

First Symposium on NONHOMOGENEITY in ELASTICITY and PLASTICITY

A Report by D. C. Drucker

THE first Symposium on Nonhomogeneity in Elasticity and Plasticity was held in Warsaw, Poland, from the 2nd to the 8th of September. It was the first meeting in Poland sponsored by IUTAM (the International Union of Theoretical and Applied Mechanics) and our hosts, led by W. Olszak, spared no effort to make the occasion both memorable and pleasant. Social events and sightseeing trips interlaced and surrounded the very full technical program. From the time of personal greeting upon our arrival at the airport to the time of waved goodbyes, help and advice were available instantly if needed. On the other hand, we were completely free to look around on our own and to visit any place we pleased by foot or by taxi.

A planned sightseeing tour of Warsaw brought home fully the enormous effort of rebuilding a city almost totally destroyed by war and occupation. The grand exteriors of the "social-realist" style of architecture, compulsory until 1956, dominated Warsaw. More functional and more economic modern buildings also were being erected. We were told that many more would soon go up utilizing prestressed concrete and other means of prefabrication. The pride of Poland in its heritage was evident in the very costly reconstruction of the oldest section of the city, already completed because it had been given first priority. A two-day excursion to Krakow with its medieval castle and churches which suffered relatively little damage emphasized the ties with the past. So too did a visit to Zelazowa Wola, the birthplace of Chopin. A side trip from Krakow to the concentration camps of Auschwitz and Birkenau was a grim reminder that the veneer of civilization sometimes runs thin. Here, less than twenty years ago, 4 000 000 people were brought in freight cars and killed systematically. An extensive museum tells the grim story through photographs and exhibits. These and other lessons of the past two decades seem to have made as

strong an impression upon the people of Poland as upon the people of Holland and of Norway. Surprisingly many of the younger and the older Poles feel free to make clear their cultural, political, and economic beliefs. They have a real faith in the future of a Poland with additional and strong ties to France, Great Britain, and the United States. We can but hope that their dreams will come true.

Travel between Poland and the West is now much easier for all. Many of the younger as well as the more established men have already spent some time abroad or plan to do so in the very near future. An interchange between Poland and the USSR also seems to be frequent with the Russians looking at all of the "peoples' republics" as one big happy scientific family.

TECHNICAL sessions of the symposium were held in the skyscraper Palace of Culture and Science, called unaffectionately by some the "culturescraper". The decorative high-ceilinged meeting room with its marble pillars was amply large for the 39 participants from 14 foreign countries and the approximately equal number of Polish engineers and applied mathematicians. Here the symposium was opened with greetings from the president of the Polish Academy of Sciences and the president of IUTAM. Regular contributed papers were given 15 minutes for presentation. Two longer invited papers also were delivered and were of great interest to the audience. One by Professor Olszak and Dr. W. Urbanowski summarized the very extensive earlier work on plastic nonhomogeneity which was, in the main, carried on under Dr. Olszak's guidance. The second summary paper was a presentation by M. A. Biot of his current and past work on stability problems of nonhomogeneous viscoelastic media. Extended abstracts of the 63 papers, and in some cases the complete papers themselves, were printed in advance and distributed to the participants. The organizing committee



Before the Chopin concert at Zelazowa Wola, G. Kärholm of Chalmers Institute of Technology, Mrs. and Academician N. I. Muskhelishvili of the USSR, Prof. W. Koiter of Delft, Prof. E. Stern of Brown, Prof. I. S. Sokolnikoff of UCLA.

Photos by E. T. ...

D. C. Drucker is chairman of the Division of Engineering at Brown University in Providence, Rhode Island.



essors P. G. Hodge, Jr., and W. Prager examine a map of Warsaw in front of the steps of the Palace of Culture and Science.



ter the concert at Zelazowa Wola Professors B. R. Seth of India and E. Sternberg of the USA swap stories.



the meeting room following Dr. Biot's lecture: (front row, left to right) W. Olszak of Warsaw, D. C. Drucker and W. Prager of Brown, C. Moisil of Bucharest, M. A. Biot and F. K. G. Odquist of Stockholm, and W. Koiter of Delft. E. Sternberg is in background at right.

plans to publish the complete proceedings of the symposium including some written discussion of the papers.

In addition to Dr. Biot, the American delegation included I. S. Sokolnikoff of UCLA, M. Z. Krzywoblocki of the University of Illinois, M. M. Frocht and P. G. Hodge, Jr. of Illinois Institute of Technology, I. Tolstoy of Columbia University, W. Prager, E. Sternberg, E. T. Onat, and D. C. Drucker of Brown University, and A. S. Iberall and T. D. Jayne of the Rand Development Corporation. Although the largest delegation by far, it did not appear to dominate as much by its numbers as in some of the prior IUTAM-sponsored meetings. The Russian delegation also was large. All talks given in Russian were translated into English as they proceeded. Most of the other presentations were in English with a number in French or German. Discussion was carried on in a mixture of English, French, and German without translation.

The technical importance of the subject of nonhomogeneity amply justified the holding of the symposium. As many speakers emphasized, all natural materials of practical importance are in fact nonhomogeneous in the small and are usually also nonhomogeneous in the large as well. Temperature variations which are so prominent in structural applications today add to the variation in material properties from point to point. Problems of this general class received considerable attention. Solutions to beam, plate, shell, plane, and three-dimensional problems were presented along with experimental observations. Applications of interest in physical metallurgy in both the elastic and the plastic range also were discussed. Several speakers observed that in some cases solutions for an inhomogeneous material may be simpler than for a homogeneous body and so serve to provide useful approximate answers. Both the formal and the very many informal discussions which took place gave everyone a reasonably clear over-all picture of what everyone else was doing in this area of research.

The large number of young Poles of high ability and excellent background in theoretical work was a source of repeated comment by all of the visitors. Understandably and yet unfortunately their experimental studies are limited by shortage of space and of money and by the lesser acclaim accorded such work and the fewer publications which are likely to result per unit of time. Although so little experimentation and testing is done, resistance strain gages of the wire and of the foil type are made in Poland. A number of demonstration models of both plastic and metal were strain gage instrumented in the structural laboratory of Z. Wasiutynski of the Polytechnic Institute of Warsaw.

The symposium ended officially at a banquet in Krakow at which Professor Olszak presided. The thanks of IUTAM were expressed by F. K. G. Odquist of Sweden, those of the Russian delegation by N. I. Muskhelishvili, of the US delegation by W. Prager, of the European countries by K. Hruban of Czechoslovakia, and of the Israeli, Japanese, and Indian delegates by B. R. Seth of India.