here the break between the two fits nicely onto the political divide. Before 1914, in an underdeveloped country with most of the research centred on Moscow and Petersburg, there was interest in the special theory but a good deal of etherial thinking in the British mould. But the general theory came in 1919 to a new country in an intellectual ferment. The story of the struggles in the 1920s and later about whether the theory was consistent

From *Einstein in Spain*

Special influence — Einstein in Toledo, 1923.

with Marxism is spelled out, though without much detail about the role of the Party in compelling consent. Finally, the chapters by Średniawa and Kaneko on Poland and Japan describe two isolated cases.

The book as a whole is a worthy attempt to survey a large field. It is not, it is true, all that exciting, but every chapter contains a full and useful bibliography.

Nineteenth-century Spain, as described in *Einstein in Spain*, had, from 1857 onwards, a centralized and doctrinaire educational system in which the ministry had dictatorial powers over curriculum and textbooks and could remove professors at will for espousing 'erroneous' doctrines of a moral, religious or political kind. The inevitable breach of the dam came in 1900, so in time for the advent of the special theory, which was backed by both the right and the left in that highly polarized community.

The political and cultural background is fully dealt with in Glick's account of how Einstein came to be invited to Spain in 1923 and what the consequences were for many questions, such as the debate over the role that science should play in Spanish society. The story is a fascinating one, well told. □

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Japanese finesse

R.W. Cahn

Fine Ceramics. Edited by Shinroku Saito. *Elsevier: 1988. Pp.352. $59.95, £44.*

ADVANCED ceramics, new ceramics, high-tech ceramics — these are a few of the terms used in the West to denote what the Japanese prefer to call 'fine ceramics'. These materials are not necessarily of complex composition — they include Al_2O_3 and SiC, among others — but they all share certain characteristics: they are used for purposes for which no ceramics at all were used a few decades ago; to give satisfactory service, they must be processed according to precisely controlled, often elaborate schedules; and their exact compositions and processing must be optimized by lengthy, detailed and intellectually demanding research.

The Japanese have chosen fine ceramics as one of their preferred high-technology areas, and this volume was created to give an account of their achievements to date. The Japanese edition appeared in 1985 and has now been translated into excellent English (by an unnamed translator). Clearly no revision was undertaken for the translation, because no references later than 1985 are cited and there are bibliographical entries such "1984, in press". Even so, the book is only slightly dated.

In his illuminating introduction, Saito explains that Japanese research on fine ceramics was greatly stimulated by the Ministry of International Trade and Industry (MITI) Project for Future Industrial Research, which was started in 1982 partly to "counter criticism from abroad that Japan has always received a 'free ride' on foreign technology". He emphasizes that MITI decided to limit its support "to projects too risky for private companies to carry out R&D, and to immature markets". Hence, fine ceramics for electronic and electrical applications, by far the largest market sector, were left to industrially financed research, and MITI concentrated its support on structural ceramics, materials for advanced internal combustion engines in particular.

The book contains articles on 39 distinct topics, grouped under 4 main headings: ceramic processing, characterization, structural ceramics and electronic ceramics. Forty five authors have contributed: of these, 16 work in industry, 23 in universities (there is one joint appointment) and 7 in government laboratories.

The primacy accorded to processing is characteristic of the Japanese approach: in fact, throughout the book authors return again and again to the processing needs of various novel ceramics, and in the particularly demanding field of structural ceramics, processing is the overriding theme. As it is here conceived, processing presupposes a subtle understanding of solid-state chemistry, which is a major feature of several articles.

The bibliographies are predominantly Japanese; Western literature is cited only insofar as it is necessary to set the scene. In view of the declared objective of the book, which is intended to be a "greeting from Japan to colleagues in the ceramic industry worldwide", this is as it should be.

Numerous Japanese technological and scientific innovations are summarized, especially in the electronic field: Furuhata and Toda's very full survey of ferroelectric and electrooptic materials is an especially fecund source of information. Ura on the Japanese innovation of BeO-doped SiC to replace Al_2O_3 for ceramic packaging of integrated circuits is also outstanding; it is no wonder that Japan has cornered the world market in this speciality. Shirasaki and Kakegawa's study of the role of Ba^{2+} vacancies in governing an insulating–semiconducting transition in La-doped $BaTiO_3$ is a fascinating scientific detective story.

Particular interest attaches to the articles on structural ceramics, which reveal a record of painstaking and persistent testing of components in relation to numerous processing variables. On reading these articles, I have fully appreciated for the first time why Japan is steadily taking the lead in this risky field also. From a commercial viewpoint, the remark thrown out by the editor that Japan, alone in the world, has begun to manufacture household merchandise such as knives and scissors from ceramics, is evidence of a carefully thought-out piece of 'contrarian investment'.

Because of its various asides on policy making (by MITI, by a new ceramic research association, and by the Ministry of Education, Science and Culture, which in 1982 initiated an *academic* cooperative project on 'functional' — that is, electronic — ceramics), the book should be of value to research directors as well as to research ceramists. Generally, the close symbiosis between government, industry and academe emerges at various points throughout the volume.

As a systematic source-book, *Fine Ceramics* is unequalled. It warrants close attention from a wide readership.

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• Longman have just issued a paperback edition of *Physics of Amorphous Materials* by S.R. Elliott. The book is an introduction to non-crystalline materials for students of physics, physical chemistry, electrical engineering and materials science, and also a reference source for those in industry. Price is £15.95. For review see *Nature* **314**, 26 (1985).