PARTICLES

sponsored by

PROTON THERAPY CO-OPERATIVE GROUP

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

Number 26 July 2000 Janet Sisterson Ph.D., NPTC

Costs: At PTCOG XIX, the Steering Committee decided that part of the registration fee for PTCOG meetings would be used to help produce both Particles and the abstracts of the PTCOG meetings. Only part of the costs is covered in this way, so more financial help is needed from the community. PTCOG is always happy to receive financial gifts; all such gifts are deductible as charitable contributions for federal income tax purposes. The appropriate method is to send a check made out to the "Massachusetts General Hospital" and sent to Janet Sisterson at the address given below.

Facility and Patient Statistics: I continue to collect information about all operating or proposed facilities. Please send me your information. My latest published summary of the worldwide detailed patient statistics through 1997 is:
"World wide proton therapy experience in 1997." Author: J. M. Sisterson. CP475, Application of Accelerators in Research and Industry, eds. J. L. Duggan and I. L. Morgan, AIP Press, New York (1999), p959-962. Copies available on request.

Particles on the Internet: The URLs for the Harvard Cyclotron Laboratory, which contain links to PTCOG and Particles are:

- http://neurosurgery.mgh.harvard.edu/hcl/ or http://brain.mgh.harvard.edu:100/hcl
- **New for 2000!** Particles is available as a PDF file.

Other proton therapy links:

- Northeast Proton Therapy Center: http:// www.mgh.harvard.edu/depts/nptc/nptc.htm
- LLUMC, California: : http://proton.llu.edu
- U of California, Davis: http://crocker.ucdavis.edu/cnl/research/eyet.htm
- Midwest Proton Radiation Institute: http://www.iucf.indiana.edu
- National Association for Proton Therapy: http://www.proton-therapy.org
- TRIUMF, Canada protons: http://www.triumf.ca/welcome/proton_thrpy.html
- TRIUMF, Canada pions: http://www.triumf.ca/welcome/pion_trtmt.html
- CPO, Orsay, France: http://www-sop.inria.fr/epidaure/personnel/bondiau/CPO_base/cpo_base.htm
- PSI, Switzerland: http://www.psi.ch/
- Proton Oncological Therapy, Project of the ISS, Italy: http://top.iss.infn.it

- TERA foundation, Italy: http://www.tera.it
- Catania, Italy: http://lnsuni2.lns.infn.it/~catana/
- GSI homepage: http://www.gsi.de
- The Svedborg Laboratory, Sweden: http://www.tsl.uu.se
- Clatterbridge Centre for Oncology: http://synaptic.mvc.mcc.ac.uk/simulators.html
- ITEP, Moscow, Russia: http://www.protontherapy.itep.ru
- Tsukuba, Japan: http://www-medical.kek.jp
- Tsukuba, Japan - new facility plans: http://www-medical.kek.jp/devnewfac.html
- HIMAC, Chiba, Japan: http://www.nirs.go.jp/ENG/particl.htm (ENG case sensitive)
- NAC, South Africa: http://medrad.nac.ac.za/index.htm

ARTICLES FOR PARTICLES 27

November 30 2000 is the deadline for news for Particles 27, the January 2001 issue. Address all correspondence for the newsletter to:

Janet Sisterson Ph.D.
Northeast Proton Therapy Center
Massachusetts General Hospital
30 Fruit Street, Boston MA 02114

Telephone: (617) 724-1942
Fax: (617) 724-9532
E-mail: jsisterson@partners.org

Articles for the newsletter should **NOT** exceed two pages in length.

PTCOG BUSINESS and FUTURE PTCOG MEETINGS

Chair: Michael Goitein
Department of Radiation Oncology
Massachusetts General Hospital
Boston MA 02114

Secretary: Janet Sisterson
Northeast Proton Therapy Center
Massachusetts General Hospital
Boston MA 02114

Steering Committee Members

USA	Europe	Russia	Japan	South Africa
W. Chu	U. Amaldi	V. Khoroshkov	K. Kawachi	D. Jones
M. Goitein	H. Blattmann		H. Tsujii	
D. Miller	J.-L. Habrand			
J. Sisterson	G. Munkel			
James Slater	E. Pedroni			
A. Smith	A. Wambersie			
H. D. Suit				
L. Verhey				

The times and locations of the next PTCOG meetings are as follows:

PTCOG XXXIII	Berlin, Germany	September 25 – 27 2000
PTCOG XXXIV	Boston, MA, USA	April, May or June 2001
PTCOG XXXV	Tsukuba, Japan	November 2001

The future of PTCOG

Every now and again it seems worthwhile to focus attention on the status of an organization to determine whether it is fulfilling its function(s) well - and whether there are mid-course corrections of a minor or major kind which should be made. We intend to set aside some time at the next PTCOG meeting in Berlin to at least begin such a discussion – we may then continue the discussion at the following meeting in Boston, if it is indicated. These discussions will begin at the steering committee meeting and will continue at the business meeting.

