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A Newsletter for those interested in proton, light ion and heavy charged particle radiotherapy.

Number 1 February 1988 Editor: Janet Sisterson Ph. D., HCL

This is the first issue of a newsletter devoted to matters of interest to all those involved, or planning to become involved in proton, light ion or heavy charged particle radiation therapy. It is anticipated that there will be two issues of this newsletter per year, in June and January. The exact form that this newsletter takes depends on us all; this is a great medium to exchange information, ideas, news of recent developments and events in our quest to have these modalities more available to the general public.

For this first newsletter, fifteen institutions were contacted and asked for their recent news; replies were received from seven. For the next issue, let's see if we can't do better. The information sent to me for inclusion in the newsletter does not have to be extensive but it should be "camera ready" if possible so as to minimize editorial hassle. Graphs and line drawings are welcome.

Deadline for the next newsletter will be May 31 1988. Address all correspondence to Dr. Janet Sisterson, Harvard Cyclotron Laboratory, 44 Oxford Street, Cambridge, MA 02138. Telephone (617)495-2885 or send mail to me via the VAX computer at BITNET%"SISTERSON@HARVHEP".

NEXT PTCOG MEETING - APRIL 7,8,9 1988

The next PTCOG meeting, to be held at TRIUMF, will be in Vancouver on Thursday and Friday April 7 & 8 1988. A Clinical meeting will be held at the Four Seasons Hotel in Vancouver on Saturday April 9 1988, sponsored by TRIUMF and the Cancer Control Agency of B. C. This clinical meeting is primarily designed to inform radiation oncologists, neurosurgeons, ophthalmologists and others in Canada of the potential value of proton beams.

George Goodman notes that Vancouver is one of the most choicely located cities in the world and is probably at its most beautiful in the spring. Spring skiing should be at its peak at nearby mountains.

The official word on this meeting should be coming from Michael Goitein any minute now. Unofficially, I can say that there will be rooms reserved at a special rate at the Four Seasons Hotel in downtown Vancouver; the rates (all Canadian $) are likely to be $90 for a single or double room, $125 for the Four Seasons room and $145 for the Deluxe Four Seasons room. The agenda for the clinical meeting on Saturday, includes speakers form Harvard, TRIUMF, Berkeley and Lausanne Switzerland.

For more information contact your PTCOG secretary Michael Goitein or George Goodman, Cancer Control Agency of British Columbia, 600 West 10th Ave, Vancouver B. C. Canada V5Z 4E6.

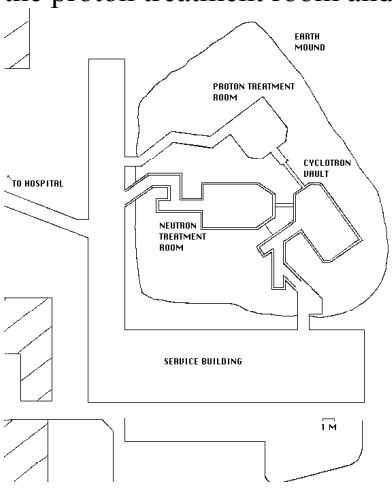
PTCOG NEWS

The following information was received by the end of January 1988.

Rush-Presbyterian - St. Luke's Medical Center in Chicago, Illinois has been conducting a feasibility study for a proton and neutron therapy center. The proposed center's neutron therapy would replace the practice currently at Fermilab. Other medical centers in the city have expressed interest in making the project a cooperative venture. *Roger Kruger, Nuclear-Oncology, S. C., 1725 West Harrison - Suite 802, Chicago, Illinois, 60612.*

At the **National Accelerator Center, South Africa**, the first 200 MeV proton beam was obtained on March 4 1987. This year will be devoted to designing and drafting the horizontal 200 MeV beam line. This will require the manufacture of a carousel of scatterers for fields from 5 cm in diameter to 30 or 40 cm diameter, measurement of the resultant beam profile and depth-dose curves and manufacture of the SOBP devices/s. *Vic Levin, Department of Radiotherapy, Groote Schuur Hospital, Observatory 7925, South Africa.*

At the **MRC Cyclotron Unit, Clatterbridge Hospital, Merseyside, England,** funding for the project using the horizontal 62 MeV proton beam to treat uveal melanomas was obtained by April 1987. This funding came from several national charities,, notably the ICRF (Imperial Cancer Research Fund) and in May 1987 the building of the proton treatment room commenced. The building work was completed in October 1987, see the plan. There is enough room to house a vertical beam, if it might be wanted in the future. At present, various cables and services are being installed together with a beam shutter between the proton treatment room and the cyclotron vault.



