RELEVANCE OF LINACS

by

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May I add my welcome to those already extended and express the hope that this Conference will be useful and also enjoyable.

A large part of the world is presently in technological turmoil as we bestir ourselves to the tasks of halting the deterioration of our environment while increasing our rate of energy utilization and providing to the many an opportunity to enjoy the amenities and comforts which technology now makes possible.

It is science which gives birth to our wealth of technology. This technology can be used or misused; it can bring to us all great comforts or great sorrow; it can serve as stepping stones for further understanding of science or for misunderstanding of science. At the present time technology is all too prominent in the latter role. And the fault is largely ours, for we have not fulfilled our role of teacher, teacher to those millions who never see a laboratory and never know a scientist.

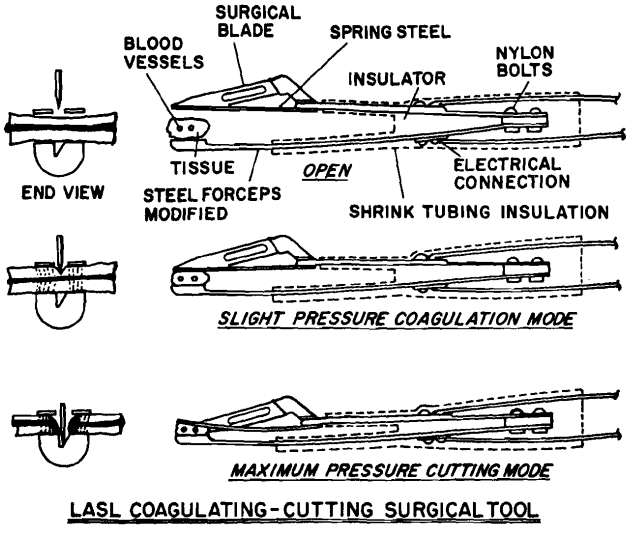
But even teaching, by word alone, is not enough. I think it is clear that we must continuously provide and display examples of how science and technology can and do enrich the lives of all people and how they may be used to preserve the goods of this planet for our children and their children. And that is where you come into the picture. I talk to you as distinguished representatives of the community of accelerator builders, that dedicated and ingenious group which can solve almost any problem, provided the solution is not contrary to the laws of Nature.

Let those devoted to basic science take the lead in learning about the pion-pion scattering length, but you should take the lead in collaboration with biologists and therapists and pathologists, in devising means to use pions in the treatment of cancer. Let the basic researchers show the way to understanding the neutron-proton interaction, in all its glory; but you should take the lead, with some help from them, in using neutrons to solve the problems of radiation damage to fuel elements and structural components of fast breeder reactors (and eventually fusion reactions), a problem so vital to assuring a future supply of clean energy. Let the radiochemists delve into the mysteries of nuclei of great mass or far from the line of stability; but you can discover how to produce radioisotopes cheaply and safely and abundantly for use in medicine and agriculture and industry. Let the physicists push towards the limits of validity of quantum electrodynamics by study of muonic atoms and muonium; but why not also use these systems to understand chemical structures or in diagnostic medicine. It can be done. I am convinced.

The point I have tried to make is that our community of accelerator builders has the skills and competence to fashion technology not only to build accelerators, but also to put to practical use the very same particles which their accelerators generate. And sometimes the technology is useful even without the particles. Look for example at vacuum technology and computer technology and superconducting technology. I show you Fig. 1, which is an electrosurgical tool developed by Dr. Edwards, a prominent and gifted surgeon at the UNM Medical School, in collaboration with Doss and McCabe, whose skills are now part of LAMPF. This simple device reduces the time for arterial transplants in a very significant way.

Let us be a bit more specific and talk, for a moment, about linacs, which is after all the subject of our conference. Figure 2 shows the diversity and breadth of one of the programs currently under way with electron linacs. And even more powerful electron linacs, from the standpoint of utility, are now possible, some nearing completion.

