

INTERNATIONAL TRAVEL GRANT REPORT

IUTAM Symposium on Laminar-Turbulent Transition

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Michael S. Broadhurst¹, Vassilios Theofilis² and Spencer J. Sherwin¹

¹*Department of Aeronautics, Imperial College London, UK*

michael.broadhurst@imperial.ac.uk

²*School of Aeronautics, Universidad Politecnica de Madrid, Spain*

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1. Scope

A series of IUTAM symposia held over the last twenty five years at well-known centres of research in the subject - Novosibirsk, Stuttgart, Toulouse, Sendai and Sedona - has proved to be a great catalyst for research in the field of transition dynamics from laminar to turbulent flows. Currently, this field is changing significantly with several emerging directions. The scope of the sixth meeting, held in Bangalore at the Jawaharlal Nehru Centre for Advanced Scientific Research, covered the broad areas of flow instabilities and transition, including the Direct Numerical Simulation (DNS) of complex flows.

2. Contribution

My contribution to the conference was to present a paper titled, 'Spectral Element Stability Analysis of Vortical Flows'. The aim of the presentation was to highlight the recent developments made in the field of vortex stability, using a BiGlobal stability analysis coupled with a Spectral element solver. Secondly, the development of the Parabolised Stability Equation (PSE) concept to three-

dimensional vortical flows was introduced as a novel method to analyse flows with a weak dependence on the axial direction.

As the conference was organised with a very specific scope, and a select target audience, all presentations were attended by most; with my presentation well received. Although question time was limited at the end of the talk, personal communication with several of the researchers in attendance throughout the conference (including at an organised excursion) showed significant interest in the issues raised, and may lead to the possibility of a European collaboration.

The selected papers presented at the conference will be published in a book of IUTAM04 Proceedings published by Kluwer/Springer Academic Publishers. The papers are currently being reviewed by the Scientific Committee.

3. Benefits and Conclusion

One of the primary reasons for attending the conference was to introduce the PSE concept, which is regarded as the next logical development in flow stability analysis, and is considerably cheaper (computationally) than DNS. With other research groups pursuing parallel developments also presenting at the meeting, it was an ideal opportunity to place my research within a wider context. The contacts made, and the opinions gained from other researchers, should also prove to be invaluable later.

One of the issues highlighted during the conference was that implementation of the numerical methods presented, and timely publication of the results, will also significantly strengthen my Ph.D. thesis. Simultaneously, through our research group, the current standing of UK engineering in general will benefit.

4. Acknowledgements

I would like to finish by acknowledging my co-authors; Dr. S. Sherwin for his ongoing supervision and informative discussions; and Dr. V. Theofilis for suggesting the research and his excellent advice throughout. Finally, I thank the Royal Academy of Engineering for allowing this opportunity, which has been an ideal platform to demonstrate our research developments, and to hear the considered opinions of other respected authorities.