The rise of 'Mobilism'

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The Dark Side of the Earth. The Battle for the Earth Sciences: 1800-1980.
By Robert Muir Wood
George Allen & Unwin: 1985. Pp.246. £11.95, $19.95.

"GEOLOGY is dead; long live the Earth sciences". This in a nutshell is the message of Robert Muir Wood's analysis of continental drift from Wegener's chequered career up to the sudden and stunning success of "mobilism" in the plate tectonics revolution of the 1960s.

At one level, this bold survey can be read with equal pleasure and profit as one of the best interpretations of that astonishing scientific upheaval. Unlike Anthony Hallam's *A Revolution in the Earth Sciences* (Oxford University Press, 1973) it does not primarily aim to evaluate the inner logic of successive geological theories; nor does it rival the dramatic blow-by-blow commentary on tectonic breakthroughs offered by William Glen's *The Road to Jaramillo* (Stamford University Press, 1982). But Dr Wood's reading has special virtues of its own. He offers the best account yet of the nineteenth century heritage of speculations about oceans and continents which formed the matrix of drift theory. And he is adroit in bringing his protagonists to life and illuminating their particular parts in the story. Harry Hess is identified as the senior figure who consistently championed younger researchers such as Fred Vine in their heterodox investigations; John Tuzo Wilson is shown to have been the right man in the right place at the right time for propounding the wider "mobilist" synthesis. And due weight is given to the crucial role played by Teddy Bullard as a catalyst, above all in making Anglo-American cooperation in this enterprise so fruitful. Not least, Dr Wood commands a good turn of phrase, and patiently weaves together with enviable skill all the strands of a highly complex narrative.

So here is a sure-footed and wide-ranging account of the triumph of continental drift, with much to offer to specialists and non-specialists alike. But Dr Wood has bigger fish to fry. His case is that the plate tectonics revolution was not just a great transformation in geology — indeed, it is wrongly interpreted if we see it as a revolution in geology. For it was rather a revolution *against* geology.

From its early nineteenth century giants up towards the present, geology's great triumph lay in the stratigraphical and palaeontological vision, in generating the science of the rocks, indeed, a love of the rocks. Geology studied the land masses, especially their mountains. As synthesized in classics such as Eduard Suess's *Das Antlitz der Erde* (1885–1909), it theorized the continents in the context of a stable, if shrinking, Earth, and then minutely studied their deformations through tireless fieldwork and mapping.

The plate tectonics revolution has left this either wrong or stranded high and dry as an irrelevance. The "mobilist" vision swung attention away from the establishment's preoccupation with hammering out ever more data about the strata. Instead "drifters" turned the whole Earth into their parish and their problem. Unlike conventional geologists, they followed Lyell's advice (think like intelligent amphibians) and gave the ocean beds at least as much attention as the land masses. They insisted on tackling questions, such as the global distribution of the continents, from which orthodox geology shied away; they deployed specialist skills in fields such as seismology and geomagnetics not routinely possessed by pukka geologists; and they ended up proposing a theory which could not be judged — for or against — at the bar of conventional geology.

In other words, the revolution in plate tectonics was the overtaking of geology by an alliance of disciplines which we may call geophysics. Or, put another way, enter the Earth sciences, marching under the banner of a global theory, which rendered old geology obsolescent in much the same way as Darwin's evolutionism left behind classificatory natural history as a key to the economy of life.

This was a revolution made by aliens. Some were geographical outsiders, such as the South African, Alexander Du Toit, or Warren Carey from Australia. Others were disciplinary marginal men, classically of course Wegener himself (first and foremost a meteorologist, as Dr Wood rightly insists, while perhaps unduly playing down his geological credentials). Practically all the pioneers of "mobilism" had training or research experience in some branch of geophysics — often in seismology or geomagnetism — which set them apart from true-blue geologists. Not least, "mobilism" was typically the brainchild of the "mobile", the young and ambitious, and was perceived by the old guard to be unsettling (in America it was dubbed "leftist", in Russia, "bourgeois").

Thus the plate tectonics revolution did not emerge out of the geological main stream. Above all, its inspiration came from that late arrival, deep-sea geology. And this in itself would have been unthinkable without the gigantic sea-bed surveying operations funded at huge expense by allied governments during and after the Second World War (projects in which Hess, Ewing and Bullard were all prominent); and then, at a later stage, without the United States pouring money into seismology to monitor nuclear tests. Thus strategic needs produced new fields of expertise; these led to the discovery of the magnetic field anomalies of seafloor rocks, which in turn proved the surprising youth of the ocean floor, and gave rise to the key idea of seafloor spreading, that *since qua non* of the vision of continents borne on mobile plates.

Of course, Dr Wood is not arguing that conventional geology contributed nothing at all to this. But the fact that even so catholic and prescient a geologist as Arthur Holmes got so far yet no further in convincing himself and others of drift, perfectly shows its limitations even at its best. And, at its worst, orthodox geology proved to be an ostrich.

So plate tectonics should not be seen as a revolution in geology, but as marking geology's eclipse, a refocusing of scientific attention away from the rocks towards the whole Earth, a re-think of planet Earth for the space age. Science thus advances, Dr Wood argues, not by accumulating data, nor even by internal theory switches, but by massive re-groupings of disciplines. The old gods are devoured not by their own children but by their neighbours' (except perhaps in the Soviet Union where geological gerontocrats have had more success in keeping the new "drifters" at bay). Late Victorian geology had resented being put in its place by the physico-mathematical imperialism of Lord Kelvin, and had unilaterally declared its independence of physics. Now, a century later, geophysics has had its revenge.

Occasionally, the contrast Dr Wood draws between senile geology and virile Earth science is overstated for polemical effect (his own evidence sometimes gives it the lie); and it is a pity that, drawing too freely upon hindsight, he oversimplifies certain complex figures, such as T.C. Chamberlin and Maurice Ewing, and turns them into whipping boys. Although providing attractive line drawings of the main protagonists, the book would have benefitted, I think, from some explanatory diagrams. Yet all praise to him for recognizing that in understanding the history of science no less than in understanding the history of the Earth, "fixism" will not do. No more than the continents, are the sciences themselves fixtures; they too are subject to drift, expansion and subduction. This is an important re-interpretation, whose "mobilist" vision should send some shock waves through the geological establishment. □

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