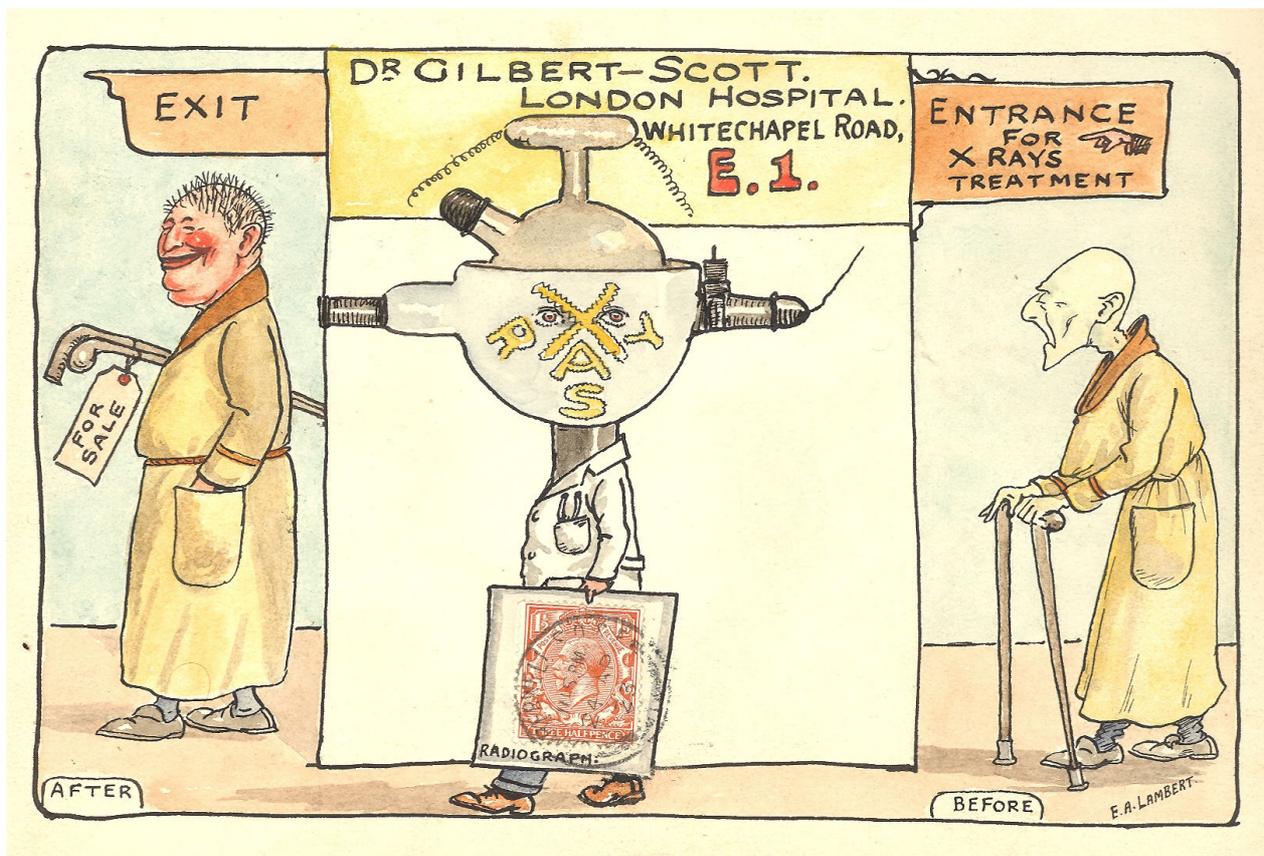


The Invisible Light

The Journal
of
The British Society for the History of Radiology



20th Anniversary Year 1987-2007

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Editorial Notes

20th Anniversary Year 1987-2007

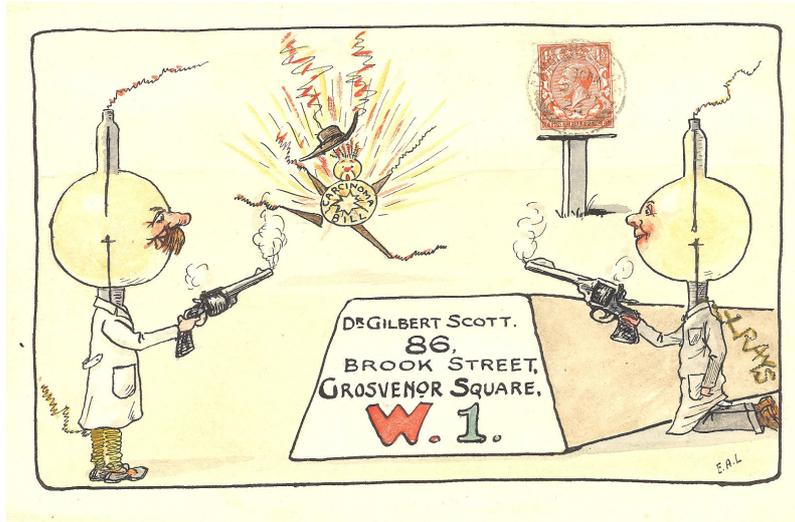
I hope you like this issue of 'The Invisible Light.' It's interesting to reflect how the study of the history of radiology has developed in the last two decades. The British society for the History of Radiology and its previous incarnations is not 20 years old. And as they say, doesn't time go fast when you are enjoying yourself. The first meeting of the Historical Working Party that was the precursor of the Radiology History and Heritage Charitable Trust took place on the 11th September 1987. So much has happened in the last 20 years and I think we can be pleased at the changes. The history of radiology is much more visible as a subject and we have all worked hard to increase the profile of radiology history. I am currently preparing a talk on the history of radiology for the Welsh Society for the History of Medicine at the meeting in Llandudno.

In January I took part with John Pickstone in a poll organised by the British Medical Journal to find the greatest medical breakthrough since 1840. X-rays did not win but it was good fun to take part. The meeting at BMA House to announce the winning medical milestone was chaired by John Snow the Broadcaster and Channel 4 newsreader and was at The Hastings Room at BMA House in London. Our submission was "Imaging: revealing the world within"
Adrian M K Thomas, John Pickstone BMJ 2007; 334:s12, doi:10.1136/bmj.39052.527396.94.

A group consisting of myself and Arpan Banerjee, Uwe Busch, Alfredo Buzzi & Gerry Livadas produced a publication "The European Association of Radiology 1962-2007: A vision Realised" which was given out at the European Association of Radiology meeting held at ECR in Vienna, March 2007

I remain very interested in the history of CT scanning and the British institute of radiology now have the archive from EMI relation to the EMI Scanner. This was described in: "The EMI archives of the development of the CT scanner are moving to the BIR" in RAD Magazine (2007) Vol: 33 #381, 28-29.

In early May I gave a presentation "X-Rays and Radiation" to the Bromley and Beckenham Philatelic Society, at Beckenham Public Halls in Beckenham in South London. I illustrated the development of X-rays and radioactivity philatelically and showed two covers given to my by the late Michael Gilbert Scott. Mike was the son of Sebastian Gilbert Scott the pioneer radiologist from the London Hospital. The two covers were drawn by a grateful patient and artist (E A Lambert) and were sent in the early n1920s. The one on the front cover shows a sick patient entering the London Hospital, Whitechapel road for X-ray treatment and leaving quite recovered. The second and following cover show two Coolidge tubes shooting 'Carcinoma Bill.'