The following questions seem appropriate:

Is PTCOG meeting the interests of:
- experienced physicians in the field
- experienced physicists in the field
- students
- those who are contemplating new facilities
- current or prospective commercial and quasi-commercial vendors?

Is PTCOG providing adequate:
- scientific discussion
- educational experience
- commercial interchange?

Are the venues for PTCOG meetings appropriate?

currently, roughly, cycling amongst: one meeting in North America, one in Europe, one elsewhere.

Is the frequency of meetings (presently, 2 times a year) appropriate? Proposals have been heard to:
- cut back to once a year
- compromise at one meeting roughly every 9 months.

Is the economic basis of PTCOG (everyone pays their way, meetings are break-even, no treasurer!) satisfactory?
- should there be annual dues?
- should we encourage industrial exhibits and raise money through them?

These, and any additional topics which the steering committee members may wish to raise, will be the subject of an extended steering committee meeting at the Berlin PTCOG. We look forward to seeing you there. If you are unable to be in Berlin but would like to contribute your thoughts and ideas, please send them to Janet Sisterson (jsisterson@partners.org).

Michael Goitein, chair
Janet Sisterson, secretary

Summary of the Steering Committee Meeting,
PTCOG XXXII
Tuesday April 18, Uppsala Sweden.

Present: E. Blomquist, W. Chu, M. Goitein, E. Grusell, J. Sisterson, J. Wilson, D. Nichiporov, J. Heese, H. Kluge, H. Tsujii, B. Gottschalk..

1) **Future meetings**:

Definite	Tentative
September 2000: Berlin, Germany	Fall 2002: NAC, South Africa
April, May June 2001: Boston, MA, USA	
November 2001: Tsukuba, Japan	

There was much discussion about the details of the program for the Berlin PTCOG meeting. It was resolved to hold a "Public Steering Committee" session at this meeting to discuss the future of PTCOG in regards to the timing and focus of the meetings and issues regarding membership and finances.

PTCOG XXXIII

September 25-27 2000
Hosted by the Hahn-Meitner-Institut Berlin GmbH, Berlin, Germany

The half-yearly PTCOG meetings concern the present and future role of proton radiotherapy. The preliminary program includes:

- clinical physics of proton beams;
- proton beams in ocular oncology and macular degeneration;
- new developments in proton therapy;
- clinical results of proton beam radiotherapy.

One special feature of this PTCOG meeting will be the combination with the European Cyclotron Progress Meeting ECPM XXXII, which will be held from September 21-23 at the same location. The ECPM meeting is devoted to cyclotrons and their applications and covers reviews and descriptions of existing machines and equipment, novel solutions and unsolved problems. Please check our website http://www.hmi.de/events/ecpm for details and separate registration. Topics of common interest to both communities will be emphasized in both meetings. In particular, we plan a workshop on Sunday, September 24, tentatively entitled "progress on cyclotrons in radiotherapy".

ABOUT THE ORGANISERS: The meeting is organised by the Ion Beam Laboratory ISL of the Hahn-Meitner-Institut Berlin (HMI). The HMI, located in Berlin-Wannsee and formerly dedicated to nuclear research, is now one of Germany's scientific research centers specialized in the investigation of structures of solid matter, new materials and manufacturing techniques for photovoltaic cells. The work ranges from basic research to practical applications. A research reactor provides neutron beams for the Berlin Neutron Scattering Center (BENSC) and the particle accelerator produces high energy protons up to heavy ions for the Ion Beam Laboratory ISL. The HMI operates in collaboration with the university clinic Benjamin Franklin in Berlin-Steglitz Germany's only facility for proton beam treatments of ocular melanoma.

