

Synchrotron Radiation in Research and Clinical Medicine*

William Thomlinson

National Synchrotron Light Source, Brookhaven National Laboratory, Upton, New York, USA

The application of synchrotron radiation to research and clinical medicine generates a lot of interest because it deals with some of today's most fundamental and important medical problems. Thus, it is easy to relate to the research, which has exciting potential for advancements in the field of medicine. This talk will give an overview of significant developments in the field from the pioneering Transvenous Coronary Angiography projects to computed tomography, micro-planar beam radiation therapy, and diffraction enhanced imaging (DEI) for mammography. Most of the medical programs use or have used phantoms and animal models. However, there have been human coronary angiography studies at SSRL, NSLS, Photon Factory, and an on-going major pre-clinical trial at HASYLAB. Operation of the ESRF Medical Research Facility and the mammography beamline at ELETTRA promise a significant increase in efforts over the next few years. Medical research is also planned at SPring-8. During the past year, interest has developed at a number of laboratories in mammography imaging using diffraction-enhanced imaging. Originally developed at the NSLS, DEI experiments have already been carried out at APS, ESRF, and ELETTRA, and a program is being planned at Daresbury Laboratory. All of these efforts are developing new techniques using synchrotron radiation as a "gold standard" x-ray source. Independent of success as research programs at synchrotrons, some of the techniques may never advance to routine clinical use. Synchrotrons, unless available in truly compact size, are too costly and access is very limited. The synchrotron medical community has to find the balance between unique utilization of the large machines for research and clinical applications and the need to expand the techniques into clinical and hospital environments. Efforts are underway to develop compact sources based on synchrotron and other technologies.

*Work supported by the US Department of Energy under Contract # DE-AC02-CH10886.