E A Lambert: 'Death of Carcinoma Bill'

In March I attended the official re-opening of the Deutsches Röntgen-Museum in Remscheid (Lennep), Germany. I was able to sleep in the birth-house of Wilhelm Conrad Röntgen.

Birthplace of W C Röntgen in Lennep.



It was a great pleasure to be able to stay in the birthplace of Röntgen and my thanks are due to the Deutsches Röntgen-Museum for their hospitality.

The museum is being transformed due to the efforts of Dr Uwe Busch who is the Deputy-Director of the Museum. Uwe is the Project manager for the transformation of the museum and his aim is to make the museum relevant to the 21st century. The museum is re-branded as 'Museum X' and is full of fascinating high-tech displays.

I am very pleased that Uwe Busch will be attending UKRC in Manchester later this year and that the British Institute of Radiology has awarded him its honorary membership.



Uwe Busch at the desk of Wilhelm Röntgen. The desk always has chocolates and fresh flowers.

The 'old' Röntgen Museum.



Uwe Busch examining on the new displays in the museum.



At the opening reception of 'Museum-X.'

The 'ghosts' of Wilhelm and Bertha Röntgen were able to attend!



Please send me articles for inclusion in MS Word format please. I am always very pleased to receive submissions.

Please visit our stand at UKRC.

Adrian

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13th May 2007

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2007 ukradiological congress: Advance Programme

This 2007 UK radiology congress will be held in Manchester on 11th - 13th June 2007

www.ukrc.org.uk

The Congress President this year is Prof Rodney Reznek.

History Special Focus Group ('kindly organised by the British Society for the History of Radiology'). The history session is in stream 7 and is on the afternoon of the 12th June 2007.

The BSHR has organised a full session. Do come and attend. We will also be having a stand in the technical exhibition. If you are able to help on the stand please contact either myself or Mrs Jean Barrett.

The programme is:

'The current state of radiology history'

Dr Adrian Thomas, Princess Royal University Hospital, Orpington

'Archiving clinical radiology in Manchester in the 20th century'

Mrs Geraldine Hunwick, The John Rylands University Library, Manchester

'The German Röntgen Museum'

Dr Uwe Busch, Deutsches Röntgen Museum, Remscheid, Germany

'Dr Samuel Stuart Pennington and the Battle of the River Plate'

Dr Alfredo Buzzi, University of Buenos Aires, Buenos Aires, Argentina

'Patient and staff radiation doses from early radiography (1899-1902)'

Dr John Kotre, Newcastle General Hospital, Newcastle-upon-Tyne

Books and Articles on the History of Radiology

Development of Physics Applied to Medicine in the UK, 1945-1990 (Paperback)

by D Christie (Editor), E Tansey (Editor)

Price: £6.00

Paperback: 172 pages

Publisher: Wellcome Trust Centre for the History of Medicine at UCL (1 Nov 2006)

Language English

ISBN: 0854841083

This was organized with the assistance of Professor John Clifton (Harpenden) and chaired by Professor Peter Williams (Manchester), this seminar examined the early developments of medical physics in the UK between 1945 and 1990. Participants discussed a range of themes including medical physics before and during the war, the role of the King's Fund and the formation of the Hospital Physicist's Association (HPA), expansion of medical physics outside radiotherapy and to non-radiation physics (ultrasound, medical instrumentation, bioengineering, use of digital computers), developing regional services and links with industry. The seminar finished with a discussion on the changing scene in the 1980s, covering topics such as funding, academic and undergraduate medical physics, imaging, CT, NMR and others. Participants included Mr Tom Ashton, Dr Barry Barber, Professors Roland Blackwell and Terence Burlin, Dr Joseph Blau, Mr Bob (John) Burns, Professors John Clifton, David Delpy, Philip Dendy and Jack Fowler, Dr Jean Guy, Mr John Haggith, Drs John Haybittle, Alan Jennings and John Law, Professors John Mallard and Joe McKie, Mr David Murnaghan, Professor Angela Newing, Dr Sydney Osborn, Professor Rodney Smallwood, Dr Adrian Thomas, Dr Peter Tothill, Mr Theodore Tulley, Professors Peter Wells and John West and Mr John Wilkinson.

The book is essential reading for anyone interested in the history of medical physics in these islands.

Interesting Web sites

Institute for Radiological Protection and Nuclear Safety (IRSN)

http://www.irsn.org/va/05_int/05_inf_1dossiers/05_inf_17_tchernobyl/05_inf_17_0tchernobyl.htm

The French government's Institute for Radiological Protection and Nuclear Safety (IRSN) has posted much interesting material on its website relating to Chernobyl. This includes a graphic animation of the plume of radioactive caesium-137 from the world's worst nuclear accident at Chernobyl in April and May 1986.

BOY WHO BUILT A NUCLEAR REACTOR IN HIS BASEMENT: PARTS BOUGHT ON eBay 24 November 2006 By Ryan Parry US Correspondent (Daily Mirror)

http://www.mirror.co.uk/news/tm_headline=boy-who-built-a-nuclear-reactor-in-his-basement-&method=full&objectid=18150199&siteid=94762-name_page.html

"A TEENAGER has created a working nuclear reactor in the basement of his family home. Thiago Olson, 17, bought spare parts on eBay and persuaded manufacturers to give him discounts to create the machine. The schoolboy took 1,000 hours over two years to build the fusion reactor, which creates energy by combining atoms. During the process, a 40,000-volt charge is supplied from a gutted mammogram scanner. Mum Natalice, of Detroit, Michigan, said: "Originally, he wanted to build a hyperbolic chamber." When she said no to the oxygen machine, he decided on the fusion reactor which he calls "the holy grail of physics". The process is safe because the reaction ends as the power drops. The level of X-rays produced is too low to be harmful. Thiago is called "mad scientist" by his friends. "

Fred Dawson wrote that he suspected that this is the type of machine constructed:

"The Farnsworth-Hirsch Fusor, or simply fusor, is an apparatus designed by Philo T. Farnsworth to create nuclear fusion. It has also been developed in various incarnations by researchers including Elmore, Tuck, and Watson, and more lately by George Miley and Robert W. Bussard. Unlike most controlled fusion systems, which slowly heat magnetically confined plasma, the fusor injects "high temperature" ions directly into a reaction chamber, thereby avoiding a considerable amount of complexity. The approach is known as inertial electrostatic confinement."

<http://en.wikipedia.org/wiki/Fusor>

Daily Telegraph: Heritage plan for nuclear power stations

By Charles Clover, Environment Editor

Last Updated: 2:31am GMT 27/11/2006

<http://www.telegraph.co.uk/news/main.jhtml?xml=/news/2006/11/27/npower27.xml>

"Nuclear power stations could be given the same degree of protection as castles and archaeological sites under plans being drawn up by heritage bodies.

The plans have been prompted by the closure of Britain's first generation of civil nuclear sites, which were built or planned in the first decade after the Second World War and are now facing demolition.