LOCATION AND TRANSPORTATION: The meeting takes place at the:

Hotel Steglitz International (SI), Albrechtstr. 2, 12165 Berlin, Germany
Phone: +49 (30) 790050 email info@steglitz.bestwestern.de,
Fax: +49 (30) 79005550 URL: www.si-hotel.com

The hotel is located close to: U-Bahn station of line U9: Rathaus Steglitz
S-Bahn station of line S1: Rathaus Steglitz
stops of various bus lines

If you arrive by train at station *Zoologischer Garten*, U-Bahn U9 takes you there directly.
If you arrive by plane at Tegel airport, take bus X9 to station *Zoologischer Garten* and then U-Bahn U9 to *Rathaus Steglitz*.
If you arrive at Schönefeld airport, take S-Bahn S45 and change at station *Schöneberg* to S-Bahn S1 with destination *Rathaus Steglitz*.
You can check any kind of train connections directly through the web service http://bahn.hafas.de giving *Rathaus Steglitz (S+U), Berlin* as destination.

TENTATIVE TIME SCHEDULE

24. 9. 2000	13.00 - 18.00	Workshop on "Progress on Cyclotrons in Radiotherapy"
	18.00 - 20.00	Reception and Registration
25. 9. 2000	8.30	Registration
	8.30 - 9.00	Opening Remarks
	9.00 - 12.30	Clinical Session
	12.30 - 14.00	Lunch
	14.00 - 17.00	Eye Session
	17.30	Bus Transfer to HMI
	18.00 - 19.00	Visit of Accelerator and Eye Beam Line
	19.00 - 21.00	Welcome Buffet at HMI
	21.00	Bus Transfer to Hotel
26. 9. 2000	7.30 - 9.00	PTCOG Steering Committee Meeting
	9.00 - 12.30	Accelerators, Gantry Design, Scanning, Quality Assurance
	12.30 - 14.00	Lunch
	14.00 - 16.00	Poster Session and Coffee
	16.00 - 18.00	Future of PTCOG (see article on Page 3)
	19.30	Banquet

27. 9. 2000	9.00 -13.00	Treatment Planning and Clinical Protocols
	13.00 - 14.00	Closing Remarks

For early arrivals: An excursion is planned for the afternoon of September 23, either a visit to Potsdam, or a boat tour through Berlin.

CALL FOR PAPERS: If you plan to submit a contribution to PTCOG XXXIII, please give the title on the registration form. Talks will be a maximum of 15 minutes including time for discussion. If the session is full, speakers will be informed and asked to consider a poster presentation. The maximum size for a poster is 1.0 x 1.8 meters. Presenters are strongly encouraged to send an abstract of their presentation to both the conference organizers (ptcog@hmi.de) and Janet Sisterson (jsisterson@partners.org) before **July 31, 2000**. The abstracts will be published with the December 2000 issue of Particles. Abstracts should be about one half page in length, including authors and affiliations. Computer projection, double slide projectors and overhead projectors will be available.

CONFERENCE FEE: The **conference fee** is EUR 230 (DEM 460). The fee covers receptions, coffee breaks and 2 lunches (September 25 and 26). The price for the **conference dinner** is included in the conference fee. For an accompanying person the cost for the conference dinner is EUR 50 (DEM 100). You may combine the payment with that of the conference fee.

PAYMENT

- Payment with Euro/Master-Card, Visa and American Express
- Send a cheque payable to Hahn-Meitner-Institut
- Payment in cash or with travellers cheques at the registration desk
- Transfer the conference fee to the bank account of HMI: The bank account of HMI is with *Berliner Sparkasse*. The account number is **105 000 4007**. German banks are identified by bank numbers. For the *Berliner Sparkasse* it is **100 500 00**. From abroad also the so-called swift code of the bank **BELA DEBE** might be useful. In any case, add the **keyword PTCOG, and your name and institution**, otherwise we are not able to find your payment.

DEADLINE FOR ACCOMMODATION IN THE CONFERENCE HOTEL: Rooms are reserved at the conference hotel *Steglitz International* for a special rate of DEM 160 per night for a single and DEM 200 for a double room. Please add DEM 22 per person to include breakfast. Please book directly with the hotel using the keyword HMI. The deadline for the hotel registration is **July 31, 2000**.

You may also inform yourself about other hotels and book through the internet page http://www.btm.de. The locations of the hotels are found in http://www.stadtplandienst.de, which offers map and search facilities. As tourists and business meetings are usually crowd hotels in Berlin until end of September, we strongly suggest early reservations.