The installation of the beam line will commence after the delivery of the main quadrupole magnets, which is hoped to be in January/February 1988. Meanwhile, the construction of a stereotactic chair

(based on the design at SIN) has begun and the SIN version of Michael Goitein's planning program has been installed successfully on a DEC MicroVax II. *David Bonnett, MRC Cyclotron Unit, Clatterbridge Hospital, Bebington, Merseyside L63 4JY, England.*

The principal thrust of **Fermilab work on the Loma Linda project** in the last quarter of 1987 has been directed toward accelerator component procurement and fabrication, preparation of space for accelerator assembly and the development of a dedicated team for the design of hardware and software for the beam delivery systems.

The main accelerator magnets and their alignment stands have been fabricated and are currently being measured and magnet shims are being applied for final field corrections. The vacuum chambers have been fabricated, vacuum baked and leak tested. Final complete assembly of these components is expected in January. All of the other ancillary magnets for injection extraction and corrections are being fabricated.

The synchrotron RF system components are being assembled and will be completed by March 1988. A series of decisions have been reached which match the dispersion at injection as well as □'s and □'s to the relevant synchrotron parameters. This changes the layout of the injection system as well as the design of some of the injection components. These modifications are currently being made to all design drawings and specifications.

The machined parts for the injector RFQ have been mechanically measured and accepted. Testing will proceed through February 1988. The RF drive amplifier for the RFQ is being built by Micro Wave Controls Corporation.

A design and development team consisting of George Coutrakon, Jon Slater, David Lesyna and James Nusbaum has started detailed design and planning work for the nozzle development program. The design reports are in preparation and are being distributed for information and review as sections are being completed.

Science Applications International Corporation (SAIC), the firm selected by LLUMC as the Industrial Partner has completed specifications for all power supplies for the accelerator and the beam transport system. Proposals and bids for these components are presently being prepared by vendors.

A gantry structure has now been selected and detail fabrication drawings together with stress and deflection analyses are underway. SAIC is also furnishing software support for the nozzle development team and are helping coordinate the design of computer networking for all associated computer systems. *Phil Livdahl, Fermilab, P. O. Box 500, Batavia, Illinois 60510.*

The **Gustaf Werner Cyclotron in Uppsala, Sweden**, pioneer in proton therapy in the 1950's and 60's is now back on the stage. This happens after ten years of reconstruction and extension of the associated

experimental and clinical research facilities. Proton beams of 45 - 200 MeV, ≤ 10 □a became available in the Fall of 1987, and are now subject to pre-clinical tests. Patient treatment, on a part-time basis, is foreseen to start in September 1988, in two treatment rooms, one dedicated to small ocular and intracranial targets, one to larger malignant tumors.

The name Gustaf Werner is still tied to the cyclotron but the Institute GWI has been renamed and divided into a University unit for basic and applied research, the Department of Radiation Sciences (ISV) and a national accelerator laboratory, The (=Theoder) Svedberg Laboratory (TSL). The clinical responsibility still rests mainly on the departments of oncology and neurosurgery at the close-by Academic Hospital in Uppsala and the department of neurosurgery at the Karolinska Hospital in Stockholm. *Borje Larsson, Gustaf Werners Institut, Uppsala University, Box 531, S-751, Uppsala, Sweden.*

Last November, the **Institut Gustave Roussy, Villejiuf** and the **Institut Curie, Paris** made a series of measurements which confirmed that this proton beam would be well suited for clinical use, not only for small tumors (e.g. eyes) but also for large tumors (e.g. head or abdomen). The modifications that would be needed to the present beam line are relatively simple and include provision for preabsorbers to degrade the Bragg peak, collimation, localization systems and patient immobilization systems.