Calder Hall was the world's first commercial reactor. Britain's first generation of civil nuclear sites could be scheduled

It is envisaged that scheduling – and not listing – would be the best way of preserving structures such as the distinctive sphere of the fast breeder reactor at Dounreay, Caithness, and the turbine hall and control room of Calder Hall power station, Sellafield, the world's first commercial reactor.

The whole exercise is likely to be controversial because nuclear power stations were, in their day, the subject of fierce planning battles and considered blots on the landscape.

Roger Bowdler, the head of designations at English Heritage, said: "These are extremely early stages, though, and we intend to tread immensely cautiously. Some of the enormous buildings have a brooding presence that is extremely strong and the jury is out on their claims for architectural remembrance.

"A schedule means it has got to go on being like it is. There might be a way of doing it in a discretionary way which gives you all you need."

"Both English Heritage and Historic Scotland have had to react to demolition plans drawn up by the Nuclear Decommissioning Authority, which owns the power station sites, and by the UK Atomic Energy Authority (UK AEA), which is responsible for most of the pioneering nuclear facilities. Mr Bowdler said UK AEA had already embarked on a process of recording the history of civil nuclear power.

"For the most part their interest coincides with our interest which is to ensure that a good record is kept to see that what they were doing is understood and that the excitement of the time is captured."

The controversy began when the cooling towers at Calder Hall were proposed for listing to the Department of Culture.

This was refused because the design of cooling towers was standard for all power stations and harks back to the 1930s.

A spokesman for the Nuclear Decommissioning Authority said: "There has been no formal consultation on this yet though clearly we do realise that some of these buildings do have iconic status."

At Dounreay, UK AEA is already looking to preserve the distinctive sphere of the fast-breeder reactor, even though it costs £150,000 to repaint the structure every two years.

Environmentalists are not opposed to protecting nuclear sites. Tony Juniper, director of Friends of the Earth, said: "We need to be reminded of the huge amounts of money they wasted and the radioactive legacy they left us."

Poison DUst <http://www.informationclearinghouse.info/article17249.htm>

"Poison DUst tells the story of young soldiers who thought they came home safely from the war, but didn't. Of a veteran's young daughter whose birth defect is strikingly similar to birth defects suffered by many Iraqi children. Of thousands of young vets who are suffering from the symptoms of uranium poisoning, and the thousands more who are likely to find themselves with these ailments in the years to come. Of a government unwilling to admit there might be a problem here. Filmmaker Sue Harris skilfully weaves the stories of these young veterans with scientific explanations of the nature of "DU" and its dangers, including interviews with former U.S. Attorney General Ramsey Clark, New York Daily News reporter Juan Gonzalez, noted physicist Michio Kaku, Dr. Rosalie Bertell, Dr. Helen Caldicott and Major Doug Rokke- the former U.S. Army DU Project head."

Musée de l'Assistance Publique - Hôpitaux de Paris

"Opened in 1934 and situated in the handsome seventeenth century Hôtel de Miramion in the Latin Quarter near Notre Dame, the Musée de l'Assistance Publique - Hôpitaux de Paris spans the history of hospitals in Paris from the Middle Ages to the beginning of the twentieth century. The collection numbers nearly 10,000 items: paintings, sculptures, drawings and medical instruments among others. Some of these works and objects are put on display during special exhibitions, while a part remain on permanent display. We think this fascinating museum would be of interest to your members as an educational opportunity. It is for that reason that we were hoping to be able to share information on it with you. Please contact us if you would like more information or see our website at www.aphp.fr/musee. Thank you for your time. Sincerely, Bryna O'Sullivan, Student Intern"

"Les collections composent aujourd'hui un ensemble d'environ 10.000 numéros inscrits à l'inventaire (peintures, sculptures, dessins et gravures, mobilier, textiles, traités, instruments médicaux et objets de soins, d'exploration ou d'enseignement, ...) représentatifs de tous les aspects de la vie hospitalière, du Moyen Age à nos jours. Elles illustrent les grandes composantes de l'histoire de l'hôpital parisien (histoire religieuse et sociale tout d'abord, histoire médicale et paramédicale ensuite, histoire des professions de santé), et apportent des repères significatifs sur l'évolution des représentations du corps et de la maladie. Environ 8% des collections est présenté dans les salles du parcours des collections permanentes, ce qui correspond à la moyenne des musées en France. Les œuvres et objets en réserve sont régulièrement présentés dans des expositions temporaires : celles du Musée tout d'abord, celles ensuite de nombreux musées en France et à l'étranger. Un petit nombre fait l'objet de dépôts ponctuels dans des hôpitaux de l'AP-HP. Musée d'institution, le Musée de l'AP-HP recueille principalement des témoignages en provenance des hôpitaux et services de l'Assistance Publique. Une petite proportion provient cependant de particuliers ou de sociétés privées, permettant ainsi d'identifier et suivre des courants ou réseaux d'échanges et de diffusion. Depuis 2002, l'entrée de nouvelles pièces dans les collections est soumise à l'avis de la Commission scientifique régionale placée sous l'autorité de la DRAC Ile-de-France, conformément à loi du 4 janvier 2002, relative aux musées de France."

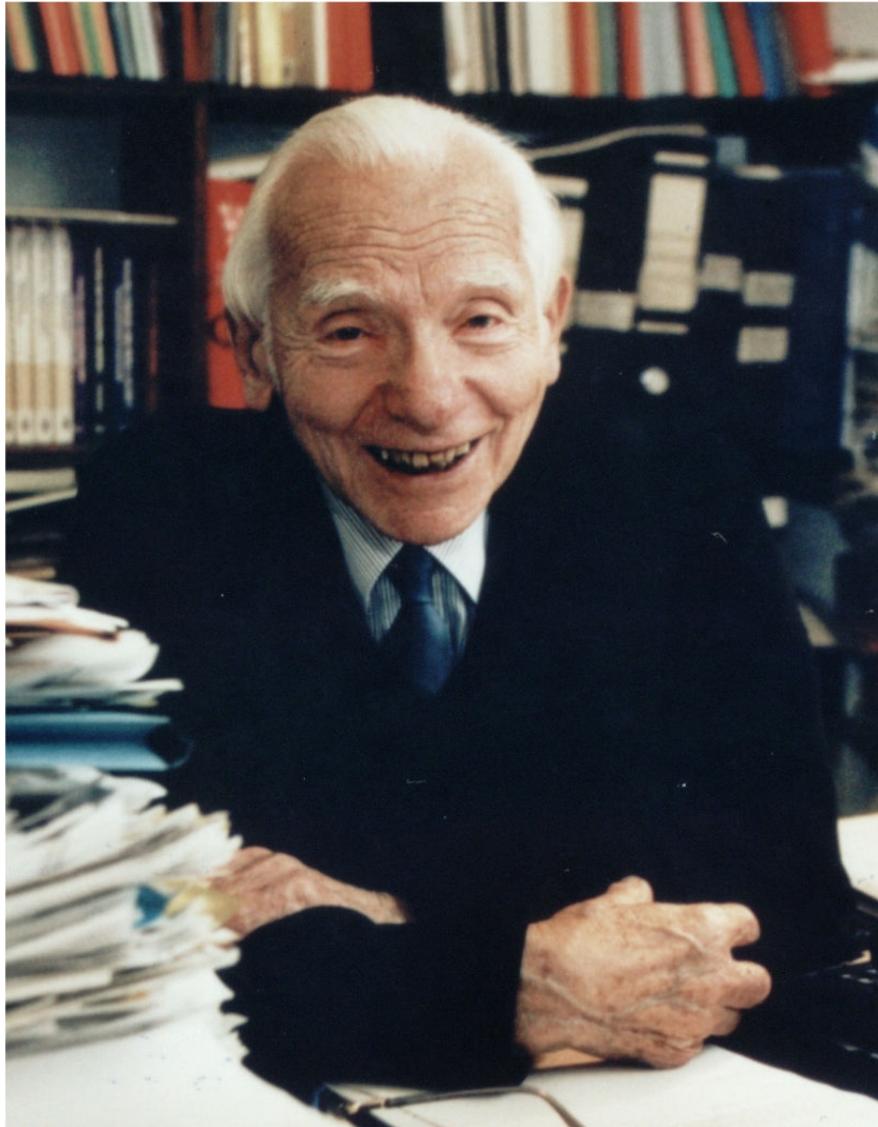
THE BRITISH SOCIETY FOR THE HISTORY OF RADIOLOGY (BSHR)

