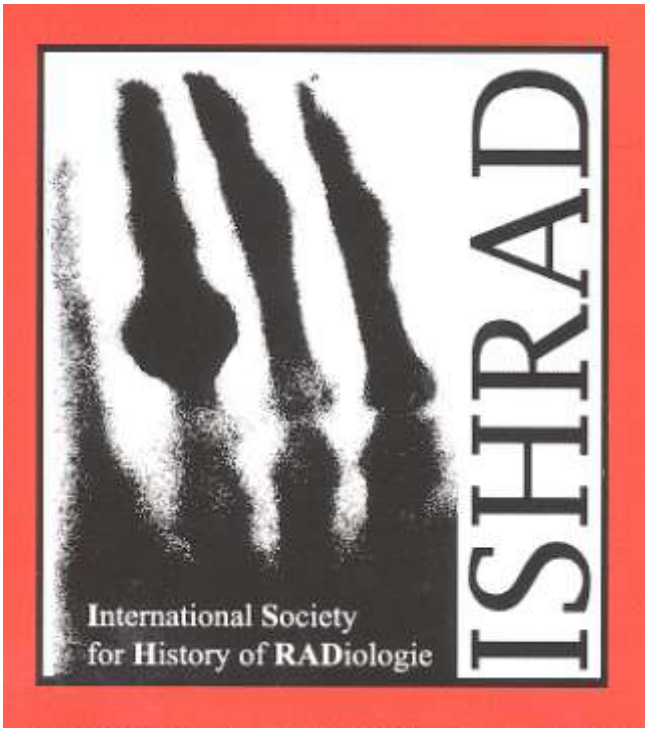
THE INVISIBLE LIGHT

The Journal of

The British Society for the History of Radiology



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Editorial

It was good to see you all at ECR and quite excellent that we have founded ISHRAD – the International Society for the History of Radiology. A number of us have been talking about this for many years and the society is now a reality. Congratulations! I am pleased to have Alfredo Buzzi as Vice-Chairman, Uwe Busch as Honorary Secretary and Arpan Banerjee as Honorary Treasurer.

The history of radiology is important and brings us all together. This was demonstrated in 1995 when there were celebrations throughout the world to celebrate the centenary of the discovery of the new rays by Wilhelm Conrad Röntgen. I was very privileged to be in Remscheid in 1995 for the 150th birthday celebrations of Röntgen since he discovered X-rays in his 50th year. It has been very pleasing to see the transformation of the Deutsches Röntgen Museum since then under the skilful hands of our Honorary Secretary Uwe Busch who is the Deputy Director. The spiritual home of radiology is in Remscheid and we hope to have a meeting there in November 2011. I will be going to Remscheid in the next couple of weeks to sign a document for ISHRAD with the notary and I will arrange a date with Uwe.

This year is the centenary of Marie Curie's second Nobel Prize which she received for Chemistry. Her first Nobel Prize was for Physics which she received jointly with Pierre

Curie and Henri Becquerel. This year is also the 'Year of Radiotherapy' and we need to remember that ISHRAD is as much about radiotherapy as it is about diagnostic radiology. ISHRAD is for all who are interested in the history of the radiological sciences including doctors, radiographers, physicists, industry, historians and others.

It is important that the history of radiology is integrated into the history of medicine which is why I am pleased that I give a talk on the Diploma Course for the History of Medicine of the Society of Apothecaries (DHMSA) that is held in London. I have also been presenting work at the British Society for the History of Medicine (BSHM www.bshm.org.uk) of which I am the current Vice-President. The BSHM has a congress this year in Guilford at the University of Surrey (which is close to London) from 31st August to 3rd September 2011. If you wish to present a paper please let me know and I will send you the details. It would be great to see you there. The conference is in association with the Faculty of the History and Philosophy of Medicine and Pharmacy of the Society of Apothecaries and a theme is 'Modern Medical Advances. Details are available from the BSHM secretary: drfdavidson@yahoo.co.uk

The British Society for the History of Radiology http://www.bshr.org.uk/ has a newsletter/journal called 'The Invisible Light' that publishes papers and if anyone has something of interest then I would be delighted to consider it. There is to be a history session at UKRC www.ukrc.org.uk , the UK annual radiology meeting, which will be held in Manchester from 6th to 8th June 2011.