ORGANISING COMMITTEE:
J. Heese (chairman), H. Kluge (chairman), M. Fitzek, M. Nausner, I. Reng

For further questions please contact the **conference secretary**:

Mrs. G. Liar de Martin
Hahn-Meitner-Institut / ISL
Glienicker Str. 100
14109 Berlin, Germany

Phone: +49 30 8062 2415
Fax: +49 30 8062 2097
Email: ptcog@hmi.de
URL: http://www.hmi.de/events

Announcement of the

7th Workshop on Heavy Charged Particles in Biology and Medicine
and WE - Heraeus-Seminar 246
GSI, Darmstadt Germany
September 28 - 30, 2000

This workshop will be held after the PTCOG meeting in Berlin. Aim of this workshop will be to understand and discuss the complex dependence of RBE on physical and biological parameters, to compare it to the existing cellular and clinical data, and to dicuss the integration of clinical RBE from charged particles (protons to carbon) and neutrons into treatment planning comparing different model calculations as well as using standard values.

The workshop will consist of overviews as invited talks and poster contributions. There will be ample room for discussion.

Information: http://www.gsi.de/conferences/HCPBM7/

Contact: K.Langbein,Biophysik,GSI,
Planckstr.1, 64291 Darmstadt,
Germany
Tel: +49-6159-71-2139,
Fax: +49-6159-71-2106,
Email: K.Langbein@gsi.de

International Conference on Ocular Pathologies
12 – 13 October 2000
Laboratori Nazionali del Sud – INFN
Catania, Italy

Aim of the conference is to give a meeting point for ophthalmologists, radiotherapists and medical physicists about the status and future perspectives of the treatment of ocular pathologies with proton beams.

Particular care will be devoted to the treatment of tumoral pathologies, like uveal and iris melanomas and of macular degeneration. The status of the existing facilities and new projects will be presented. The treatment planning development will be matter of discussions intercomparing the different clinical experience.

The conference will have four different main sessions:

- ocular pathologies
- radiotherapy approach
- treatment planning
- clinical dosimetry.

Abstracts: should be submitted to **Dr. Giacomo Cuttone** (Laboratori Nazionali del Sud – INFN, Via S. Sofia 44 – 95123 Catania, Italy) by : - snail mail; fax (+39-095-542300); email: cuttone@lns.infn.it; on-line: http://www.tera.it/ise/catania.html

Oral and poster contributions have to be presented before July 31st 2000 (no more than 100 words, no figures). A book of abstract will be distributed during the workshop. Proceedings of the conference will be published by Physica Medica.

Preliminary program:

Thursday, October 12th: Ophtalmology – Radiotherapy
Friday, October 13th: Overview of facilities – Clinical Dosimetry – Treatment planning

Registration fee: before August 15th 2000: 300.000 ITL: after August 15th 2000: 400.000 ITL
Modality of payment: should be directed to Istituto Scientifico Europeo by:
credit card (VISA, Mastercard/Eurocard, American Express): please, note name of cardholder, expiration date and n° of card!!
International Bank Draft (Banca Popolare di Intra, filiale di Novara – CAB:10100 – ABI:05548 – c/c:55600/0)

Hotel Reservation:

Hotel Baia Verde (at the sea) single (195.000 ITL/night) double (260.000 ITL/night)
Hotel Jolly (center of the city) single (160.000 ITL/night) double (195.000 ITL/night)

Scientific Committee:

U. Amaldi – TERA Foundation, Novara, I
P. Chauvel – Centre A. Lacassagne, Nizza, F
B. Damato – Royal Univ. Hospital, Liverpool, UK
S. Lo Nigro – Università di Catania, I
R. Santoni – Università di Firenze, I
M. Zingirian – Clinica Oculistica, Genova, I
E. Balestrazzi – Clinica Oculistica, Aquila, I
L. Conte – Ospedale di Circolo, Varese, I
E. Egger – PSI, Villigen, CH
A. Reibaldi – Clinica Oculistica, Catania, I
D. Vinciguerra – INFN-LNS, Catania, I
L. Zografos – Hopital "J. Gonin", Lausanne, CH
A. Kacpereck – Clatterbridge Center for Onc., Bebington, UK

Organizing Committee:

R. Cirio – INFN, Torino – ISE, Arona, I
G. Cuttone – INFN-LNS, Catania, I
G. Nicoletti – Clinica Oculistica, Catania, I
L. Raffaele – Policlinico, Univ. di Catania, I
M.G. Sabini – INFN-LNS, Catania, I
A. Crespi – Ospedale S. Gerardo, Monza, I
A. Hegedus – ISE, Arona, I
G. Privitera – Policlinico, Univ. di Catania, I
G. Ruggieri – INF-LNS, Catania, I

For further information:

Agnes Hegedus (Istituto Scientifico Europeo – ISE)
Piazza S. Carlo, 1 – 28041 Arona (NO), Italy
Tel: +39-0322-249700 / Fax: +39-0322-240800
Email: ise@tera.it http://www.tera.it/ise/catania.html

PTCOG Information/News/Reports:

The following reports and articles were received by July 2000.

