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DEPARTMENT OF
MINERALS AND ENERGY



BUREAU OF MINERAL RESOURCES,
GEOLOGY AND GEOPHYSICS

Record 1973/194



FUTURE OF THE DEEP SEA DRILLING PROJECT AFTER 1975

Report on an open meeting of the
JOIDES planning committee held
in Zurich, September 26-28, 1973

by

P.J. Cook

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SUMMARY

With the termination of the funding of the Deep Sea Drilling Project by the United States National Science Foundation in 1975 it is proposed to 'internationalize' the project, which will then be known as the International Program for Ocean Drilling (IPOD). Major projects proposed for IPOD include: (i) Drilling of oceanic basement to below layer 2 (basement penetration of 2-4 km is contemplated). (ii) Drilling of both active and inactive oceanic margins; this will involve deep penetration of slope sediments in some places, and may necessitate the use of blow-out prevention devices. (iii) Deep-sea drilling for the elucidation of the palaeoenvironmental history of the oceans.

Several sites near Australia have been tentatively proposed for the period 1975-1979.

INTRODUCTION

In response to an invitation from the JOIDES (Joint Oceanographic Institutions Deep Earth Studies) Executive Committee, the writer attended a meeting to discuss the planned International Program for Ocean Drilling (IPOD) as an observer. All expenses incurred by the writer were met by the Australian Government. The meeting was held in Zurich from September 26 to September 28, 1973 and this paper summarizes the main points arising from that meeting. Comments on possible Australian participation in IPOD are given in Appendix 1.

BACKGROUND

In 1964, the JOIDES consortium, comprising a number of United States oceanographic institutions was formed to plan a program of ocean-floor drilling. The Scripps Institution of Oceanography was designated the operating institution for the Deep Sea Drilling Project (DSDP), and Global Marine Inc. the drilling contractor. Funds were provided by the United States National Science Foundation (USNSF), initially for 18 months, but this was subsequently extended for two periods, each of 36 months. The seven years of drilling (to August 1975) will have a total cost of \$68.3 million ⁽¹⁾.

A unique drilling vessel the D/V Glomar Challenger was developed for the program. This vessel, which has the facility of dynamic positioning, has drilled in water depths of up to 6.7 km and has achieved a sub-bottom penetration of 1.3 km. To date more than 300 sites have been drilled throughout the world's oceans, with more than 30 of these in the Australasian region. The scientific results accumulating from this drilling program have been of fundamental importance to our understanding of the Earth's history.

It is no exaggeration to describe the Deep Sea Drilling Project as one of the most important scientific projects of the 20th century: for instance, it has produced definitive evidence of continental drift and sea-floor spreading, which forms the basis for the theory of global (plate) tectonics; and it has also supplied information of potential economic importance on oil and gas occurrences and metal accumulations, some of them in the Australasian region.

The USNSF has indicated that, when Phase III of the DSDP is completed in 1975, it will no longer fund the project to the same extent as previously, but nevertheless it would not like to see a project of such importance to the world scientific community abandoned. Consequently the JOIDES committee has decided to attempt to 'internationalize' the project: this is considered desirable, not only as a mechanism for obtaining finance, but also to achieve maximum involvement by the world geoscientific community.

PROBABLE STRUCTURE AND FUNDING OF THE PROJECT AFTER 1975

On completion of the present DSDP contract in 1975 it is hoped that a number of countries will contribute financially to IPOD. On doing so they will become full members of the JOIDES executive and the planning committee, and consequently will be in a position to influence the course of IPOD. Contributions of \$1 million per country per annum have been sought from a number

(1) All costs are in \$US unless otherwise stated.

of nations (generally through the national institution of the nation). To date, only the USSR has definitely committed itself to a contribution of \$1 million, and the Institution of Oceanology of the USSR is now a member of the JOIDES executive. It seems fairly certain that West Germany will be making a \$1 million contribution; France and Britain are rather more uncertain, but are expected to decide finally to contribute. Canada is undecided, and Japan has decided it will not contribute at this stage. Switzerland wishes to contribute but only to a maximum of \$200 000 per annum.

At present it is envisaged that IPOD will run for 5 years at a maximum cost of about \$70 million, i.e. a maximum cost of about \$14 million per annum. Assuming that the USNSF will meet much of the cost (Table 1), and that Britain, the USSR, West Germany, and France each contribute \$1 million, it will still probably be necessary to obtain other contributions to make IPOD viable. The JOIDES executive met in late October 1973 to discuss alternative ways of making a financial contribution apart from \$1 million per annum, as several scientists expressed the view that they country may wish to be involved but could not afford a \$1 million contribution. Thus, assuming that the project continues after 1975, it will undoubtedly have an executive committee composed of scientists from various countries, but the composition of the executive is still uncertain.

TABLE 1

Estimated financial summary for IPOD (1975-1979)

(amounts in \$US)

(a) Using Glomar Challenger (1975-1979)

Total IPOD cost	\$58 million
Possible USNSF contribution	\$39 million
Possible International contribution	\$19 million

(b) Using Glomar Challenger (1975-1978) and alternative new vessel (1978-1979)

Total IPOD cost	\$72 million
Possible USNSF contribution	\$53 million
Possible International contribution	\$19 million

THE OCEAN DRILLING PROGRAM AFTER 1975 (IPOD)

With the commencement of IPOD in 1975 it is anticipated that the drilling program will emphasize three aspects:

- (a) Deep oceanic crustal drilling
- (b) Oceanic margin drilling
- (c) Oceanic palaeoenvironment drilling

(a) The aim of this portion of the program would be to drill deep holes (penetration of 2-4 km) into igneous rock, hopefully reaching beyond layer 2, as layers 3 and 4 have not yet been sampled. Information obtained from this

drilling would help our understanding of the vertical and lateral structure of the crust, the mechanisms of plate tectonics, and the formation of orebodies. High-priority areas for drilling include the Sea of Japan, the North Atlantic, and the Gulf of California. Lower-priority areas include the Caribbean, and the area west of Australia from the Argo Abyssal Plain to the Java Trench.

