

EUROMECH 254

Transition Layers in Gases. Kinetic Theory and Experiment.

REPORT FOR THE EUROPEAN MECHANICS COMMITTEE.

The Euromech 254 Colloquium on "Transition Layers in Gases" was held in a XVII - th. century manor house (property of the Ministry of Culture and Art) at Radziejowice, 40 kilometers south-west from Warsaw, starting on August 30, till September 1, 1989. The total number of participants was 39, coming from 13 countries: Poland (13), USSR (7), West Germany (4), France (3), Italy (2), Sweden (2), USA (2), Austria (1), Bulgaria (1), Japan (1), Rumania (1), South Africa (1), Yugoslavia (1).

Two invited and 27 contributed papers were presented. The chairmen wanted to promote the exchange of opinions between theoreticians from one side and experimentalists from the other, in search of closer understanding of newly observed phenomena. However, the number of papers reporting new experimental findings was too limited to make such an exchange possible. The discussions were concerned mainly with feasibility of various theoretical and numerical approaches to solving the particular rarefied gas flow problems.

The presented papers can be divided into three classes: those on mathematical problems, those on numerical simulations and few papers on experimental results. There was no leading subject among mathematically oriented talks. However, one fact should be mentioned. Until recently mathematical theory of kinetic equations was mostly based on techniques developed in other areas of mathematics. The paper of Prof. Toscani shows an opposite directions, namely that methods developed in kinetic theory can be fruitful in theoretical mathematics. Another striking observation was that mathematicians are approaching models of increased complexity (kinetic equations with a force term, relativistic Boltzmann's equation, shock waves in kinetic models etc.). This rises the hope on rigorous solutions of complex problems of practical importance which can bring new important results, for example in transition layers problems. Numerical simulations were the most discussed topic during the Colloquium. Essentially, representatives of all important groups

working in this field in Europe were present, and a number of people from U.S.A. and Japan. Several papers dealt with different aspects of shock wave calculations and discussion was concentrated on technical aspects of different numerical approaches. Presented results showed that numerical methods can be as accurate as experimental measurements and by far less expensive. Even results for large Mach numbers are quite promising as shown in the talk of Prof. Muntz. The experimental papers, presented during the Colloquium in a limited number, were concentrated on those problems which are the most difficult for theoretical or numerical treatment, namely shock waves in complicated geometries. This is definitely the field where experimental results are still superior.

According to the opinions expressed by the participants, the Colloquium was reasonably successful. There were numerous discussions, particularly between the scientists from the West and the East, for whom it turned out to be a very good opportunity to exchange ideas. The limited participation of experimentalists in the Colloquium is connected probably with the fact, that experimental research in this field, being very expensive and time-consuming, produces less numerous papers than theory. It seems therefore advisable to promote more experimental work, as there are still many areas, where both experiment and theory are needed to understand the observed phenomena.

The Colloquium was sponsored partially by the University of Warsaw and by the Ministry of Education under grant RPI-10. Thanks to that we were able to minimize the cost of participation, which was \$100 per person and covered all the accommodation and living expenses during the Colloquium.

Andrzej Palczewski
 Andrzej Palczewski
 Co-Chairman

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