NOTICE: Recently published book: Proton therapy and Radiosurgery. H. Breuer and B. J. Smit

The principle of calculation of the dose-volume curves in Chapter 1 is controversial and should serve to stimulate discussion. At this stage, it is not recommended that the graphs and tables (page 153-163, and references to this section, as well as appendix P3.1 and P3.2 and drawing (a) on page 280) are used for patient management, rather that they should be checked, as suggested in the book, against all existing dose-volume models. *B. J. Smit, Dept. of Radiotherapy, Tygerberg Hospital, University of Stellenbosch, Private Bag, Tygerberg 7505, South Africa*

The Northeast Proton Therapy Center, Boston, USA: A Status Report

The Northeast Proton Therapy Center (NPTC) is a state-of-the-art proton beam therapy facility under construction at Massachusetts General Hospital in Boston, USA. The therapy equipment (a cyclotron, two gantries, and a fixed horizontal beam) is being built by Ion Beam Applications (IBA) of Belgium under a contract with the MGH which is jointly and roughly equally funded by the MGH and the National Cancer Institute. The contract was let in April, 1994 with a date for the first patient treatment originally envisioned for September, 1998.

The NPTC building is completed and functions well. The great majority of the equipment is on site and has been installed for some time (the cyclotron put out its first beam in June, 1997 and has generally worked well since then). The missing element is the therapy control system (TCS) – a sophisticated computer control system which was mandated by the hospital's specifications for automated and very efficient operation. This, in turn, was at least partly motivated by the need to transfer the existing and flourishing clinical program at the Harvard Cyclotron Laboratory as soon as the NPTC became operational.

IBA's first approach to the design and coding of the TCS ran into difficulties and the development had to be out-sourced to a company specializing in control system software development. This introduced a substantial delay into the project. However, the news is now very positive. The design, coding and unit testing of the software is substantially completed, as is the software integration phase (a complex matter of cumulatively assembling software modules and testing the software/hardware interfaces). It is anticipated that before the end of August it should be possible to begin the series of extensive tests of the entire system (software plus hardware combined) which goes under the name of "Verification and Validation." One aspect of the Validation tests is to confirm that treatments can be accurately delivered using the new version (version 1) of the TCS. (Beam experiments have been possible for a long time under the original version 0.) The other critical aspect of the equipment which, we anticipate, will be confirmed in the Validation testing is the day-to-day operational reliability of the entire system.

Once Validation tests are complete, the test results will be submitted to the FDA for per-market clearance – the so-called 510(k) process. Shortly thereafter, acceptance tests will be performed, followed by a period of clinical commissioning, leading up to a first patient treatment on the first gantry. We anticipate that the machine should be accepted by the end of this year, and that the first patient treatment should take place by the end of the first quarter of 2001. The clinical program at HCL will then be transferred to the NPTC over the next several months. *Michael Goitein, Northeast Proton Therapy Center, Massachusetts General Hospital, 30 Fruit Street, Boston, MA 02114.*

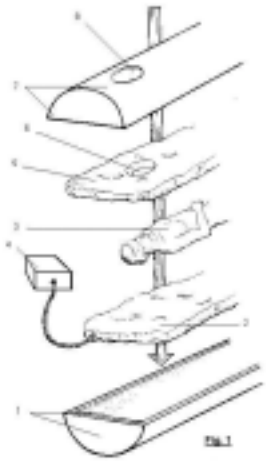
News from **ITEP, Moscow**, Russia:

The Medical-Physical Department of the Institute of Theoretical and Experimental Physics in Moscow, Russia has opened its webpage where all necessary information about the Department, its staff, collection of papers and some current publications will be included by wishes of the authors from this Department or its co-operators. Works included there in Publication List can be requested from authors, to receive it in English version, if necessary. This information can be found electronically at the following internet address: http://www.protontherapy.itep.ru. E-mail addresses of contacts are Michael.Lomanov@itep.ru and Igor.Tarasov@itep.ru.

