

atomic parameters makes any human participation in the calculations very tedious. If solving protein structures were as important as reaching the moon, this problem could be solved rather quickly. However, with such a small fraction of most national

resources devoted to basic research, it seems likely from this conference that the crystallographers in the world may have to continue exercising their programming ingenuity on undersized computers for some time to come.

## II. PHASE TRANSITIONS

By Gabrielle Donnay

Of the forty papers contributed at the symposium on phase transitions, nine unfortunately came after the deadline and thus will not appear in the printed abstracts. The symposium was divided into eleven sessions, three of which were devoted to invited one-hour lectures.

The first of the invited papers, presented by M. J. Buerger of the Massachusetts Institute of Technology, preceded the symposium. Its purpose was to survey the advances made in the field and perhaps to intrigue members of the Congress into staying the first three days of the following week to learn more about the subject. I believe Professor Buerger succeeded on both counts. He showed how his structural classification of transitions into reconstructive and displacive ones overlaps the thermodynamic division into first and higher orders, and he suggested that mixed transitions may occur that involve both types of orders.

R. A. Young of the Georgia Institute of Technology spoke of his own detailed study of the mechanism of the quartz transition at 573° C, which entailed, among other things, refined structure determinations at eight temperatures below and above the transition ( $R$  indices less than 4%).

A. R. Ubbelohde of Imperial College, London, pointed out the need for just such careful single-crystal observations during phase transitions. He discussed the phenomena to be looked for, among

them coexistence of multiple domains of slightly different structures, on the one hand, and continuous slight changes of one-crystal structure that remains homogeneous throughout, on the other.

These three lectures provided the stimulation that comes from hearing about an interesting subject from experts with different backgrounds and different ways of looking at the same phenomena. Thus, even without contributed papers, the symposium would have been a success.

As it was, many of the contributions illustrated the points raised by the invited speakers; others brought out new ones. The Russians are very active in this field and had eight interesting papers. Among them were the following: a new classification of magnetoelectric properties (seven in all), NMR studies of ferroelectric phase transitions, and a study of ferroelectric-antiferromagnetic transitions that accompany *compositional* changes in solid-solution series. This latter type of phase transition, which is of particular interest to mineralogists, has attracted little attention so far in this country.

The attendance at all sessions was surprisingly good, considering that even the most enthusiastic crystallographer must have been close to saturation by then. The general appreciation of this symposium is evidenced by present plans to hold another symposium on the same topic *before* the next IUCr Congress in Moscow in 1966.

## III. *some aspects of*

## LATTICE DYNAMICS

By David R. Chipman

Because of the proximity of the International Conference on Lattice Dynamics in Copenhagen from August 5 to 9,\* Symposium III of the Rome meet-

ing in September was designed, not as an opportunity for presentation of the latest results in the field of lattice dynamics, but rather as an elementary course to give the average crystallographer an understanding of the types of problems which

\* See *Physics Today*, February 1963, p. 102.