At the Annual Meeting of the BSHR at the British Institute of Radiology 26/2/07 two interesting talks were given on the subject "Profile of Sir Joseph Rotblat."

Mrs Sally Milne who had been Personal Assistant to Sir Joseph in the last few years of his life described his early life in Poland and his subsequent achievements after coming to Liverpool. This was an amazing life, not only in his award of the Nobel Peace prize but in all his other many achievements. Sally gave a fascinating insight into him as a man-always in a hurry, but with the philosophy that he felt a scientist should be responsible for the outcome of his work. His two main aims in life were: The abolition of Nuclear Weapons, and the abolition of war itself. Often questioned on not achieving this, he would reply: "What is the alternative?" As the youngest signatory to the Russell-Einstein Manifesto he often quoted the words "Remember your humanity and forget the rest"

Mr. Bryce Halliday then gave us an intriguing view of the "Atom Train". Sir Joseph had been instrumental in gaining funding for this project. During 1947 this train toured England bringing "on hands" exhibits to the General public, schools Colleges etc. The admission charge was one shilling, and Sir Joseph also gave lectures in the various venues. The public was able to see all about Nuclear Fission, and experience Geiger Counters for the first time. Some watches were never used again after being placed by the Geiger Counter! Mr Halliday was responsible for keeping the exhibits fully working and described how interested the public was in it. He described the various exhibits which I am sure would interest today's public.

Jean Barrett



Sir Joseph Rotblat

British Society for the History of Radiology
British Institute of Radiology
36 Portland Place, London.
7.00pm, Monday 26 February, 2007.

A PROFILE OF SIR JOSEPH ROTBLAT

Sally Milne

Joseph Rotblat was a man of the most outstanding quality. He was an atomic physicist and worked on the Manhattan Project in the 1940s; a pioneer in medical physics – and hence his connections with the British Institute of Radiology – and one of the towering figures of the Twentieth Century as a champion for peace and the social responsibility of scientists. He was the only scientist to resign from the atomic-bomb project at Los Alamos on moral grounds when it was known from intelligence sources that the Germans were not developing the bomb, and on his return to the UK he switched the direction of his career from nuclear to medical physics, when he worked as Chief Research Physicist on the health impacts of ionizing radiation at St. Bartholomew's Hospital. At the same time he had another, parallel, career in world affairs, at which he worked tirelessly until his death, building international understanding and cooperation to reduce the dangers posed by the weapons he had helped to create, working

for their elimination and ultimately the elimination of war itself as an acceptable social institution. He did this work largely through the Pugwash Conferences on Science and World Affairs – the organization he helped to create and with which he won the Nobel Peace Prize in 1995.

To understand Joseph Rotblat and the great ideas and themes that dominated his life, it is necessary to know something of his early life and influences, and the difficulties he faced and overcame. He was born in Poland into a prosperous Jewish family in 1908, and was the fifth of seven children. His parents lost the family home and all their money and possessions in the First World War, and he went from having a very happy childhood with his own pony and holidays in the country to suffering extreme poverty and hardship. He disliked potatoes to the day he died because he had been forced to eat them frozen from the ground as a child – or starve. He had very little formal education but, despite this managed, by studying with library books in the evenings and working as an electrician during the day, to win an open scholarship to study at the Free University of Poland and obtained his Doctorate in Physics from the University of Warsaw in 1938. While working for his doctorate he carried out research at the Radiological Laboratory of the Polish Science Society under Professor Ludwig Wertenstein, who became his mentor. Wertenstein had been an assistant to Marie Curie and had also worked with Rutherford in Cambridge. Rotblat often referred to him as not only a great physicist but also a philosopher and humanist who had a great influence on his thinking, in particular on humanitarian issues and issues to do with social responsibility in science.

After he had obtained his PhD Rotblat had the choice of either going to work at the Joliot-Curie Laboratory in Paris or working with James Chadwick, the discoverer of the neutron, at Liverpool University. He chose Liverpool because he thought that working on the development of the cyclotron being created there would enable him to develop that expertise in his university in Poland. However, his stipend at Liverpool was not enough for two people to live on, and so he had to leave his wife, Tola Gryn, whom he had married in 1937, behind with the plan that once he was established she would follow. It wasn't long before he was awarded the Oliver Lodge Fellowship for some work developing a detector system to allow the study of radionuclides with sub-second life times. This paid him more money, and he returned to Poland to bring his wife to England.

There followed a tragic event in his life because Tola contracted acute appendicitis just as they were to leave and so he had to come back alone, with the plan that she would follow when she had recovered enough to travel. However, the day after he left, Hitler invaded Poland, and despite desperate attempts to obtain papers for her – he wrote to Niels Bohr, relatives in Brussels, friends in Italy- he never saw his wife again. He discovered after the war that she had died with her mother in a concentration camp at Majdanek. He never re-married.

Before he left Poland Joseph Rotblat's own experiments had shown that the newly discovered fission process emitted neutrons, and he very quickly understood that this could lead to a chain reaction of enormous explosive power. Whilst at Liverpool he also worked with Otto Frisch and Rudolph Peierls. The Frisch-Peierls memorandum of 1940 demonstrated the feasibility of an atomic bomb, but Britain at that time was at war and didn't have the resources to develop it. At the beginning of 1944 he was headhunted with Chadwick to go to the Los Alamos National Laboratory in New Mexico as part of the British team assigned to the Manhattan Project. He insisted on retaining his Polish nationality and was given a special dispensation by the Americans and only took up British nationality in 1946 when he decided to remain here rather than return to Poland under Communist rule.