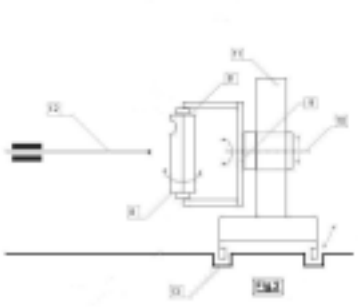
Michael Lomanov, Institute of Theoretical and Experimental Physics, B. Cheremushkinskaya 25, Moscow 117259, Russia.

<AntiGANTRY> (<AG>) - a new system of engineering and technology of rotational-scanning proton/heavy ion-therapy without GANTRY.

Hadron-therapy still remains extremely expensive, and the lion's part of necessary expensives is not on accelerator, but on GANTRYs and other medical part. So, it is necessary to search the way for lower investment costs on a medi-co-technical part. With this purpose we tender a new System <AG> of an irradiation of an upright posed patient by a horizontal beam of protons or multicharge ions.



We fulfilling a fixation of patient in a thin-wall Shell, which is looking like cylinder, cut up on two halves along (Fig.1). A hermetic bag 2 filled on by small-sized plastic pellets is put in a horizontally posed inferior half 1 of the Shell. The patient 3 is put down on a bag. Than pump 4 suck out an air from the bag and the bag becomes solid. Further we cover the patient over by second bag 5, and the second half 7 of Shell, and after we connect both halves of Shell in a unit. Such hardened bags are stored in a "library" and used for fixing given patient daily. The well-known American firm MED-TEC inc. guarantees a safety of the relief of the surface of bags within 6-7 weeks



The Shell is established on the Mobile Stand (Fig.2). The upper and lower backs 8 of the Shell, are put in girder 9. Turning the girder about horizontal axis 10, we turn up the Shell in vertical position. The girder is moved up- and downward along a vertical mount 11 of the Stand. During a rotational-scanning irradiation, the Shell with patient is rotated around of a vertical axis and moved in horizontal and vertical directions under a fixed or scanning horizontal narrow beam of particles 12. The design of the Stand allows to place the Shell with patient not only vertically, but also in horizontal or in any intermediate position. In these cases is carry out an irradiation with a method of linear scanning.

The patients are prepared for an irradiation (including fixation, centration, serial horizontal CT-tomography) simultaneously and separately in six Preparatory procedural rooms, placed outside of a zone of irradiation. The computer aided transport system automatically delivers the next patient from Preparatory procedural room to Radiative one and back together with his Mobile Stand, without

infringement of quality of fixation and centration (for example, on a guide 13 or magnetic pillow). Besides, through Radiative room, the Stands with patients are transported always two by two, in one direction, by the method which one we have termed as the pendulum conveyer.

Such organization of preparation and irradiation of the patients allows to take the most of throughput of the accelerator (up to 1000-1200 patients/ year) and carry out the most conformal method - a rotational-scanning or linear-scanning irradiation of tumours of any forms, sizes and localizations. <AG> can work with any medical accelerator of protons/ions needlessly either constructive alteration or adaptation. The area of 300 sq.m. is necessary for accommodation <AG>-system (without rooms for the accelerator and the stuff). The cost price of a serial copy of <AG>-system will make about 1 million bucks (including cost of horizontal computer Tomographs of an original construction in any of procedural rooms). That is in tens time cheaper than systems applying GANTRY to protons and in hundreds time cheaper than similar systems to ions of Carbon (C^{12}).

Throughput of the <AG>-system is up to 1000-1200 patients per one year, and it carry out a rotational-scanning or linear-scanning irradiation of tumours of any forms, sizes and localizations. <AG> can work with any medical accelerator of protons/ions needlessly either constructive alteration or adaptaton. The area of 300 sq.m. is necessary for accommodation <AG>- system (without rooms for the accelerator and the stuff). The cost price of a serial copy of system will make about 1 million bucks, including cost of horizontal computer tomographs of an original construction in any of Preparatory procedural rooms. *B. Astrakhan, Russian Cancer Research Center RAMS, 24, Kashirsckoye schosse, 115478 Moscow, Russia (astrakob@online.ru.).*

Robert Rathbun Wilson 1914-2000.

Robert Rathbun Wilson (center) at Harvard University in the mid 1940s. The photograph is from the files of the Harvard Cyclotron Laboratory, P. W. Bridgeman is on the right, but why, when, where this photograph was taken is not recorded.

Robert Rathbun Wilson died on January 16 2000 at his home in Ithaca, New York at the age of 85. He has been one of the most important figures in the history of the development of particle accelerators. He is probably best known for leading the team that designed and built the highly successful Fermi National Accelerator Laboratory – Fermilab. As well as accomplishing this enormous technical feat, Wilson conceived and created the attractive and unusual environment in which Fermilab is located. Robert Wilson was also an accomplished artist and some of his sculptures are displayed on the grounds

of Fermilab, as well as at Harvard University and the Northeast Proton Therapy Center, Massachusetts General Hospital.