Preliminary results show that the depth of the Bragg peak of the 200 MeV proton beam is the order of 26 cm in water. The beam is still rather contaminated with neutrons and the entrance dose is rather high but it is felt that this can definitely be improved (Figure 1). To simulate the eye treatment conditions, the beam was degraded to 85 MeV using 12 cm of graphite; depth of penetration was around 6 cm of water and the beam diameter was 3 cm (Figure 2).

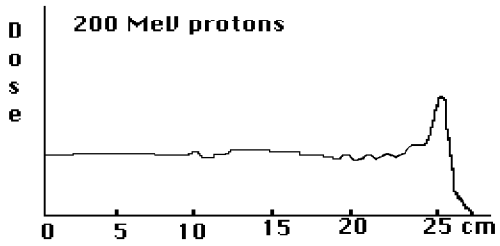


Figure 1

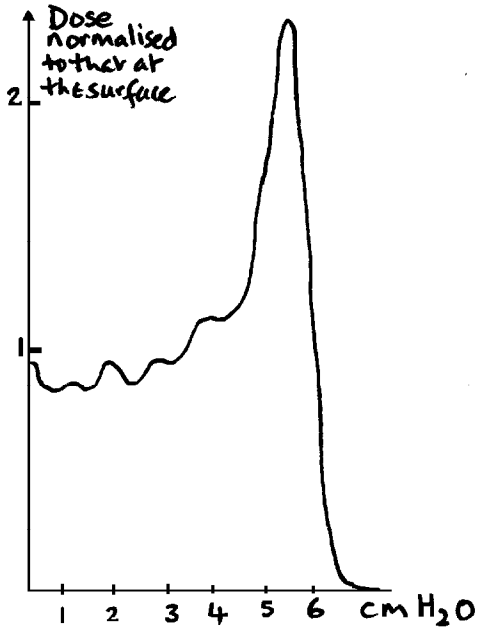


Figure 2

As no more basic physics research is scheduled at the Orsay synchrocyclotron after later 1989, it will close unless the interested parties can raise the necessary funds to keep the machine alive for medical applications. Given these encouraging preliminary data, the two Instituts hope that they will be successful in their fund-raising efforts. *Jean-Louis Habrand, Institut Gustave Roussy, Villejuif, 22 Rue de Nerdun, 92150 Suresnes, France.*

At the **Harvard Cyclotron Laboratory**, the new eye treatment station designed expressly for treatment of eye tumors was put into service on 6 July 1987. "Beam 1.5", as it is affectionately known, branches off our original clinical line, Beam 1, but delivers beam into the same cave. Eye treatment apparatus is now entirely independent of the neurosurgical apparatus in Beam 1 eliminating frequent changes and permitting more sophisticated design to be implemented. Thus Beam 1.5 includes the use of range modulator wheels produced by the computer controlled milling machine resulting in superb depth-dose profiles; there is much better CCTV monitoring of the position of the eye; and the patients' chair has also been improved. The next step is to re-examine the design of the head holder system.

Another change has been to install a remote control system to change the configuration of the proton nozzle double scattering system and display its condition. The change from 20 cm field capacity to 30 cm capacity is now made in a few seconds, saving several minutes of operator time and reducing chance of error. Provision has been made for another field capacity to be added as needed.

A comprehensive set of measurements of multiple coulomb scattering through various target materials and thicknesses has been made, and the results were reported briefly at the last PTCOG meeting. These measurements lead into the design of an upstream range modulator and absorber system to remove these beam modifying devices from the treatment room. Bernie Gottschalk has been developing computer programs that explore in great detail the design of such systems.

