

## Editorial

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This journal has been published since 1980 (from 1980 until 1991 as the *Bulletin of Alloy Phase Diagrams* and since 1991 as the *Journal of Phase Equilibria*). As with all things, there has been change with time. The Bulletin was inaugurated to provide a vehicle for the dissemination of evaluated phase equilibria. This evaluation effort resulted from the Alloy Phase Diagram Program that was a joint initiative of ASM and the National Bureau of Standards (now the National Institute of Standards and Technology). The publication has experienced modification through the years and has become primarily a research journal concentrating on topics relating to the nature of equilibrium and nonequilibrium in materials systems and to consideration of factors that tend to promote or defeat the establishment of such equilibria. I have been fortunate to have been associated with the publication in one way or another since its inception, and have been the editor for 10 years.

In reminiscing about how the Journal has changed through the years, my mind wandered to the change in the level of our understanding of materials that has occurred during my 50 years in the field. As a fresh young graduate student in the late 1940s, I can remember being impressed by a lecture given by Heidenreich of the Bell Laboratories on the use of the electron microscope to examine the fine details of the deformation structures in aluminum that were associated with cold work. That study was one of the earliest applications of the electron microscope to materials applications. Indeed that work opened the door to our understanding of structural imperfections and their role in the deformation process. The electron microscope has subsequently been developed into several forms and has become a mainstay in determining and analyzing microstructures and the effects of material composition and of mechanical and thermal history.

The electron microscope has now developed to the point where electron diffraction may be used for examination *in-situ* of the crystal structure of very small grains of a phase. This is in stark contrast to the difficulties of obtaining undeformed single crystals of sufficient size to determine the details of crystal structure by x-ray diffraction. Actually, the study of crystallography has itself changed markedly through the years. Before the advent of the modern computer, the determination of the atomic array in a complex crystal structure was suitable for a Ph.D. thesis. Now, with a battery of computer programs and with automated diffraction equipment, such a determination is, in most cases, a routine procedure.

With regard to phase equilibria, changes with time are equally impressive. The Calphad approach has progressed to the point where it is effectively an engineering application. Phase equilibria for complex multicomponent systems may now be calculated with a degree of confidence. Thus, a variety of possible combinations of elements may be explored within economic feasibility. The applications are, of course, limited by the available input information and there is still a need for good experimental work and that is all too often lacking. Theory has potential for supplementing this lack of experimental information, and the "first principle" calculations that are in their infancy have produced initial results that are promising.

The goal of the *Journal of Phase Equilibria* is to publish current work in our field and to keep our readers abreast of changes with time that are of interest and utility. Published work may be experiment, theory, and/or application. We intend to supplement these reports with material on historical aspects of our field in order to emphasize the directions of development. In addition, we propose to publish more tutorials so that, as the reader's interests change, he may easily shift into an unfamiliar area. Our editorial staff aims to distribute a journal of high quality with a sufficient quantity of articles to cover a broad spectrum of information relevant to our field of interest.

**Jack Smith**  
**Editor**  
***Journal of Phase Equilibria***