

Editorial Preface

This is the inaugural volume of the journal *Reviews of Accelerator Science and Technology*.

Particle accelerators are a major invention of the 20th century. From the first linear accelerator built by Rolf Wideröe in an 88-cm long glass tube in Aachen, Germany, in the 1920s to the latest gigantic 27-km circumference deep-underground *Large Hadron Collider* at CERN in Geneva, Switzerland, particle accelerators in the last nine decades have evolved enormously and fundamentally changed the way we live, think and work.

Accelerators are the most powerful microscopes for viewing the tiniest inner structure of cells, genes, molecules, atoms and their constituent protons, neutrons, electrons, neutrinos, quarks, and possible still undiscovered even more fundamental building blocks of the universe such as dark matter and dark energy. Accelerators are a time machine bringing us back billions of years to the first few milliseconds after the *Big Bang* at the creation of our universe.

They are the brightest light sources man has ever made, allowing us to take crystal clear images at the angstrom scale ($1 \text{ \AA} = 10^{-10}$ meters) with femto-second resolution ($1 \text{ fs} = 10^{-15}$ seconds). This opens up a whole new world for material science, chemistry, molecular biology and life sciences.

Spallation neutron sources are another invaluable tool provided by accelerators for advanced science and technology. Accelerators with megawatt beam power may ultimately solve a critical problem facing our society, namely, the treatment of nuclear waste and supply of an alternative source of energy.

In addition to scores of large accelerators, there are also tens of thousands of smaller accelerators throughout the world. They are used every day for medical imaging, cancer treatment, design of new drugs, radioisotope production, fabrication of semiconductors and high-density microchips, mass spectrometry, cargo x-ray and gamma-ray imaging, detection of explosives and illicit drugs, and detection of illegal trafficking of nuclear materials. Commercial industrial accelerators have a global market with annual sales of multi-billions of dollars and rapidly growing.

Furthermore, in the course of building larger and more complex accelerators, technologies have been pushed to an extent never imagined before — large volume ultrahigh vacuum, large scale superfluid helium application to cryogenics, superconducting magnets, superconducting radio frequency systems, high power microwave devices, radiation-hard materials, global control systems, advanced instrumentation and diagnostics, super-fast computing and communication networks, and giant data storage and processing systems.

The goal of this new journal, *Reviews of Accelerator Science and Technology* (RAST), is to give readers a comprehensive review of this driving and fascinating field. RAST will document the tremendous progress made in this field in the past decades and describe its bright future. RAST will cover a wide range of topics, including linear and circular accelerators, high beam power accelerators, high brightness accelerators, synchrotron light sources, free electron lasers, medical accelerators, accelerators for industrial applications, advanced accelerator technologies as well as promising new breakthroughs up to the most recent research frontiers.

In order to produce a journal of the highest quality, an Editorial Board consisting of distinguished scientists has been formed. This Board advises the Editors on the long- and short-term planning of the journal, and selection of topics and prospective authors of each volume.

Articles are by invitation only. Each article will be written by one or more leading scientist with recognized authority in their fields and will be peer reviewed. Beginning in 2008, one volume will be published each year. The first volume is an overview of various types of accelerators across the entire field. Each of the later volumes will focus on one or two particular type of accelerators and present in-depth discussions and analysis.

The first volume consists of fourteen articles. The first article lists the milestones in this nearly century-long journey of particle accelerators. The following seven papers describe various types of accelerators, including electron linear accelerators, high power hadron accelerators, cyclotrons, colliders, synchrotron light sources and free electron lasers, medical and industrial accelerators. Three papers introduce advanced accelerator technologies: superconducting magnets, superconducting radio frequency systems and beam cooling. There is a comprehensive review article on the rise and fall of the Superconducting Super Collider (first part; the second part will be published in Volume 2) and an article on the evolution, growth and future of accelerators and the accelerator community. There is also a book review of a new biography of Pief Panofsky.

In addition to these review articles, this volume also includes a poster titled *A Brief History of Particle Accelerators*. The 30 landmark events from 1919 to 2008 selected highlight the dramatic historical movement in the accelerator world.

The efforts required from the community as a whole to initiate and nurture a new professional journal will not be small. We firmly believe that a high quality journal is a demonstration of the identity of our community and of its importance to society and all of science. We are confident that with an excellent Editorial Board, strong support of the accelerator enterprise and active feedback from the readers, this publication will become an authoritative review and a major vehicle for the dissemination of accelerator science and technology to the global scientific, academic and industrial communities.

Alexander W. Chao

Stanford Linear Accelerator Center, USA
achao@slac.stanford.edu

Weiren Chou

Fermi National Accelerator Laboratory, USA
chou@fnal.gov

Editors