FOREWORD

SPECIAL ISSUE ON THE INITIAL RELEASE OF MCNP6

Guest Editor

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This special issue of *Nuclear Technology* features four papers on topics relating to the newly released Monte Carlo N-Particle version 6 (MCNP6) radiation transport code, the result of six years of merging MCNPX into MCNP5. MCNP6 Beta 2 was released in February 2012, and MCNP6 Beta 3 was frozen in June 2012 for subsequent release. The plan is that the Beta 3 release contains all the capabilities found in the production release.

The first paper in this special issue, "Initial MCNP6 Release Overview," presents an overview of MCNP6: its development and release history; new geometry, physics, tally, and variance reduction capabilities; the underlying physics models and nuclear and atomic data; and discussions on the confidence in the code's accuracy. The second and third papers in this issue focus on two of these new features. "MCNP6 Unstructured Mesh Initial Validation and Performance Results" discusses the new ability for MCNP6 to read unstructured mesh geometry and associated materials from the commercial finite element code Abaqus. While many MCNP users will be interested in the multiphysics analysis now possible (e.g., radiation-induced melting and thermomechanical deformation), many more will simply be interested in the ability to import mesh geometries created by computer-aided design/computer-aided engineering tools into MCNP. The next paper, "The MCNP6 Delayed-Particle Feature," discusses MCNP6 delayed neutron and gamma capabilities and validation efforts. The fourth paper, "MCNP Variance Reduction Developments in the 21st Century," is an overview of methods implemented since 2000: pulse-height tallies, nested dxtran spheres, precollision and next-event estimators.

In my mind, these papers are proof that MCNP maintains an ongoing and vibrant development. Our endeavors develop new, robust, and valuable methods and features for our diverse user community. Our active user base continues to grow and to use our code for the betterment of society. I also believe that MCNP has a bright future. We strive to extend physics, parallel capability, variance reduction methods, and more. I am particularly fond of three new capabilities: the aforementioned mesh capability, an On-The-Fly Doppler cross-section broadening for temperature effects, and a continuous-energy cross-section sensitivity k_{eff} analysis tool. The latter two are described on our mcnp.lanl.gov website.

What will MCNP look like in its second 35 years? I cannot say. But, I do know that it takes a creative, dedicated staff to achieve what we have so far, and they should be applauded for it. I especially wish to thank the longtime staff members who have recently retired: Tom Booth, Art Forster, John Hendricks, Denise Pelowitz, Dick Prael, and Laurie Waters. Together they have devoted more than 150 person-years of effort to MCNP. Finally, we appreciate and acknowledge the funding from the U.S. Departments of Energy (principally, Advanced Scientific Computing Research), Defense, and Homeland Security, and ultimately, the U.S. taxpayer.