

Physical Science in Japan and Australia to 1914: A Comparison

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In this paper, we analyse the process whereby physics became established virtually simultaneously in Australia and Japan, two countries remote from Europe on the western rim of the Pacific Ocean, during the last years of the 19th and the first years of the 20th century. This process took place, however, in very different cultural contexts in the two cases. Hence a comparative study may be expected to be especially revealing in this instance. In particular, features found to be common to the early history of physics in two such different environments are highly likely to be found upon further investigation to have been characteristic of the establishment of the physics discipline in other parts of the world as well. At the same time, a comparison of the kind proposed will enhance our understanding of the history of science in each country separately, because it will enable us to identify with much greater surety just which features of the development in each case were specific to the country in question.

In both countries, most of the laboratory research of the university professors of physics reflected a “practical” view of the subject, for it bore upon one of the most exciting engineering developments of the age, the generation and transmission of electric power by means of alternating currents. Systematic geophysical observing—of weather patterns, the Earth’s magnetic and gravitational fields and, in Japan, earthquakes—was the other major preoccupation in these scientifically little explored lands. Often, and especially in Australia, this work was done at the local observatory rather than at the university. By comparison, the “new” physics of X-rays, radioactivity and the quantum theory, the cultivation of which was, along with the development of work on standards and precision measurement, beginning to give physics a disciplinary identity of its own, was, with one or two exceptions, not pursued in concentrated fashion by Australian and Japanese physicists, whether in university or observatory.

So far, then, as the subject-matter and general perception of the discipline was concerned, the pattern of development was similar in Australia and Japan. At the level of practice, physics, it appears, amounted to very much the same thing in the two countries in the early phase of its development. Where differences emerge, such as in the emphasis in Japan on seismological work, specific local conditions provide an obvious explanation.

At a deeper level, however, important culturally-derived differences remained. Though the practice of physics was transferred to Japan quickly and effectively, most Japanese scientists and,

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indeed, most of those involved in the westernization of Japan, did not quite realise how deeply these disciplines were rooted in Western culture. Consequently, although they were eager to introduce the bulk of the new scientific knowledge, they did not pay much attention to how this could be adapted to their own cultural environment. The frequently used phrase, *wakon-yosai* ("Japanese spirit and Western know-how") well represents the basic attitude of the Japanese intellectuals of the time.

In Australia, the paucity of physicists was exacerbated by the fact that those few were scattered among several widely separated population centres. No such problem existed in Japan where, even after the establishment of Kyoto University, most physics activity was centralised in Tokyo. In Australia, there was never, during our period, a sufficient number of physicists in any one centre to sustain a local physics society, and as a result the roughly annual meetings of the inter-colonial Australasian Association for the Advancement of Science (founded in 1888) assumed a particular importance. In Japan, however, the Tokyo-based Mathematico-Physical Society was able to function as a viable *de facto* national society.

In Japan, American and French influences were felt at the beginning, and there were also continuing links with Germany that became stronger with the years. In both countries, however, the greatest influence in physics in the early stage of its establishment was British, and in Australia it remained so. Yet the nature of the relationship with British physics differed profoundly from one case to the other. Though numbers of Japanese students went to Britain for their advanced training, they always remained Japanese and were constantly aware that they were there solely to help modernize their country. There was never any doubt that in due course they would return to Japan. Contrariwise, when British physicists took up positions in Japanese institutions, no matter how warmly they were received, they always remained foreigners, and were always regarded as but high-salaried temporary employees necessary for the creation of a modern Japan. In Australia, on the other hand, imported British professors of physics were in most respects indistinguishable from the thousands of other recent immigrants from Britain, or their immediate descendants, who made up the bulk of the white population. Furthermore, when Australian students went to Britain, they at once merged with the local population. For most Britons and most Australians of the time, Australians *were* British; they simply lived further out of ear-shot of Bow-bells than most of their fellow citizens. It was therefore seen as just as "natural" for a Briton from Australia as it was for one from, say, Yorkshire, to be appointed to a physics post in a British university, provided only that he was sufficiently talented and had received the necessary advanced training. It also made it perfectly natural for a British physicist, once appointed to a position in an Australian university, to retain it for many years, or even for life. Whereas the Australian appointments were always open-ended, the foreign professors who were brought to Japan invariably were appointed for a limited term only, and were expected to leave once they had served out their contracts.

However, the very closeness of the relationship between British and Australian physics, though it undoubtedly brought many advantages for Australia, in the long run held Australian physics in a state of dependency on Britain for much longer than might otherwise have been the case. In particular, it made it all too easy for bright young Australians who went to Britain for their

advanced training to remain there. There was throughout our period—and indeed for very much longer—a constant siphoning off of much of the best Australian talent in physics to Britain. By contrast, Japan's political and cultural independence prevented a similar state of dependency persisting in her case. So, too, did the fact that Japan had a language of her own, for this made the development of a local scientific publishing network essential. In Australia, with English as the national language, it was all too tempting to remain dependent on British scientific journals and publishing houses.

Thus we observe, in both Australia and Japan, an educationally and experimentally orientated physics, overlaid with a significant amount of geophysical observing, being introduced at almost exactly the same period, in the 1870s and '80s, in very much the same way. This was done by importing a number of foreign physics teachers into newly-established science teaching programmes in the infant universities. In both cases the principal influence was initially British. The science was equally new to both cultural environments, as indeed it was in Britain and America at this same period under its new guise as the science of precision measurement. In Australia it was accepted simply as a part of the larger inheritance from Britain, in Japan it was introduced as part of a deliberately adopted westernising policy; but for a time the practical effects were the same in the two cases. In addition to geophysical observations, such research as was undertaken was chiefly in the field of electricity and magnetism, often in relation to contemporary problems of electrical communication and power transmission. Though the universities soon began offering advanced as well as undergraduate training, both countries continued to send numbers of their brightest students overseas, to Europe, for their advanced work. Whereas the Japanese students invariably returned to Japan, however, many of the Australians did not, to the permanent impoverishment of the Australian physics community. Hence, though in both countries the numbers of practising physicists remained very low and the science they did thus unable to achieve the depth and continuity necessary to establish an independent status of its own, the Japanese community of physicists nevertheless grew steadily in strength and independence, whereas its Australian equivalent remained marginalised for much longer within a larger imperial scientific culture. Questions of political dependence or independence thus had profound consequences, even for the development of such an apparently apolitical subject as physics appeared to be in the decades prior to World War I.