While Robert Wilson accomplished many bigger and better things in his productive life, to the proton radiation therapy community, he is probably best known for the seminal paper (R. R. Wilson (1946). Radiological use of fast protons. Radiology 47, 487-91) which was written while he was a member of the Physics Department at Harvard University. This paper was intended to "acquaint medical and biological workers with some of the physical properties and possibilities of such rays. To be as simple as possible, let us consider only high-energy protons: later we can generalize to other particles."

The paper summarizes the properties of proton beams that could be used to advantage in medical applications and predicts that accelerators under construction at that time should easily be able to produce sufficient current for medical applications. Not only does this paper describe the properties of proton beams, but it also suggests the use of "a rotating wheel of variable thickness, corresponding to the tumor thickness between the source and the patient" to cover the whole volume with the "very high ionization density which obtains over the last few millimeters" when treating large tumors. It also suggests that "the exposure can be monitored precisely simply by placing a shallow ionization chamber between source and patient. Absolute determinations of the dosage can be determined by measuring ionization currents in gases of the elements of tissue or in a gas which mocks up the molecular formula of tissue."

Robert Wilson was invited to address the Second International Symposium on Hadrontherapy held at CERN in 1996 – fifty years since he wrote that profound paper. In his talk (Advances in Hadrontherapy, Excerpta Medica, Int. Cong. Series 1144. Eds: U. Amaldi and B. Larsson, Elsevier, pp ix-xiii, 1997), he described how he came to write the paper describing the properties of proton beams when his immediate mission then had been to just find the penetration of 150 MeV protons in various materials for radiation protection purposes. In discussing what led him to investigate the penetration of protons in tissue-like material, he states " I found the range in brass was going to be several inches while a few inches of lead would fix everything. That was the solution and I should have then gone on to other problems in designing the machine, but I did not stop. Why? There was no reason I should go on to anything beyond that, since I had done the job as far as the engineering design of that machine. Fifty years later I do not know why I did not stop. I suppose the first reason was just simple curiosity to find out a little bit more……So I went on, and instead of just talking about the penetration of particles, I jumped into the almost obvious thing that I could see next: because one could hurt people with protons, one could probably help them too. So I tried to work out every detail I could from the scattering to the Bragg curve……"

Such lively curiosity, imagination, scientific competence and humanity will be sorely missed.

Janet Sisterson

TREATMENT PLANNING SYSTEMS FOR PROTON THERAPY
July 2000

The following Table was presented in October 1999 by Skip Rosenthal, MGH at the Workshop on Treatment Planning Systems, PTCOG XXXI. Information was provided by: S. Rosenthal, A. Mazal, M. Collier, T. Lomax, S. Nill, and D. Miller. This Table is a new feature of Particles, and will be updated each issue. Please send corrections/additions to Janet Sisterson.

Year	Created By	System Name	Status
1979-93	LBL	LBL system	Not Available
1980	MGH	Rx	**Distributor MGH**
1980	MGH	EYEPLAN	**Distributor MGH – EYES only**
1990-96	MGH/Seimens	V-Treat(AXIOM)	Not Available
198?,1991	PSI	PSI system/Pion	**Distributor PSI**
1995	DKFZ/Royal Marsden	Voxelplan/Proxelplan	**Adapted by GSI, NAC, DKFZ**
1996	Radionics/MGH/HCL	P-Knife	Not Available
1997	LLUMC/PerMedics	OptiRad 3D	**Commercial Pending FDA**
1998	Tsukuba	Hitachi system	In-house system
1998	DKFZ	OCTOPUS	**Under development – EYES only**
1994	Orsay/Curie	ISIS	Distribution ?
1998	CMS/MGH	FOCUS	**Commercial Release 1999**
1998	DKFZ	KonRad Plus Protons	Research Only
199?	Uppsala/KVI	Helax (+ protons)	Distribution ?
	RenderPlan		?
	Adac		?
	Michigan		?
	Varian		?