(b) Oceanic margin drilling. It is anticipated that this program will involve the deep drilling of sediments (maximum penetration of 4-5 km) in 1-4 km of water on continental margins. Margins of both the active and inactive types will be studied. Study of active margins (generally converging plate boundaries such as those of the Papua New Guinea region) should clarify the processes of subduction, the effects of these processes on the sedimentary column, and the nature of mineralizing processes associated with subduction. The study of inactive margins (such as those flanking Australia) should help elucidate the chronology of continental drift and the possibility of oil, gas, and mineral accumulations. Coincidentally, such marginal drilling programs are likely to act as a powerful stimulus to hydrocarbon exploration in these presently inaccessible areas, and may also lead to important technological discoveries.

At present the possibility of future drilling in three areas in the Australian region is being considered. These are (i) off the NW Shelf; (ii) the eastern end of the Australian Bight; and (iii) the western margin of the Tasman Sea.

(c) Palaeoenvironmental drilling. The pre-1975 Deep Sea Drilling Program is already concerned with this topic, for ocean sediments record to some extent the conditions under which they were deposited. Drilling would presumably be generally in areas where the sedimentary record is most complete. Results obtained would help considerably to solve problems of worldwide correlation, and to elucidate changes both in the chemistry of the oceans and in past climates. Potential drill sites have not yet been chosen; there are probably a number of areas in the Australasian region which could be profitably drilled.

IMPLICATIONS FOR AUSTRALIA IN THE TENTATIVE INTERNATIONAL PROGRAM FOR OCEAN DRILLING

As a consequence of our new understanding of global tectonics, discoveries made by IPOD in the North Atlantic may conceivably have important implications for our understanding of geological phenomena on the Australian Plate. Therefore, the entire program is potentially important to Australia and our understanding of Australian geology. In addition, some aspects of the tentatively proposed drilling near Australia are likely to be of direct interest to Australian geologists. These are: (i) Deep basement drilling in the eastern Indian Ocean. (ii) Drilling in the active margin of the New Guinea region. (iii) Drilling in the inactive margin of the Australian Bight, the west Tasman Sea, and off the Northwest Shelf. Items (i) and (ii) could be valuable to our understanding of mineralization and mineral deposits on the Australian continent. Item (iii) would be an invaluable follow-up to the EMR continental margin survey, and could be of great assistance in the location (and exploitation) of hydrocarbon accumulations on the margin.

It should, however, be emphasized that these proposals for the Australasian region are just a few of the many proposals which will be considered by IPOD. The fundamental deciding factor on where to drill will be the scientific merit of the site, though it is not unreasonable to assume that financial considerations cannot be completely ignored. One further point which was emphasized at the Zurich meeting was that the JOIDES planning committee is more than happy to receive proposals from scientists (either individually or collectively) for potential IPOD sites to be drilled in the period 1975-1979.

INVOLVEMENT BY AUSTRALIA IN DEEP-SEA DRILLING

Australian scientists have been involved in DSDP for a number of years, and so far 12 Australian scientists (see Appendix II) have participated in cruises - after the Swiss scientists, this is the greatest number of non-US scientists from any nation involved in the program.

To date no financial contribution has been sought from Australia but it would seem likely that we may be approached in the future. It is therefore relevant to give here some of the reasons advanced by the scientists of other countries to justify their financial involvement in IPOD: (i) The project is of vital importance to the world geoscientific community, and unless support is forthcoming internationally, the project will die from lack of funds. It is therefore up to the individual nations to play their part in supporting it financially to ensure its continuation. (ii) No country outside the United States and perhaps the USSR could afford to operate its own drilling vessel of the Glomar Challenger type; consequently a consortium is the only feasible way of undertaking such a project. (iii) The deep continental margin drilling would act as a stimulus to hydrocarbon exploration. (iv) Involvement in the operation of an advanced vessel such as the D/V Glomar Challenger helps to ensure that scientists of the various countries keep up-to-date with modern technological developments in drilling. (v) Financial involvement in IPOD ensures a voice in the planning phase.

CONCLUSIONS

The aim of this record has been to present a brief factual report on the Zurich meeting. The merits of Australian involvement have not been considered. It appears probable that DSDP will 'internationalize' after 1975 to form IPOD. It is therefore important that the Australian geoscientific community considers in the near future (perhaps through a national DSDP committee) the nature and level of any Australian involvement in IPOD.

APPENDIX I

AUSTRALIAN PARTICIPANTS IN THE DEEP SEA DRILLING PROJECT

- | | |
|----------------------------|---|
| 1. Dr A.N. Carter | - University of New South Wales |
| 2. Dr P.J. Cook | - Bureau of Mineral Resources |
| 3. Dr L.R. Frakes* | - University of Florida, USA, when on
JOIDES cruise; at present at Australian
National University, Canberra |
| 4. Dr V.A. Gostin | - University of Adelaide |
| 5. Dr H. Heckel | - Geological Survey of Queensland |
| 6. Dr E. Kemp | - Bureau of Mineral Resources |
| 7. Dr B. McGowran | - University of Adelaide |
| 8. Dr B.C. McKelvey | - University of New England |
| 9. Dr G.H. Packham* | - University of Sydney |
| 10. Mr S. Shafik | - University of Adelaide |
| 11. Dr J.J. Veevers* | - Macquarie University |
| 12. Dr C.C. von der Borch* | - Flinders University |

*Cruise leader