Joseph Rotblat always said that he became a scientist as a result of the terrible experiences he had had as a boy growing up, in order to make the world a better place. Working on the bomb was against every reason he had for becoming a scientist. He only ever agreed to work on the atomic bomb because he thought that if Hitler managed to make such a bomb, it might prevent the bomb from being used if he knew the Allies also had it – the Mutually Assured Destruction theory. In later years he said that with hindsight he saw the flaw in this argument, because Hitler was a madman and in all probability would have used it against the UK in any case in some grand Wagnerian 'Götterdämmerung' finale to the war, despite the possibility that it would be dropped on Berlin in retaliation. When it became clear later in 1944 from intelligence reports that the Germans were losing the war and that they were not trying to

manufacture an atomic bomb, he saw no reason to continue to make such a terrible weapon and resigned and returned to the UK.

Very little has been said about the harsh reaction by the US to his resignation. He was labelled as a turncoat, a traitor, a spy even (although this was to be disproved). He was hounded by the British and American secret services for years for listening to and obeying his conscience. When he left Los Alamos, he travelled with all his possessions in a box and somewhere on the journey back to Liverpool they were stolen (he believed by the FBI) and despite the most strenuous efforts they were never recovered. His act of conscience was an act of great courage because he fully understood that he would pay heavily for it in terms of his future career. There is no doubt that Joseph Rotblat paid for his actions by being ignored and disliked by the Establishment both here and in the US for a very long time. It was really only when he was in his eighties, after receiving the Nobel Peace Prize, that most of his many honours came to him.

When he returned from the US to Liverpool, he began to educate the public and policy makers on the dangers of nuclear weapons, and shortly after the end of the war helped to found the Atomic Scientists Association, and later raised money and organized the Atom Train exhibition, which was the first large scale effort to educate the public about the peaceful and military applications of nuclear energy. It was at this time that he switched the focus of his scientific work to medical physics, pioneering the use of linear accelerators for radiation therapy and becoming one of the world's leading authorities on fall-out and effects of ionizing radiation on humans. (He led two major world health organisation studies in 1984 and 1987.) At Bart's, in partnership with Professor Patricia Lindop, he did extensive work on the effects of radiation on living organisms, studying especially ageing and fertility effects.

On 13th April 1954 Rotblat met the eminent British philosopher and mathematician Bertrand Russell through a BBC Panorama programme on which they both appeared to explain the new hydrogen bomb, which had been tested the month before in the Bikini Atoll. Russell was impressed by what Rotblat had to say on the programme, and Rotblat subsequently became his adviser on nuclear weapons issues. The Hydrogen bomb had a yield of 15 megatons (approximately a thousand times more powerful than the bomb used on Hiroshima). A Japanese fishing boat, the Lucky Dragon, was caught in the radioactive fall-out and one man died and the others were very sick. Later that year, from data on the radioactivity of the Lucky Dragon, that he had acquired from a Japanese scientist, Professor Yashushi Nishiwaki, Rotblat calculated that the weapon must have had a third stage making it a fission-fusion-fission bomb. Rotblat's analysis was of very great significance in that it showed that a relatively simple extension of the technology available made it possible to create an enormous bomb releasing very great amounts of radioactivity.

He wanted to publish his findings immediately but was persuaded not to by Sir John Cockcroft, Head of the UK Atomic Energy Authority, because of the sensitivity of our relations with America, which were going through a difficult time after the Klaus Fuchs spy scandal. But when the US Atomic Energy Commission put out a very misleading report on the Bikini Atoll test, Rotblat was convinced that he should go public with his information, which caused considerable controversy. The British government was furious and he was viciously attacked in the House of Lords. All this time he was in touch with Russell who was also becoming increasingly fearful about the new bombs and the dangers they presented. Russell's fears for the future led to his writing in 1955 the now-famous document, The Russell-Einstein Manifesto, and Rotblat was asked by him to chair the press conference at its launch at Caxton Hall in London to answer any scientific questions.

Joseph Rotblat was the youngest of the eleven signatories who were nearly all Nobel Prize winners and who included Albert Einstein, Max Born, Frédéric Joliot-Curie, Linus Pauling, and of course Russell himself. It is the most remarkable document written in Russell's magnificent prose, and it was on the basis of this document that the Pugwash Conferences on Science and World Affairs as an organisation, and with which Joseph Rotblat's name is almost synonymous, was founded.

It poses the question:

"Here, then, is the problem which we present to you, stark and dreadful and inescapable: Shall we put an end to the human race; or shall mankind renounce war?"

And it ends:

“ Remember your humanity and forget the rest. If you can do so, the way lies open for a new Paradise; if you cannot, there lies before you the risk of universal death.”

The problem the Manifesto described was one to which Joseph Rotblat selflessly and tirelessly devoted the last 50 years of his life.

He was one of the prime movers in planning and setting up the conference of scientists, for which the Manifesto called, in 1957 in Pugwash, Nova Scotia, from which small community the Pugwash Conferences derives its name. This conference became the founding meeting of a new international organisation – The Pugwash Conferences on Science and World Affairs. Pugwash, as the conferences are commonly called, has held well over 300 conferences, workshops and symposia on nuclear issues, arms control and peace-building.

One of the most remarkable achievements of Pugwash was that even at the height of the Cold War, when there were very few formal channels of communication open, it was able to facilitate meetings between scientists and public figures from both sides of the Iron Curtain. Participants at Pugwash Conferences always attend in a private capacity, which is what very often makes the discussions so very fruitful. These contacts are widely credited for laying the groundwork for a number of treaties, among them The Partial Test Ban Treaty (1963), the Nuclear Non-Proliferation Treaty (1968), the Anti- Ballistic Missile Treaty (1972), the Biological Weapons Convention (1972) and the Chemical Weapons Convention (1993). Joseph Rotblat was the organisation's first and longest serving Secretary General (1957-73), and later its President (1988-1997), and was for the rest of his life President Emeritus. As John Holdren, a member of the Pugwash Council (1982-97) and Teresa and John Heinz Professor at the John F. Kennedy School at Harvard, eloquently described his contribution to Pugwash: “ For its entire existence until its death he was the animating spirit of Pugwash and the embodiment of its commitments to diminish the dangers from WMD and from war itself.” Membership of Pugwash has many of the leading scientists and people with a professional interest in matters of WMD, peace, and the social responsibility of scientists from around the world.

I came to know Professor Joseph Rotblat through my son, Tom Milne. Tom worked with ‘Prof’ – as we both called him – throughout the 1990s, which was a very exciting time: the Cold War had ended and there was a belief that there might be a breakthrough in the problem of nuclear disarmament. I was working freelance at that time and was asked to help edit papers for the Proceedings of the International Pugwash Conferences, which Prof and the London Pugwash office had always undertaken to do. As well as providing a record of the Pugwash Conferences themselves, they form a remarkable history of the events of the times from the perspectives of scientists, academics and professionals from all parts of the world. Today the number of enquiries we receive in the Pugwash office from students and others worldwide about particular papers and persons proves that it has been a very worthwhile undertaking. When Tom obtained his Ph.D and it was time for him to move on in 2001, Prof asked me if I would work for him full-time. I didn't think about this for very long.

So what was he like to work for? He was inspirational, demanding, impatient, generous, energetic, incredibly kind, with a great sense of humour and totally committed to his goals of nuclear disarmament, and ultimately the abolition of war itself. The most striking, amongst his many striking qualities, was, I think, his courage and alongside it, his integrity. To walk away from the Manhattan Project when he did with all the pressures and hostility that this act engendered was truly heroic. Then, of course, there was his intellect. I always likened it to a very powerful beam of light, because he had the ability to concentrate with great intensity on the core of a problem. When he focused on anything he would go into himself and think, and then out would come the solution – shingly clear, with no compromise or fuzziness, logical and long-term. He never pandered to current opinion, and was a long way ahead of his time.