Some neutron dose measurements have been made to explore the possibility of increasing the shielding between beam areas to permit concurrent treatments in the two treatment rooms. *Andy Koehler, Harvard Cyclotron Laboratory, 44 Oxford Street, Cambridge, Massachusetts 02138.*

Note:-
Thanks to Roger, Vic, David, Phil, Borje, Jean-Louis and Andy for their contributions for this issue, but I need more. ***Please,*** correspondents, for this newsletter to be a useful communication tool for us all, **SEND ME YOUR NEWS!**

RECENT PUBLICATIONS

Often some of the most pertinent information that we need is hidden in an institution's internal reports. To help spread the word, I will include titles of relevant documents here and for starters this is a list of recent reports at HCL.

B. Gottschalk, "Drift tube length and frequency range in the proton therapy synchrotron", HCL internal report PTA 10/8/85.

B. Gottschalk, "Statistical measure of beam emittance", HCL internal report PTA 10/25/85.

B. Gottschalk, "Double-scattering system with optimum dose uniformity in proton radiotherapy", HCL internal report PTA 8/1/86.

B. Gottschalk, "Design of a hospital-based accelerator for proton radiation therapy; scaling rules", Nucl. Instr. Meth. **B24/25** 1092 (1987). Long version: HCL internal report PTA 10/1/86.

B. Gottschalk, "Proton therapy accelerators: an eye machine and a general-purpose machine", HCL internal report PTA 3/8/87.

B. Gottschalk, "Proton radiotherapy nozzle for combined scatterer/modulator", HCL internal report PTA 9/1787.

B. Gottschalk, "Efficient use of the dose flatness monitor", HCL internal report PTA 1/22/88.

A. M. Koehler, "Preliminary design study for a corkscrew gantry", HCL internal report (1987).

M. S. Z. Rabin, "A short note on x-y phase space mixing", HCL internal report PTA 4/8/87.

M. S. Z. Rabin, "The effects of misalignments and displacements on the corkscrew gantry beam", HCL internal report PTA 6/18/87.

I will also include lists of recent publications or reproducible reports that you send me. As we don't want this Newsletter to become too large, neither of these items should be too long.

WORLD WIDE CHARGED PARTICLE PATIENT TOTALS

The following institutions are/were active in the treatment of patients with protons, pions, light or heavy ion beams. At this time (February 1988), Los Alamos is closed for ever; Uppsala, after a long shut down should be re-opening soon.

INSTITUTION	LOCATION	TYPE	DATE FIRST RX	CURRENT PATIENT TOTAL	DATE OF TOTAL	
Berkeley 184	CA. U.S.A.	p	1955	30	1957	
Berkeley 184	CA. U.S.A.	He	1957	1297	Dec 1986	
Berkeley Bev.	CA. U.S.A.	Heavy	1975	83	Dec 1986	
Uppsala	Sweden	p	1957	73	1976	
Harvard	MA. U.S.A.	p	1961	4139	Dec 1987	
Moscow	U.S.S.R.	p	1965	1359	Oct 1987	
Dubna	U.S.S.R.	p	1967	80	1977	
Gatchina	U.S.S.R.	p	1975	457	Oct 1987	
S.I.N.	Switzerland	π^-	1980	313	Aug 1987	
S.I.N.	Switzerland	p	1984	262	1987	
Chiba	Japan	p	1979	~30	Aug 1986	
Tsukuba	Japan	p	1983	67	1987	
Los Alamos	NM. U.S.A.	π^-	1974	230	1982	closed
TRIUMF	Canada	π^-	1979	~122	1987	
				8542		

The following institutions are actively developing proton facilities

INSTITUTION	LOCATION	COMMENTS
Loma Linda	CA. U.S.A.	Hope to treat the first patient in 1989.
Clatterbridge	England	Building a 62 MeV proton beam line.
Orsay	France	Tests underway for a proton beam.
N. A. C	South Africa	Designing a 200 MeV proton beam line.
Nice	France	Hoping to develop a proton beam line.
Louvain-la-Neuve	Belgium	Hoping to develop a proton beam line.
EULIMA	?	Light ion facility; cooperative venture.

These figures represent the best information that I have. I would be glad to hear from anyone with better or more up-to-date numbers, or from institutions not included in this summary.