

## Scientific Report

### *Theoretical Mechanics of Combustion*

According to popular agreement of all participants at the end of the meeting, and judging from comments received subsequently, Euromech 294 proved to be more successful than I had originally hoped it would be.

My intention, when first suggesting this colloquium to the European Mechanics Council, was to fill a gap in the vast range of meetings that can already be found; despite being a sound applied mathematical or theoretical mechanical subject-area with practical applications in engineering and technology, the theoretical study of combustion actually has no niche of its own. It fits only very uncomfortably as a relatively small component within larger combustion gatherings where, unfortunately, the majority of experimental and chemical experts (or other non-theoreticians) often appear to be unconvinced of the value of theoretical work that does not simply consist of number-crunching with immediately practicable conclusions. As a result of this, combustion theorists often find it unduly difficult to have papers accepted at such broadly-based, predominantly non-theoretical gatherings.

My intention was to provide an independent meeting (or to initiate a series of such meetings) which would be dominated by discussions covering mathematical and physical modelling, solutions of relevant types of equations, new techniques and ideas, *etc.* related to the description of aspects of combustion. In fact there is already a very informal series of meetings under the title "International Workshops on Mathematics in Combustion" which have this aim. These meetings take fruit from time to time whenever a combustion theorist feels like organising one (and indeed I organised one myself in 1987 alongside an "International Colloquium on the Dynamics of Explosions and Reactive Systems" in Warsaw). Usually having about 20 to 30 participants, these meetings have most frequently been scheduled alongside larger combustion gatherings as a focal point for theoretical issues. They therefore still tend to suffer from the pre-selection of papers accepted for the larger meeting. An independent gathering can better attract contributions that are novel and inventive, or which make significant mathematical progress without yet achieving demonstrable practical results.

As well as being independent, EUROMECH 294 provided one of the first occasions when combustion theorists from eastern and western Europe could meet without political constraint. Fortunately, sponsorship by a number of organisations also managed to ease the financial constraint which would otherwise have been insuperable. A total of 13 participants from eastern Europe were able to attend.

The meeting gave rise to 38 presentations covering a good range of problems, including some experimental results. Topics covered were: ignition and extinction; detonation, from a variety of perspectives; turbulent combustion; multiphase or heterogeneous combustion; flame-front structure and dynamics; approximate model equations; flame-acoustic interaction; solid combustion and its dynamics; dimensional analysis and renormalisation; fractal examinations and scale-invariance applied to flame surfaces. Experimental research studies were described in turbulent combustion, solid combustion and in detonation. At the end of the last day, the meeting was completed with a discussion (and even demonstration) of geysers in the Kamchatka peninsula.

Presentations were scheduled to last for between 30 and 45 minutes over four days. However, many of these presentations provoked lively and interesting debates which made it difficult to keep to a strict timetable. On the other hand, this added a great deal to maintaining a "workshop" atmosphere and nobody objected to stretching the daily schedule as and when necessary.

In my opinion, it would be worth repeating such a meeting after two or three years. This would seem to be a reasonable gestation period for many new theoretical ideas, and it would be particularly interesting to see how the more adventurous work presented at EUROMECH 294 will have matured in the intervening period.

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Dear Professor Lundberg

*Report for EUROMECH*

Please find attached my report on Euromech 294. I am also sending you a copy of the report via e-mail written in  $\text{\LaTeX}$ . So, if you can process  $\text{\LaTeX}$ , you will be able to print the report quickly for yourself.

Yours sincerely

Dr. J. W. Dold