1 as observed.

The essential condition for observing this kind of fractionation, which oxygen well fulfills, is to have two or more isotopes of low abundance. The effect could be quite a general one in oxygen, taking place for several reactions induced photochemically on different oxygen-bearing reactants. Nor would P and T be much constrained for these processes to occur.

Thiemens and Hidenreich's researches are still in their infancy, but already the prognosis for establishing the shielding process as the relevant mechanism in the laboratory experiments is quite good. Since their first report, they have already observed similar results for CO_2 , as would be predicted.

Whether the effect has been cosmochemically significant will be more difficult to establish. Attributing the effects seen in meteorites to the photochemical process has advantages. If the effect in meteorites is nuclear, the high chemical abundance of oxygen requires that much more isotopically anomalous material would have existed in the early Solar System than other isotopic anomalies seen in meteorites require.

Also, the question of why silicon does not show similar isotopic anomalies would be answered: in silicon, the two isotopes present in low abundance are 44 times more abundant on the average than their oxygen counterparts. And finally, it has always been a little peculiar that the oxygen effect should have a slope just equal to 1 when various slopes could result in mixing oxygen from different nucleosynthetic pots.

It is certainly too early to tell, but it may very well be that the Clayton effect will eventually be interpreted in terms of early electromagnetic radiation in the Solar System and not in terms of the distribution of supernova debris. □

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International lithosphere programme

Deep seismic profiling plans in Australia

from M. W. McElhinny

THE International Lithosphere Program (ILP) in Australia got off to an enthusiastic start at the Sixth Convention of the Geological Society of Australia held in Canberra from 21 to 25 February. The Australian National Committee for the ILP sponsored four symposia on the areas most appropriate in the Program's initial stages: lithospheric transect studies of the Australian continent (LITSAC); recent plate movements and deformations in the Australasian region; oceanic lithosphere studies around Australia; and intraplate igneous activity in Australasia.

LITSAC (chairman R. Rutland) is the main programme. Committees will be set up in each state to coordinate the choice of sites for major transect studies; these will form part of the Australian Continental Reflection Profiling Program (ACORP) — itself based on the highly successful COCORP project in North America. Unlike COCORP which used the Vibroseis method, however, the ACORP programme will use explosion seismology; Australia is less densely populated and environmental constraints are not so severe.

The first major study, involving nearly 1,500 km of deep seismic profiling of the Central Eromanga Basin in western Queensland, has already been carried out by the Bureau of Mineral Resources. Reflections were obtained from between 20 and 60 km depth underneath a seismically homogeneous upper crust lying at between 6 and 20 km depth (D. Finlayson and S. Mathur). The technical standard of the sections and the clarity of the deep reflections were particularly impressive and clearly showed that explosion seismology could have advantages over the Vibroseis technique in deep reflection studies.

Proposals for future deep seismic reflection profiles were put forward for New South Wales, Tasmania, Western Australia and Queensland.

It was emphasized that to attract financial support from a wide range of funding agencies, the initial profiles should yield results that can readily be interpreted in terms of known upper crustal geology, make important contributions to the understanding of major regional problems, are of general significance in terms of crustal evolution and have some implications for broad-scale resource assessment.

To satisfy these conditions the New South Wales LITSAC group proposed a traverse in eastern Australia from the eastern margin of the Lachlan Fold Belt across the Gunnedah Basin and the southern part of the New England Fold

Belt. Contact between the Lachlan and New England Fold Belts is nowhere exposed on the surface but must occur along the profile. Information on the Lachlan–New England relationship will be important for tectonic and structural interpretations. The New England section is presumed to be representative of an arc–forearc basin–subduction complex scheme, and may be one of the best and most complete examples of an accretionary convergent margin preserved in the geological record. The deep structure of these margins and their evolution as they are incorporated into continental crust are little understood. The profile would contribute much to our knowledge of these processes and thus of Phanerozoic continental growth in general. Deep crustal structures of a very general kind were obtained by the LISPB programme across the Caledonian system in Britain, but otherwise deep-crustal profiling of any detail is lacking across cratonized arc–forearc terranes.

In complete contrast, M. Bickle and R. Gee proposed a series of carefully selected seismic reflection profiles in the West Australian Shield which, when integrated with other data, could provide information on several critical issues concerning early crustal evolution and structure. Of particular importance was the possibility of determining the three-dimensional shape of greenstone belts — one of the outstanding enigmas of Archaean geology. The most puzzling feature of the West Australian Shield is the deep crustal nature of the southern margin of the buried Pilbara Craton. The evolution of Archaean nuclei in Precambrian shields is still a major problem to be solved and it is evident that the Yilgarn and Pilbara Cratons, and the intervening region, had their own characteristic crustal features. A 200 km traverse across the southern margin of the Pilbara Craton could thus be particularly valuable.

The symposium demonstrated the enthusiasm in the Australian geoscience community for the major multidisciplinary programmes based around LITSAC and deep-seismic profiling. The fact that the ILP has been a catalyst in formulating a nationwide programme in Australia must be regarded as one of its major initial successes. □

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