Over 1150 sites have been drilled in the world’s ocean basins by the Ocean Drilling Program and its predecessor, the Deep Sea Drilling Project, since scientific ocean drilling began more than 30 years ago. During this time, the program has grown from a modest pilot project funded and operated by the US for an initial period of one year at a cost of about $5M, to the multi-year program we have today, which has an annual operating budget of $45M and is funded by 19 countries.

The results of the program have had a profound impact on almost every discipline in the earth sciences and many have important societal implications. A brief sampling of the major accomplishments of the program includes:

- proof of the theory of seafloor spreading
- the discovery that the Mediterranean Sea dried up during the Pleistocene
- the discovery of oil at abyssal depths (Gulf of Mexico)
- proof of the hotspot hypothesis (Hawaii-Emperor seamount chain)
- sedimentary evidence for the biblical flood (Black Sea)
- proof of the K/T boundary meteor impact theory (Gulf of Mexico)
- dating of the onset of Arctic and Antarctic glaciation
- proof of astronomical climate forcing
- internal mapping of active massive sulphide deposits on ocean ridges
- solution of the Jurassic Quiet Zone problem

but a review of the literature shows that a comprehensive list of ODP accomplishments easily exceeds 100 entries and is continuously growing in number and diversity as new segments of the earth science community make use of the vessel (Cullen, 1994; Kappel and Farrell, 1997).

Despite the enormous success of the program, there are many settings in which the program has been notably unsuccessful. Because of safety restrictions, neither the JOIDES Resolution nor the Glomar Challenger before it could drill barefoot into sedimentary structures which might contain oil or gas and neither ship has ever really succeeded in drilling in fractured rock or much deeper than 2 km into either sediments or basement because of hole instability problems. In addition, it has not been possible to drill in shallow water, in high temperature formations or in pack ice. Thus because of platform limitations, the Ocean Drilling Program has had no, or only limited access to important parts of the ocean basins, including the continental shelves, thick sediment prisms along continental margins, the oldest and most deeply buried marine sediments, deep subduction zones, petroliferous sediments, clathrates, young oceanic crust, active volcanic and hydrothermal systems, fracture zones, the lower oceanic crust and upper mantle and the Arctic. Since the drilling technology now exists to address most of these targets, the community is planning a new, more ambitious program, the Integrated Ocean Drilling Program (IODP), to replace ODP when it comes to an end in 2003. Because no single drillship can drill efficiently in all of these environments, it is proposed that the new program will use several alternative drilling platforms, including the Godzilla Maru, a state-of-the-art, riser-equipped drillship currently being built by the Japanese, plus an upgraded JOIDES Resolution or a new, enhanced US drillship which would be used during the transition to riser drilling and in parallel thereafter. It is also planned to use specialized platforms and support vessels to drill as needed in unusual settings such as in shallow water or pack ice.
Scientific planning for IODP has already begun with major international conferences and workshops with industry to identify the science to be accomplished by both riser and riserless drilling and the technical requirements of the drilling platforms (CONCORD Report, 1997; COMPLEX Report, 1999). Targets identified for riser drilling (Figure 1) include deep biosphere sampling, deep drilling and instrumentation of subduction zones with borehole observatories to monitor and predict earthquakes, deep drilling along passive margins in conjunction with industry to study the early stages of continental rifting, margin stratigraphy, clathrates and the conditions leading to hydrocarbon generation, sampling the oldest marine sediments to study paleoenvironmental conditions during the Mesozoic and deep drilling in oceanic basement to determine the composition and architecture of the lower crust and upper mantle. Topics addressed most efficiently using riserless drilling (Figure 1) include climate change, biological evolution, catastrophic events and Arctic drilling. While all of these topics are of global interest, many can be addressed and some can be best addressed along Canada’s margins or in areas of Canadian interest, such as the Arctic. The challenge to the Canadian geoscience community will be to secure new funding so that Canada can participate fully in the Integrated Ocean Drilling Program and to ensure that Canadian proposals are an integral part of the IODP drilling schedule.

Figure 1. Generic IODP riser and non-riser drilling targets: blue, paleoenvironmental studies; orange, thick passive margin sediment prisms; green, deep subduction zones, thick accretionary prisms and deep biosphere studies; yellow, Mesozoic sections; lavender, Arctic; brown, large igneous provinces (LIPs); red, hot or zero-age crust and deep biosphere studies; black, transform fault zone crust; stars, lower oceanic crust and upper mantle; O, G and C, oil, gas or clathrate-bearing sediments.

References:


Biographical Note

Matt Salisbury received his BSc from MIT in 1968 and his PhD from the University of Washington in 1974. He served as staff scientist and Associate Chief Scientist of the Deep Sea Drilling Project at Scripps until 1985 and has participated on seven DSDP and ODP cruises, three times as co-chief scientist. He is now a senior research scientist with the Geological Survey of Canada, an adjunct professor at Dalhousie University and Director of the Canadian ODP Secretariat.