Although the best known proton linacs are perhaps those that feed our great synchrotrons, these represent a small fraction of the total, as can be seen from Fig. 3, courtesy of Mrs. Kay Karper who contacted some of you for assistance in constructing this map. You are populating the USA, at least, with your brainchildren, and all are being used to good purposes, most of them to facilitate medical treatment of one kind or another. But a goodly number are already being used to provide better materials for our high technology economy; and a few to help extract from nature its well-kept secrets, so that we can better understand ourselves and our surroundings and live more harmoniously within both.



LASL COAGULATING-CUTTING SURGICAL TOOL

Figure 1

UTILIZATION OF THE NBS LINEAR ACCELERATOR

	Past	Present	Future	
Neutron	X	X	X	Fast n total cross section time-of-flight measurements
		X	X	keV n total cross section time-of-flight measurements
	X		X	Fast neutron fission yields
		X	X	Development of neutron flux standards
			X	Neutron capture cross section studies
			X	Fast neutron activation analysis
Medical	X	X	X	Electron and photon beam dosimetry
	X			Pulsed radiolysis of biochemical systems (DNA)
	X			Thick target bremmstrahlung studies
Nuclear Physics	X	X	X	Fission product yields
	X	X	X	Electron scattering
	X	X	X	Electrodisintegration of light nuclei
			X	Monoenergetic photon beams (positron annihilation)
		X	X	Monoenergetic polarized photons
Other	X	X	X	Photon activation analysis
	X			Pulsed radiolysis of dye dosimeters
			X	Radiation induced rates of 2nd order chem. reactions in gases
	X			Spallation reaction studies
			X	Dosimetry and dose distribution studies with radiochromic dyes
	X	X	X	Electron and photon beam measurement standards
	X			Production of mossbauer spectroscopy sources
	X		X	Transient beam loading studies
	X	X	X	Production of radioactive sources (general)
	X			Residual radioactivity studies
	X	X	X	Development of basic accelerator instrumentation

Figure 2

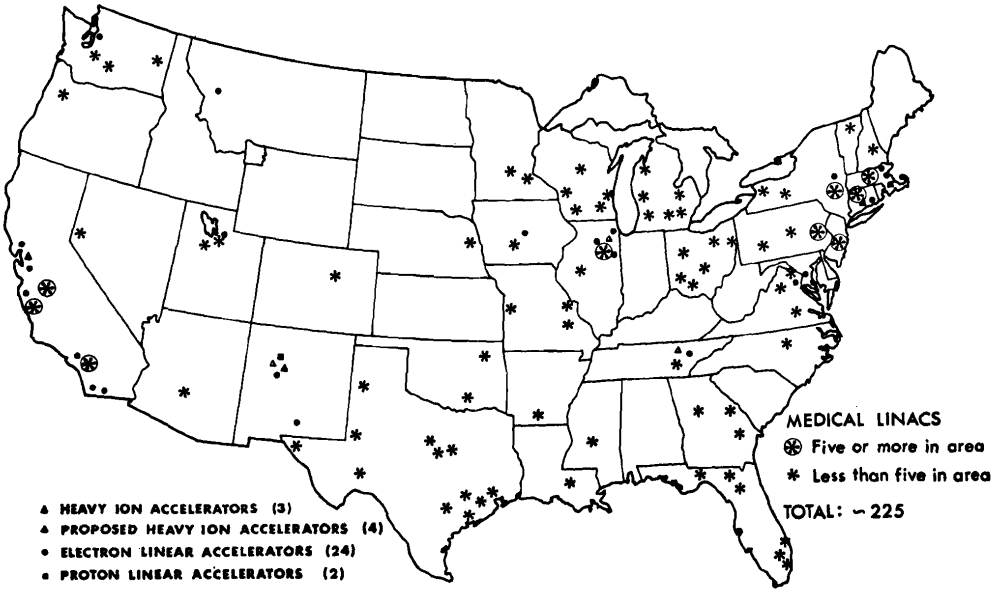


Fig. 3 Geographical Distribution of Linacs in the United States