PREFACE

FIFTH CAROLUS MAGNUS EURO-SUMMER SCHOOL ON PLASMA AND FUSION ENERGY PHYSICS

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The Carolus Magnus Summer Schools are named after the emperor who, crowned in Rome in the year 800, restored civilization in most of Western Europe some 400 years after the fall of the Roman Empire. The name of the fifth edition has been modified to acknowledge the important financial support of the European Commission and underline that the primary motivation of the organizers is to back up the European and worldwide fusion energy research effort, the aim of which is to build soon an experimental reactor. Construction of such a device will no doubt modify our research priorities and provide a decisive acceleration toward our goal: environmentally acceptable commercial energy production by controlled thermonuclear fusion of deuterium and tritium nuclei in magnetic traps, before the inevitable energy crisis of the 21st century and irreversible climatic modifications have set in. Realizing this goal may be the most urgent challenge today's civilization has to face.

The biennial Carolus Magnus school, organized by the three research institutes now grouped into the Trilateral Euregio Cluster (TEC), took place previously in Vaals, The Netherlands (1993); Aachen, Germany (1995); Spa, Belgium (1997); and Maastricht, The Netherlands (1999)—all cities close to the capital of Charlemagne's empire, Aachen. It moved this year to Bad Honnef, a small town along the Rhine river, where the German physical society runs a beautiful old mansion housing the Physikzentrum. Unlike most summer school programs elsewhere, ours is both targeted to graduate and postgraduate students and dedicated almost exclusively to the study of plasmas in magnetic confinement fusion devices. That research area indeed is multifaceted, combining the conditions prevailing in the stars and in low-temperature technological plasmas, since controlled fusion requires extreme properties—"close to operational limits"—of the plasma core, on the one hand, and the very concept of magnetic confinement implies the presence of a vacuum vessel, wall-plasma interactions, specific boundary conditions, and gradients perpendicular to the flux surfaces, on the other hand. The school has evolved since its inception: the program has been progressively updated and improved, taking recommendations from the successive waves of participants into account; most lecturers have revised their contribution; specialists from other associations have been invited for specific lectures. For those reasons, the organizing committee is satisfied that the proceedings of the Carolus Magnus Schools are printed biennially as a special issue of *Transaction of Fusion Science and Technology*. We are also very pleased with the fact that they are used as textbooks or books of reference for courses given at various European and American universities. Having been involved in the organization of all schools hitherto, I personally would like to thank here all the lecturers present and past for their continuous didactic effort in both their oral and written presentations.

The organizers and most participants are indebted for the strong support of the sponsors who are listed on a separate page. Young researchers who are nationals of the European Union or the Associated States received full funding from the Human Potential Programme of the European Commission, Research Directorate-General. Students in Russia and Ukraine were supported by the Deutsche Forschungsgemeinschaft. Finally, other sponsors' contributions have allowed us to support foreign students pursuing PhD studies in European Union universities or working in one of the three TEC associations and to fund the participation of students from developing countries. Out of a total of 49 participating students, 14 are working or studying in the organizing countries,

19 are active in other parts of the European Union or the Associated States, 7 came from the New Independent States, 4 are from South Asia, and 5 are pursuing their PhD work in the United States. The energy problem is a world-scale one, and the realization of fusion is a world-scale challenge and promise. Therefore, we consider it to be highly opportune to provide the possibility of contacts among young researchers from all around the world; the sponsors' contributions have allowed us to maintain this time again that essential feature of our summer school: its international character.

I also wish to thank the guest lecturers from outside the organizing Euregio institutions: D. Bartlett, in replacement of H. Bruhns, both from the European Commission Research Directorate-General in Brussels; K. Grassie from the Philips laboratory in Aachen; D. A. Hartmann from the Max-Planck-Institut für Plasmaphysik, EURATOM Association, in Garching; P. Hennequin from the Ecole Polytechnique in Palaiseau; G. Janeschitz from the ITER EDA Joint Central Team in Garching; and H. R. Wilson from the EURATOM/UKAEA Fusion Association in Abingdon—they have brought to our summer school the final touch of quality.

Last but not least, I personally would like to thank all of my coorganizers during the preparation of the past five summer schools for the exceptionally good collaboration that has always prevailed. They are, starting with the pioneers: Tony Donné; Raymond Koch; Luc Ornstein; Henning Soltwisch; Guido Van Oost; and lastly Dirk, Egbert, and Karl-Heinz (who, in his capacity of scientific secretary, played a particularly active role in the setting up of this school)—those will continue to carry the torch; I wish them great success with the Sixth Carolus Magnus (Euro-) Summer School two years from now in Brussels.