Proposed NEW FACILITIES for PROTON & ION BEAM THERAPY - July 2000

INSTITUTION	PLACE	TYPE	1ST RX?	COMMENTS
INFN-LNS, Catania	Italy	p	2000	70 MeV; 1 room, fixed horiz. beam
NPTC (Harvard)	MA USA	p	2001	at MGH; 230 MeV cyclotron; 2 gantries + 2 horiz
Hyogo	Japan	p, ion	2001	2 gantries; 2 horiz; 1 vert; 1 45 deg; nearing completion
NAC, Faure	South Africa	p	2001	new treatment room with beam line 30^{o} off vertical.
Tsukuba	Japan	p	2001	270 MeV;2 gantries;2 fixed; construction complete
Wakasa Bay	Japan		2002	multipurpose accelerator; building completed mid 1998
Bratislava	Slovakia	p, ion	2003	72 MeV cyclotron; p; ions; +BNCT, isot prod.
IMP, Lanzhou	PR China	C-Ar ion	2003	C-ion from 100MeV/u at HIRFL expand to 900 MeV/u at CSR;clin. treat;biol. research;no gantry;shifted patients
CGMH, Northern Taiwan	Taiwan	p	2001?	250MeV synchrotron/230MeV cyclotron;3 gantry,1 fixed
Shizuoka Cancer Center	Japan		2002?	synchrotron 230? MeV; 2 gantries; 1 horiz; funded.
Erlangen	Germany	p	2002?	4 treatment rooms, some with gantries.
CNAO, Milan & Pavia	Italy	p, ion	2004?	synchrotron; 2 gantry;1 fixed beam rooms;1 exp. room
Heidelberg	Germany	p, ion	2005?	
AUSTRON	Austria	p, ion	?	2p gantry;1 ion gantry;1 fixed p;1 fixed ion;1 exp room
Beijing	China	p	?	250 MeV synchrotron.
Central Italy	Italy	p	?	cyclotron; 1 gantry; 1 fixed
Clatterbridge	England	p	?	upgrade using booster linear accelerator to 200 MeV?
TOP project ISS Rome	Italy	p	?	70 MeV linac; expand to 200 MeV?
3 projects in Moscow	Russia	p	?	including 320 MeV; compact, probably no gantry
Krakow	Poland	p	?	60 MeV proton beam.
Proton Development N.A. Inc.	IL USA	p	?	300 MeV protons; therapy & lithography
PTCA, IBA	USA	p	?	Several systems throughout the USA

WORLD WIDE CHARGED PARTICLE PATIENT TOTALS

July 2000

WHO	WHERE	WHAT	DATE FIRST RX	DATE LAST RX	RECENT PATIENT TOTAL	DATE OF TOTAL
Berkeley 184	CA. USA	p	1954	— 1957	30	
Berkeley	CA. USA	He	1957	— 1992	2054	June-91
Uppsala	Sweden	p	1957	— 1976	73	
Harvard	MA. USA	p	1961		8558	July-00
Dubna	Russia	p	1967	— 1974	84	
Moscow	Russia	p	1969		3268	June-00
Los Alamos	NM. USA	π^-	1974	— 1982	230	
St. Petersburg	Russia	p	1975		1029	Jun-98
Berkeley	CA. USA	heavy ion	1975	— 1992	433	June-91
Chiba	Japan	p	1979		133	Apr-00
TRIUMF	Canada	π^-	1979	— 1994	367	Dec-93
PSI (SIN)	Switzerland	π^-	1980	— 1993	503	
PMRC, Tsukuba	Japan	p	1983		629	Jul-99
PSI (72 MeV)	Switzerland	p	1984		3014	Dec-99
Dubna	Russia	p	1987		58	June-00
Uppsala	Sweden	p	1989		236	June-00
Clatterbridge	England	p	1989		999	June-00
Loma Linda	CA. USA	p	1990		5262	July-00
Louvain-la-Neuve	Belgium	p	1991	– 1993	21	
Nice	France	p	1991		1590	June-00
Orsay	France	p	1991		1527	Dec-99
N.A.C.	South Africa	p	1993		367	June-00
MPRI	IN USA	p	1993		34	Dec-99
UCSF - CNL	CA USA	p	1994		284	June-00
HIMAC, Chiba	Japan	heavy ion	1994		745	Dec-99
TRIUMF	Canada	p	1995		57	June-00
PSI (200 MeV)	Switzerland	p	1996		41	Dec-99
G.S.I Darmstadt	Germany	heavy ion	1997		72	June-00
Berlin	Germany	p	1998		105	Dec-99
NCC, Kashiwa	Japan	p	1998		35	June-00
					1100	pions
					3304	ions
					27434	protons
				TOTAL	31838	all particles

The Proposed Facilities List is on the previous page.