ISHRAD is to have a website at http://www.ishrad.org/ . This will need to be developed and we can use it to put up information about the history of radiology and to advertise meetings.

Best wishes

Adrian

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UKRC 2011

We will be at UKRC from Monday 6 - Wednesday 8 June 2011: Manchester Central Convention Centre.

UKRC is a three day multidisciplinary Congress covering all aspects of diagnostic imaging and oncology, as well as radiology informatics and service delivery.

Multiple CPD opportunities; including hands on workshops, sunrise refresher schools, talks delivered by high-profile speakers and accredited education on the stands.

UKRC is the leading and largest diagnostic imaging event in the UK:

- Over 3000 delegates and visitors
- Comprehensive Exhibition
- Focus on current and emerging technologies
- Prestigious international speakers
- Eponymous Lectures from the UKRC partner societies

Come and visit our stand and go to the History Session.

16:15-17:30 History of Radiology Session on the 7th June 2011.

Moderator: Dr. Adrian Thomas

1615-1630	Introduction & Marie Curie: The Centenary of her Second Nobel Prize	Dr. Adrian Thomas, Princess Royal University Hospital, Kent
1630-1650	The Sri Lankan Radiography Oral History Project	Dr. Christine Ferris, Sheffield Hallam University Hospital, Sheffield
1650-1710	Frank Farmer	Dr. John Kotre, Newcastle General Hospital, Newcastle-upon-Tyne
1710-1730	Radiology in Argentina	Prof. Alfredo Buzzi, University of Buenos Aires, Argentina

Recent Books, Papers and Exhibitions in the History of Radiology

Having put in a note about the following book by Lloyd Kemp in the last issue Angela Newing has submitted a review which follows:

Science Isn't Everything: Memoirs of a Scientist

Lloyd Kemp Aspect Design 2009 ISBN 978-1-905795-51-2 Soft back pp402 £12.99

I find all autobiographies interesting. This one is particularly so because it charts Lloyd Kemp's long career as a pioneering physicist as well as giving great detail of his personal life.

From Kings College, London, where he lived on a bursary of £50 a year in the early 1930s and where he obtained a first in physics, he went on to a diploma in education. By chance he then became involved in early experiments in television including the very first broadcast pictures in 1938. During the war, as a conscientious objector, Lloyd first began teaching but later became a trainee medical physicist at Bradford. The book includes some hair-raising tales about radium tubes and needles used for moulds and implants. Later, after joining the physics department at the London Hospital he was able to do research on radium dosimetry including the establishment of International standards of measurement He was awarded a PhD and moved to NPL in 1966. Shortly before his retirement in 1978, Lloyd was awarded the OBE in recognition of his fruitful work in radiation physics.

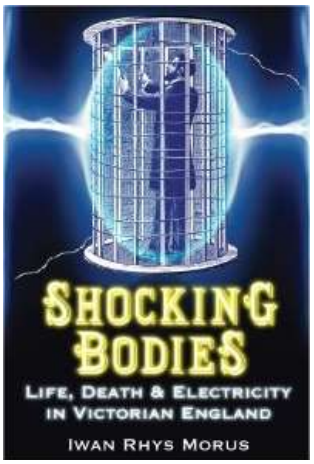
Unfortunately his wife suffered a series of strokes leaving her severely disabled, so Lloyd devoted much of his energies towards caring for her until her death in 1988. He had always been a devout Christian and writes about his faith with wisdom and authority. He was interested in the spiritual basis of life and what it means to be human. He also includes examples of his poetry and shows that he was an accomplished artist and musician.

As an historical account of early medical physics this is a seminal work. He was not a founder member of the Hospital Physicists' Association (forerunner of the IPEM), but was around when most of the developments in medical radiation were happening. It will be of considerable interest to medical historians. As a personal journey through life, with its joys and sorrows, I also recommend it to the reader.