He was also fiercely independent. There is a well-known documented story from the early days of Pugwash. When the Foreign Office was despairing of being able to influence the Pugwash agenda, an official reported that the “main problem was getting Rotblat to take any notice of what we say!” It was not an isolated incident. Watching him chair, or work, a committee was an object lesson on how to get the outcomes you wanted from a meeting. He was formidable – very well prepared, always knowing more about the subject than anyone else present, and

able to quote chapter and verse to support his argument. You had to be very good to change his mind, but, at the same time, his mind was never closed.

Prof was very energetic and tireless in chasing people for contributions to reports, conferences, meetings and books and there is a wonderful and typical story that appeared in an obituary in one of our national newspapers, in which it was rumoured that an Israeli scientist had been interned in the basement of the Pugwash office and prevented from leaving until he had completed the chapter he owed for a book. I can vouch that this story is absolutely true, because it was my son Tom, who took him soup!

Another quality was his love of language and literature. When he came to Liverpool, his knowledge of the English language was very largely confined to the novels of P.G. Wodehouse! When he first arrived he had great difficulty in understanding the 'scouse' accent and anything that was being said. He nearly gave up, and considered moving to the laboratories run by Frédéric Joliot Curie in Paris, because his French was better than his English. It was his wife, Tola Gryn – a student of Polish literature – who wrote persuading him to stay and persevere because she said otherwise he would never forgive himself; her words probably saved his life. One of his favourite sayings came from the Polish poet, Adam Mickiewicz: "Mierz sile na zamiary, nie zamiar podług sil", which roughly translated means: "Fashion your resources to your aims, not your aims to your resources." He followed this maxim all his life. As you know, he stayed, learned to speak excellent English, although he never lost his Polish accent, and wrote the most clear and beautiful prose. I never got away with a mistake of any kind. His only weak point was "tenses", when he would give up and ask me to "please put them right."

Most people in their nineties tend, on the whole, not to work full-time. Prof worked at least a twelve-hour day – and often more – and a six-day week. He came into the office four days per week usually, working from home the rest of the time, when he wasn't travelling and lecturing. I should digress here to say a little about his home, because it was where a lot of his finest writing was done.

It was a lovely, large semi-detached house in West Hampstead built around the 1930s. I remember him telling me that, when he bought it in 1950, on coming to London to take up his post as Chief Research Physicist at St. Bartholomew's Hospital, his first offer was rejected, but to his joy the house came back on the market later on, and the second time his bid was successful. He loved the house and many members of his family lived there for a period after he arranged for them to come over to England from Poland after the war. His niece, Frances – now a doctor – was brought up in the house and many family events were held there over the years. Over time, once the various members of the family moved to homes of their own, the house started to fill up in another way. Although Prof was exemplary he did have the occasional weakness here and there, and one of them was that he never threw anything away, and so the house gradually filled up with papers, books and periodicals, until it was very difficult to move in a number of the rooms. His study was filled floor to ceiling, so was the dining room with about three feet high piles of papers on the dining room table itself, not to mention the chairs, sideboards and floor and he was reduced to working on an A4 size space of table – the rest of it of course being covered with papers - in the morning room next to the kitchen. Hala, his sister-in-law, who lived in a flat opposite him, which he found for her when she moved from Liverpool, did all the cooking and looked after him wonderfully, and he likewise took care of many matters for her.

Recently we have been arranging for Professor Rotblat's archive to be housed at Churchill College, Cambridge, so that his papers will be available to students and scholars, peace activists and the general public worldwide. Before this can happen, however, all the papers have to be catalogued, and this work is being supervised by Peter Harper, the chief archivist at the University of Bath. When he came to the house to look at the archive for the first time, he whooped with delight when he discovered in a top cupboard in Frances' bedroom, the original minutes of all the early meetings of the Atomic Scientists' Association, of which Prof had been Executive Vice-President, and for which Peter had been searching for years. His collection of early papers on radiation have come to the British Institute of Radiology, and many of his books have been donated to universities in Bradford, Liverpool, and South Africa.

Prof used to travel in by tube from his home in West Hampstead, which involved a 10-15 minute walk from his home to the station and then after the tube a walk from Tottenham Court Road to the Pugwash office in Great Russell Street. He always carried a heavy briefcase overflowing

with books and papers – and he walked very fast. There is a famous story about him on the tube when he was, as usual, racing down the escalator at Tottenham Court Road and accidentally bumped into some teenagers who turned round and remonstrated with him being an old man and being in such a hurry, and Prof said: "It's precisely *because* I am an old man that I'm in such a hurry!" He told Tom and I that, try as he might, he couldn't run up the escalators in later life because he claimed they vibrated in a way that made his legs go shaky.

Prof went through his whole life at speed with tremendous energy and verve. He thought quickly, spoke quickly, ate quickly, calculated quickly, and moved quickly, and never more so than at airports. He was always first on the plane, first off and to the terminal, and in his last year, when I travelled with him, when the distances were too far for him to walk, he very reluctantly used a wheelchair. On wheels, we sped along even faster, and were through passport and the check-outs before everyone. Impatient and passionate, everything had to be done by yesterday! But he was never impatient with me, and was infinitely patient with anyone interested in and working for the same cause and objectives, generously giving of his time. I never knew him turn down an invitation to speak to young people or anyone interested in understanding nuclear disarmament issues. He had an innate courtesy, kindness and charm, which everyone who met him remarked upon.

By 2000 Joseph Rotblat was in his nineties, and had participated in and experienced some of the significant events that had shaped the twentieth century. He had a highly developed sense of historical progress and the time that it took for change to come about. He wanted to record his experiences, and in the latter years of his life he wrote a series of remarkable papers that he delivered to the Pugwash conferences and other organizations around the world, mainly on the nuclear issue, but also including matters such as international law; education as a source of irreversible progress; the social and ethical responsibility of scientists; world government; world citizenship; the corrupting effect of a war system on society; the idea of a culture of peace and openness in science.

Prof often quoted Bertrand Russell who said that one should never be afraid of being thought eccentric, and that many ideas are ridiculed at the time they are first proposed. Prof's ideas for the elimination of nuclear weapons and the idea that war itself is an unacceptable social institution, are still regarded as hopelessly utopian by many, but he always argued that they were, in fact, the only practical way forward if we are not to destroy ourselves.

Joseph Rotblat's last years were incredibly busy. As well as writing many outstanding papers and contributing to the Canberra Commission and numerous other bodies, he was also a tireless campaigner. He gave great support to the whistleblower, Mordechai Vanunu, who revealed to the world that Israel had nuclear weapons, and organized a conference in Tel Aviv in 1996, personally pleading with the then President of Israel, Ezer Weizman, for clemency (which was refused). At 93 he peacefully demonstrated on Vanunu's behalf outside the Israeli Embassy, and sat for over an hour in a tiny cage on the pavement. A few months before he died, I went with him when he demonstrated alongside Stephen Hawking and many others in Trafalgar Square, reading out the names of the Iraqi dead from the Iraq War.

