Preface

"Professor, Professor, come to see dislocations moving !". These were the words of a research student of Sir Peter Hirsch rushing into Sir Nevill Mott's office in Cambridge on May 3, 1956. Aluminium was probably at this time the best candidate for this first *in-situ* performance. Since then, electron microscopy has contributed much to materials science, and in particular *in-situ* experiments in the electron microscope, where specimens can be treated in various manners while they are being observed continuously at different magnifications, provide an information which could never be obtained with other techniques.

In the seventies, high voltage microscopes, mainly in Japan and Europe, allowed a number of such *in-situ* studies in a wide range of materials, mostly in dislocation dynamics and radiation damage, due to an improved penetration. Most of these studies were reported in the proceedings of the Kyoto conference on high voltage microscopy in 1977.

To date, a new generation of microscopes, associating an increased resolution, a simpler ergonomy and an improved reliability, is being set up in many laboratories in the world. Apart from some 1 MV machines specifically devoted to radiation damage studies (including ion beam bombardment), most of them operate at voltages between 200 and 400 kV. The improvement in resolution is obtained using symmetrical low gap pole piece, which is not necessarily compatible with the sophisticated stages needed for *in situ* experiments.

In parallel, these new standard voltages are lower than the radiation threshold of most "usual"materials, and quantitative experiments can now be carried out more easily provided some simple conditions are fulfilled. The time was ripe to bring together scientists of the two most active countries in this field, in order to share their experience and to develop cooperations.

The present volume contains most of the contributed papers to this France- Japan Seminar on "Unique Contribution of *In-Situ* Experiments in Electron Microscopes to Materials Science", which was held 9-12 November 1992 in Nagoya, Japan, in a very warm and friendly atmosphere. A number of results on dislocation processes, phase transformations and irradiation effects were discussed. New experiments in extreme conditions were reported. The feasibility of *in situ* testing was debated.

This meeting was one of the annual series of seminars administered by the Japan Society for the Promotion of Science and the Centre National de la Recherche Scientifique in order to promote interaction between scientists in the two countries.

Although the participants of this seminar were naturally limited to French and Japanese investigators, we are quite sure that the seminar covered most important aspects and results of this type of experiments, and the contributed papers in this volume will probably provide a valuable source of references for the future development of *in situ* experiments in electron microscopes.

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