Professor Angela Newing

Retired Director of Medical Physics, Gloucestershire

Shocking Bodies: Life, Death and Electricity in Victorian England [Paperback]



Iwan Rhys Morus (Author)

Price: £7.92 & Free Delivery with Amazon Prime

Iwan Rhys Morus MA, MPhil, PhD (Cantab) is a historian of nineteenth century science, technology and medicine. He is at the Department of History & Welsh History, University of Wales, Aberystwyth. He also has interests in the history of the body and nineteenth-century popular culture. He has published widely on these topics and recent books include When Physics became King (Chicago, 2005), Michael Faraday and the Electrical Century (Icon Books, 2004) and Frankenstein's Children (Princeton, 1998). His current research projects focus on nineteenth-century optical illusions as philosophical and experimental practices as well as the more general history of scientific performances in the nineteenth century. He has also just commenced new research projects on science and culture in nineteenth-century Wales and on the relationship between bodily and social health in the nineteenth century.

From Amazon blurb: "For the Victorians, electricity was the science of spectacle and of wonder. It provided them with new ways of probing the nature of reality and understanding themselves. Luigi Galvani's discovery of 'animal electricity' at the end of the eighteenth century opened up a whole new world of possibilities, in which electricity could cure sickness, restore sexual potency and even raise the dead. In "Shocking Bodies", Iwan Rhys Morus explores how the Victorians thought about electricity, and how they tried to use its intimate and corporeal force to answer fundamental questions about life and death. Some even believed that electricity was life, which brought into question the existence of the soul, and of God, and provided arguments in favour of political radicalism. This is the story of how electricity emerged as a powerful new tool for making sense of our bodies and the world around us."

Exhibitions:

It's interesting to see the number of exhibitions that have a radiological component.

ARS INTRINSICA

ARS INTRINSICA ist eine neue Art der Kunst: Es handelt sich dabei um Bilder von Organismen, insbesondere von lebenden Menschen, aber auch von Materialien wie Holz - angefertigt mit modernen Hochleistungsgeräten - wie sie heute in der medizinisch-radiologischen Diagnostik eingesetzt werden.

ARS INTRINSICA ist die Konsequenz unserer Neugierde, mit den faszinierenden Möglichkeiten dieser bildgebenden Verfahren und deren Nachverarbeitungstechniken eigenständige Kunst-Werke zu schaffen.

Inside Art (Review of the Week)

AUSSTELLUNG vom 06.11.2010 - 31.03. 2011 im DEUTSCHEN RÖNTGEN-MUSEUM, Remscheid

www.ars-intrinsica.com www.roentgenmuseum.de

DEUTSCHES RÖNTGEN-MUSEUM, Schwelmer Straße 41, 42897 Remscheid, www.roentgenmuseum.de

The Slice: Cutting to See

http://www.aaschool.ac.uk

AA Gallery: Architectural Association (AA) School of Architecture

36 Bedford Square, London WC1B 3ES (20.11.2010 - 15.12.2010)

> A cut and a slice is there any question when a cut and a slice are just the same.
>
> A cut and a slice has no particular exchange it has such a strange exception to all that which is different.
>
> A cut and only slice, only a cut and only a slice, the remains of a taste may remain and tasting is accurate.
>
> A cut and an occasion, a slice and a substitute a single hurry and a circumstance that shows that, all this is so reasonable when every thing is clear.
>
> Gertrude Stein, What Happened: A Play (1922)

We look at slices in radiology and this small but interesting exhibition looked at slices in other areas:

Seeing is a matter of surfaces. It's for this reason that both vision and representation are continually haunted by the problem of insides and outsides – the relationship between the external and what lies within. A merely perceptual matter? If only. It has crept on us: the ocular paradigm of post-Cartesian metaphysics gradually sublimed this pervasive visual anxiety, creating in the process our basic metaphors for critical inquiry itself: 'superficial' propositions, 'trenchant' analysis, the joys of insight.