Prof also initiated two major programmes in the last years of his life, working until a month or two before his death on 31 August 2005. One was the Weapons of Mass Destruction Awareness Programme (WMDAP), which British Pugwash set up with a number of other non-governmental organizations such as Greenpeace, Oxford Research Group, British American Security Information Council (BASIC) and others. Going back to the original reason for the Russell/Einstein Manifesto, that is to say, to alert the general public to the dangers of thermonuclear weapons, he set out his ideas at a meeting of the International Physicians Against Nuclear War (IPPNW) in 2002 at which he described the situation in foreign policy – in particular, that of the current Bush administration – as being set on a course which was bound to lead to catastrophe. He described the importance of bringing to the notice of the public the grave dangers inherent in the continuation of current policies, at the same time making an argument for the long-term merits of policies based on international law and morality. He followed this up with a major speech to the Pugwash Conference at Halifax in 2003 at which he again stressed the vital importance of educating the public about the dangers of the current situation. This programme is now a large part of the work of British Pugwash, with Professor John Finney as its Chair, and Professor Robert Hinde, a friend and colleague with whom Prof wrote his last book, "War No More", as its Patron. The programme has several components: a series of public lectures with high-profile speakers such as Mikhail Gorbachev, Robert McNamara and

Martin Rees; an inter-active website aimed at young people,; and an education programme designed to be part of the citizenship curriculum for secondary schools throughout the UK, which we have just launched.

Prof's last major initiative was to bring another education initiative, the PeaceJam education programme, to the UK. A year before he died, and after his first stroke, he and I travelled to Denver, Colorado to take part in a PeaceJam education programme week-end. PeaceJam is an international education programme, which works directly with twelve of the Nobel Peace Laureates to pass on their skills and experience to the next generation. He delivered an amazing talk about his life, and answered many questions from students and staff, who were enthralled by what he said. He was feted by the young people as if he had been a rock star, signing tee-shirts and having his photograph taken with them all! He was so impressed by the quality of the programme, and his opportunity as a Nobel Peace Laureate to contribute to it and interact directly with the participating students, that he wanted to bring it to the UK as he thought it the most effective peace education programme that he had seen. The programme began last year with Bradford as the host university, the first university in the UK to recognise his greatness by awarding him an honorary doctorate.

Three generations separated him from the students in Denver, but he touched them profoundly. Indeed, another of his great legacies was his ability to inspire everyone who came into contact with him all over the world. Prof always used to say that he had two objectives – one short-term and the other long-term. His short-term objective was the abolition of nuclear weapons, and his long-term objective was the abolition of war itself. He was a truly great man, and when journalists, in his last years, put to him that he had not achieved either of his objectives, and that it was becoming increasingly unlikely that he would do so, he would reply with the question: "What is the alternative?" His work, unfinished in his lifetime, carries on. As Bertrand Russell said in his autobiography when writing about Joseph Rotblat and on the threat of nuclear war: "If ever these evils are eradicated his name should stand very high indeed among the heroes."

Professor Rotblat and the Atom Train.

By Bryce Halliday

Bryce Halliday's original text originally appeared in Peter Rowlands and Vincent Attwood , editors of War and Peace, the Life and Work of Sir Joseph Rotblatt (University of Liverpool 2006)

Professor Rotblat as we have heard felt very strongly during his time in the United States that he was obliged to change the direction of his work on moral grounds from the application of atomic energy to the development of weapons of immense destructive power to its application to medicine. He also felt that the general public was ignorant of the other uses of atomic energy and he set about arousing the scientific community to the devastating effects of nuclear weapons and the dangers of their proliferation, he felt also it was his duty to do his best to educate the general public. He was involved with others in setting up the U.K Atomic Scientists Association in 1946 and was also later involved in a life-long association with the Pugwash Conference which will be related elsewhere. The Atomic Scientists Association was formed early in 1946 by scientists many of whom had taken part during the war in the atomic energy projects in Britain, Canada and the United States
The aims of the association were as follows:

1. To bring before the public of this country the true facts about Atomic Energy and its implications.
2. To investigate and make proposals for the international control of Atomic Energy in order to help in the solution of this most pressing problem.
3. To help to shape the policy of this country in all matters relating to Atomic Energy.

Full membership is limited to graduate scientists with specialised knowledge of Atomic Energy, the Association could then speak as a body of experts.

The Association held many discussions on the political problems of atomic energy, both domestic and international, in particular, it has issued memoranda in the vital subject of international control, which had been sent to delegates at United Nations meetings.

The Association provided speakers for many meetings and had co-operated with other organisations.

Associate membership was open to all interested members of the public for a small fee and received the monthly bulletin of the Association.

The Association set up a committee to promote a travelling exhibition to be called "The Atom Train" and Joe was largely responsible for obtaining funding from the Government using all his skills of persuasion.

So in early 1947 planning for the Atom Train was started and co-operation was obtained from the Department of Atomic Energy of the Ministry of Supply and the Atomic Energy Research Establishment (A.E.R.E.) at Harwell.

They loaned radioactive sources and a lot of technical equipment, Geiger counters with associated electronics and other apparatus. The Directorate of Information of the Ministry of Supply helped in the general organisation of the Exhibition and the tour. Many other individual members of the Association contributed equipment and models and were always ready for consultation.

This is where I came on the scene being recruited to be responsible for running all this equipment which was largely unfamiliar to me in detail but as I had just completed 6 years in the army working in R.E.M.E on the installation and maintenance of anti-aircraft Radio Direction Finding equipment (now called radar) I was familiar with the basics electronics.

All the exhibition material was assembled in the University of Liverpool Physics Dept. and a number of mechanical devices we had to design, were made in the department workshops.

The Train was to consist of two large goods carriages which I believe usually carried milk and had already been used for a previous travelling exhibition. The actual panelling and general layout design was carried out by an industrial design studio and constructed and installed in the carriages in a workshop at the rear of Alexandra Palace which specialised in exhibition work. I had several visits there to check on progress and to ensure our requirements were being met.

The plan was for the coaches to tour 26 railway stations, mainly in the north of England and Scotland with Swansea, Cardiff and Bristol further south. The coaches would stay 3-6 days in a bay platform depending on the size of the town or city and members of the Association would give connected talks and also, with physics students, act as guides and lecturers on the Train. The Train staff consisted of a business manager who arranged the local lectures, advertisements and our lodgings, myself and another technician to keep it all running, with a handy-man to help generally and sell tickets and booklets.

The Train coaches, fitted out with their panels etc. came up to Edge Hill sidings Liverpool, a mile or so from the University where all the technical equipment was all ready to be fitted into their places. We were visited by several physicists and I well remember one evening when Professor Peirls of Birmingham, who you will remember, with Dr. Frisch wrote the famous memorandum stating that if the isotope U235 was used for a bomb instead of U 238 the weight would be measured in kilos instead of tons, thus making a bomb possible to deliver. Joe and the Prof. were talking very animatedly and loudly, Joe in his strong Polish accent and the Prof very Germanic. The Prof finally left and Joe and I set off to return to the Lab when he turned to me and said "The trouble with these foreigners is they are so excitable !!!"

