Preface

Imre Pázsit

Division of Nuclear Engineering,
Chalmers University of Technology,
S-412 96 Göteborg, Sweden
Email: imre@chalmers.se

Biographical notes: Imre Pázsit is Professor at the Division of Nuclear Engineering, Chalmers University of Technology, Göteborg, Sweden, and an Adjunct Professor at the Department of Nuclear Engineering and Radiological Sciences, University of Michigan, Ann Arbor, USA. His research interests are deterministic and stochastic theory of neutral and charged particle transport, with applications to zero power reactor noise theory, detection statistics and nuclear safeguards; dynamics and noise diagnostics of current and future power reactors, two phase flow and fusion plasmas. He is a Fellow of the American Nuclear Society and a member of the Royal Swedish Academy of Engineering Sciences (IVA).

This volume of the *IJNEST* contains a selection of papers from the proceedings of the Sweden-Japan Joint Colloquium 'Nuclear Energy and Nuclear Applications', held on 13–14 October 2011 in Gothenburg, Sweden. The colloquium was sponsored by the Japan Society for the Promotion of Science (JSPS), and was organised by Chalmers University of Technology and the JSPS Stockholm Office. The venue of the conference was the historic building Chalmersska Huset in Gothenburg, where the founder of Chalmers, William Chalmers, lived in the early 18th century.

Six senior scientists and two PhD students from Japan attended the colloquium, the senior scientists being invited plenary speakers. The PhD students had their presentation in the poster session. Another seven invited Swedish speakers made up the total number of oral presentations to 13.

The colloquium was originally planned as a general scientific exchange meeting on the application of nuclear techniques in engineering and medicine, but the Fukushima accident happened just when the planning of the conference programme was started. It was obvious that a colloquium on nuclear science and engineering with Japanese participants could not be held without including an analysis and discussions on the implications of the accident. Several of the already invited Japanese speakers changed their original topics in order that the Fukushima event be reported and analysed. Hence the colloquium naturally focused on the incident, with the Japanese lecturers commenting on its scientific ramifications and on the lack of adequate tsunami countermeasures. Some also spoke about their first-hand experiences of engaging in post-disaster response activities in the affected area over the past half year. From the Swedish side, presentations were given on such topics as the country's adoption of EU stress tests prompted by the Japanese plant failure.

The colloquium was divided into four sessions plus two poster sessions. The four oral sessions were as follows:

- Fukushima – the event and its implications
- Radiation – biological effects and its applications
- Core physics, thermal hydraulics, stability and safety
- Spent fuel disposal, new fuel cycles and safeguards

The colloquium was opened by the first vice president of Chalmers, Prof. Mats Viberg, and the opening talk was given by Prof. Hiroshi Sano, Director of the JSPS Stockholm Office, on the role and activities of the JSPS. In the first session, Prof. Akio Yamamoto of Nagoya University spoke about the impact of the earthquake and the tsunami on the plant integrity. Information is being collected on the evolution of the accident sequence, but it is clear that the multiple barrier system against release of radioactivity to the environment, i.e. fuel cladding, pressure vessel, containment and reactor building, failed. The lessons learned in order to improve the safety of power plants were discussed. Dr. Oddbjörn Sandervåg of the Swedish Radiation Safety Authority told about the measures that were taken in Sweden and other European countries, the so called 'stress tests', to improve accident management to protect plants from loss of core cooling. Prof. Masaharu Kitamura of Tohoku University discussed the Fukushima accident from the perspective of resilience engineering. He stressed the failure to learn from the previous accidents such as the Three Mile Island and Chernobyl and discussed the possibilities of dynamic controllability of a system against unexpected disturbances.

The second session concerned the biological effects and use of ionising radiation, with a focus on Fukushima. Prof. Eva Forssell-Aronsson of the University of Gothenburg talked about the medical use of radiation for diagnosis and therapy and the related radiation safety aspects. She also included an account of her experience with visiting the Fukushima site and the knowledge base acquired from the Chernobyl and Fukushima accidents. Prof. Tomoko M. Nakanishi of the University of Tokyo lectured on the application of nuclear techniques, such as radioisotopes for real-time imaging in plant biology research. She also talked about the investigations she and her research team conducted on the agricultural consequences of the Fukushima accident. She found that the contamination affected only the uppermost few centimetres of the soil and that radioactivity uptake by the plants from the soil was surprisingly low. Her and her group's findings were cited in international journals such as *Nature News* and the *Los Angeles Times*. It can be added that an edited book by Prof. Nakanishi on the agricultural implications of the Fukushima nuclear accident was recently published by Springer. Prof. Lembit Sihver, Chalmers, talked about his research on heavy ion therapy and space dosimetry, and his collaboration with Japanese colleagues. Dr. Yukio Uchihori of the National Institute of Radiological Sciences, Chiba, told about his research on heavy ion beam cancer therapy, as well as on the work for radiation protection of the Fukushima nuclear power plant and the personnel involved.

The three papers presented in the third session on core physics, thermal hydraulics, stability and safety by Profs. Christophe Demazière of Chalmers, Makoto Takahashi of Tohoku University and Tomasz Kozlowski, then Royal Institute of Technology, Stockholm, now at the University of Illinois, USA, concerned multi-physics modelling of reactors, boiling water reactor (BWR) operator training and BWR stability, respectively. These three papers are included in full in this issue and will not be discussed here in more detail.

The last session contained three papers. Dr. Olle Olsson of the Swedish Nuclear Fuel and Waste Management Company talked about the Swedish strategy on waste disposal and the Swedish facilities including the final repository. The talk of Prof. Tsuyoshi Misawa, Kyoto University Research Reactor Institute (KURRI), concerned the experiments performed on the KART Accelerator Driven Subcritical system (ADS) of KURRI, the first operational ADS worldwide, for supporting new fuel cycles and new reactor concepts. He also described the laboratory exercises that Swedish students performed on the critical assembly KUCA of KURRI, after 2005 when the two last research reactors in Sweden were closed down. The final talk was given by Prof. Imre Pázsit, Chalmers, the conference chairman, on nuclear safeguards and methods for detecting hidden sources and quantifying spent fuel.

In the two days of the conference two poster sessions were held, with posters on reactor physics, thermal hydraulics, fusion physics and safeguards. In the first evening a conference banquet was held for the invited lecturers.

As usual with JSPS arrangements, the colloquium was open to the public, and it was well attended by about 60 interested members of the academic community. The colloquium was generously sponsored by JSPS, among others supporting the participation of the six senior Japanese speakers. The organisational and administrative help from the staff of the JSPS Stockholm Office, Prof. Hiroshi Sano, Yuko Kamoshita, Lisa-Mi Swartz, Kazutoshi Ono, and Naomi Yoshizawa is gratefully acknowledged.