The Train was officially opened in early November 1947 by Sir James Chadwick in the old Liverpool Central Station, moving immediately to start its tour in a bay platform at Chester continuing then for 6 months visiting 26 locations, finishing in London, Paddington.

It exceeded by far the expectations of the Association and we often had queues waiting to go through even up to 9pm. at night, the booklet which I still have, had to be reprinted twice making a nice profit.

The exhibition was divided into two parts, Fundamental Facts and Practical Applications. The first part showed with diagrams and models the construction of atoms and molecules, explained isotopes, especially the uranium mass numbers, how atoms behave creating molecules and compounds and Einstein's theory that mass and energy are related $E=mc^2$.

Radioactivity was explained and demonstrated to the visitor using a Geiger counter to measure the activity of his luminous dial of his wrist watch, or better still see the radiation from a piece of Trinitite, a glassy piece of fused sand found on the ground after the first atomic explosion in New Mexico, loaned by Prof. Chadwick who witnessed the event.

Splitting the atom was explained and in the days before Geiger counters, a device called a cloud chamber was used to obtain visual evidence of disintegration under bombardment, in our working model by fast alpha particles. While the Train was in Edinburgh, a young physics

student was giving a very good description to an elderly visitor of the chamber's function. The visitor thanked him and moved away and I was able to tell the student he had been speaking to the chamber's inventor Prof. CTR Wilson (for which he received the Nobel Prize in Physics.) Particle accelerators were explained, but the lovely working model of a cyclotron, loaned by the Science Museum, would never work due to the continual small movements of the coaches. A model using suspended permanent magnets was used to demonstrate the behaviour of protons and neutrons approaching a nucleus, this was a rather fragile model and was frequently broken. though during the whole tour ,only 2 people confessed to breakage. While in Blackpool it was broken more frequently than usual which we put down to the visitors being used to more robust Arcade games !!.

A fine exhibit provided by the now defunct Metropolitan Vickers, demonstrated how silver plates could be made radio-active by a neutron source, the emitted neutrons being moderated by paraffin wax.

In the second part of the exhibition, the Practical Applications, fission was demonstrated and an active diagram explained the process of a chain reaction, and three working models showed three methods of isotope separation and how a chain reaction could be controlled to produce heat in a reactor, the heat producing steam to drive a turbine electric generator Maps were displayed to give the visitor the facts of a bomb dropped on Central London showing the range and areas of destruction, and we always had a similar map of the local area of the town we were in.

The use of radio-isotopes in medicine for diagnostics and treatment were outlined with illustrations, and the use of tracers in agriculture and industry were explained.

Finally the visitors were presented with the choices open to them with the possibilities of good or evil, either destruction or construction.

Many schools and colleges with some older university students visited the Exhibition and quite a number of adult groups like the Rotary Clubs came through , the Association felt that their aim had been achieved. Some people came expecting a ride in a nuclear powered train!

The exhibition carriages were then used to tour the south of England, visiting Kent, Hampshire, Devon and Cornwall

The equipment only was returned to Liverpool, later to be assembled by me as a static exhibition in Paris to go to a U.N.E.S.C.O. conference in the Lebanon. It made its last appearance, as far as I know in 1949 when I re-assembled it again in Copenhagen to tour Scandinavian countries.

Joe Rotblat visited the Train frequently, and gave many parallel lectures and it was certainly his enthusiasm that was a major contribution to its success and it was good to see his brain-child so successful.

After the first tour of the Train I joined the Liverpool University Physics Dept. to operate and maintain the 8 Mev cyclotron built by Prof. Chadwick before the war.

Sir Robert Fox Symons (a response to a question)

Adrian Thomas

Sir Robert Fox Symons KBE MRCS LRCP DPH was a doctor graduating at St Thomas's Hospital. He was born in 1870 and died on June 26th 1932. He married in 1901 to a M. Calverley, who was a nursing sister at St. Bartholomew's Hospital.

When he was a house surgeon he was invited by Francis Charles Abbott (a surgeon at St. Thomas's Hospital) to go with the team that was going to Greece under the auspices of the British Red Cross Society. The account was written up in "The Lancet" and Abbott fully credited Robert Fox Symons for the radiography. The apparatus was the most modern available at the time and was the same as that used at St. Thomas's Hospital. Fox Symons was the radiographer for the unit. Following the Graeco-Turkish War, Fox Symons went to South Africa to help in the Boer War and remained in the Transvaal for more than 10 years, finally ending as medical adviser to both the South African Government and the British High Commissioner. Before the First World War he returned to England and to clinical practice in Kensington. He was knighted in 1918 for his services to the Red Cross during the war.

In Phalaerum during the Graeco-Turkish War a room at the base hospital was set out for the x-ray equipment and Fox Symons had this installed and working by the 1st of June 1897. Casualties arrived soon after and x-ray work continued for about six weeks. There were many difficulties, however the results were successful. Abbott and Fox Symons were able to illustrate

their report about their activities with several radiographs and claimed "to record the first skiagrams taken in wartime, as well as to show that even inexperienced hands working can get fair results." The original prints were exhibited at the first conversazione of the Röntgen Society in London (this became the British Institute of Radiology), which took place in London on the 15th of November 1897. Abbott and his team treated about 114 patients with war injuries and Fox Symons probably radiographed about half of them.

On the account of Abbott and Fox Symons is interesting because of the account of the use of x-rays under field conditions and it was the first to be available to the British Army and therefore influenced their attitudes in following campaigns.

Fox Symons lists the technical difficulties including:

- The heavy weight of the coil and accumulators.
- The fragility of the Crookes tubes and glass plates.
- The dangers of transporting cases of sulphuric acid for the accumulators.
- The delicacy and temperamental nature of the apparatus.
- The general problems of transportation.

It was also said that an additional source of difficulty was the superstition of the local inhabitants who looked at the x-ray apparatus and its use has the work of the devil. Fox Symons said that it was difficult to take radiographs when the patient was constantly crossing himself toward of evil spirits.

Of the most serious obstacle to field radiography was the lack of a reliable source of electrical power and this prevented them from siting the x-ray apparatus where it would be most useful - which was at Khalkis in the hospital nearest to the front line. Even Phalaerum did not have access to a mains electrical supply and so they used "HMS Rodney" (a warship of the Royal Navy) as the source of electricity to recharge their wet batteries.

The casualties were mainly cases of fracture or suspected retained bullets and in several patients the bullets had penetrated the body cavities. The radiographic findings in addition to helping with the immediate treatment the patient helps to define this new area of military medicine. The nature of war wounds were was changing due to the newer high velocity rifles and Abbott wrote to the War Office and said: "The Roentgen rays should always, if possible, be available at the hospital nearest the front in which the wounds can be first properly examined and dealt with.the apparatus is of no use in the field where detection can only be an incentive to premature exploration. The less wounds are tampered with before satisfactory surroundings are reached, the better. The modern bullet is practically aseptic and there is no urgency for removal....."

Robert Fox-Symons won great popularity during the Greco-Turkish war by both his kindness and by his charming manner. He was decorated and was awarded the title of Chevalier de l' Ordre Royal du Sauveur by the King of the Hellenes at the end of his Greece service.

Slate face in Lennep