With these matters in mind (and a whetted blade in hand), the editors of Cabinet magazine here take up THE SLICE, that clean incision that forever links the sharp knife to the keen eye. Moving across historical moments and disparate fields, this exhibition examines the peculiar traditions that link visibility to the swift saw. From the

cutaway view to the geometry of projection, from the microtome to the CAT-Scan, from the surgeon's scalpel to the sadist's guillotine, the slice can reveal a secret order, spill lurid innards and open new views. The convention of the architectural cross-section here finds its parallel in the physical sectioning of histological specimens. The pleasures of the Parisian voyeur meet the dutiful labours of the lumberjack. The earth itself, like an onion, reveals its hidden structure. So take a look. But remember, cutting to see is an object lesson in the violence of vision. The world looks different when you wield an edge.

Faraday House Association closes after 105 years

http://www.electricalreview.co.uk/news/118914/Faraday_House_Association_closes_after_105_years.html

Faraday House Association closes after 105 years

29th January 2010:

"It is with sadness we report the Faraday House Old Students Association (FHOSA) is to close after operating continuously over the last 105 years. It had been host to thousands of chartered electrical engineers. The Association membership is derived from old students of Faraday House.

In 1888 the revised Electric Lighting Act encouraged many local authorities to apply for Parliamentary Powers to establish generating stations to transmit power. Faraday House was founded to train engineers in this new practice. The college started life as the Electrical Standardising, Testing and Training Institution at Charing Cross but in June 1890 used the name Faraday House. It was located in the Charing Cross area, and fees were 100 guineas per annum. The first Faraday House Dinner was held in 1895 - it was free and some 170 attended. In 1905 the FHOSA was formed and 100 old students joined. A move was then made to Southampton Row. By now the college had 110 students.

In 1909 Dr Russell was appointed principal, and pioneered the sandwich course. This meant students had a year or so of theory and then experienced work in industry, returning again to more theory. By 1914 many old students joined up and a crash course was started to aid the war effort. By 1919 some 350 had been in the services and 34 had died. In 1920 the fees had risen to 300 guineas.

By 1928 1000 students had joined the Old Students Association and in 1929 a 40th anniversary dinner was held. In 1939 a discussion with the governors resulted in a decision to evacuate the college to Thurlestone in Devon. A new principal, Dr WRC Coode-Adams, took over from Dr Russell. Faraday House took over the Links Hotel. Staff and students who were married lived in the hotel or in houses that had been taken over by the college.

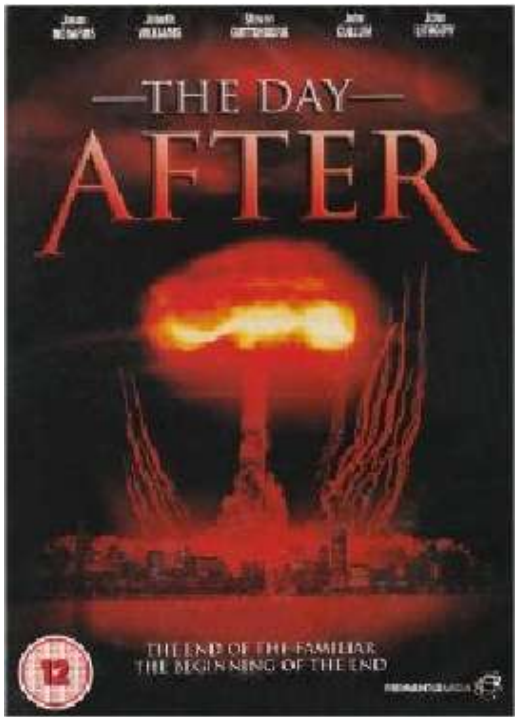
In 1942 the college returned to Southampton Row. After the war Faraday House had difficulty in recruiting, students were lured to other colleges and universities by

grants. In 1957 Mr GH Randolph Martin was appointed Principal. He had been a lecturer at the college since 1948. The college closed its doors in 1967 as losses were now running at £20,000 per year.

During its lifetime Faraday House produced a succession of engineers who attained the most senior positions in industry and electrical supply in many countries, and six old students have been president of the Institution of Electrical Engineers (now the IET)."

Films with a radiological content.

The Day After [DVD] [1983]

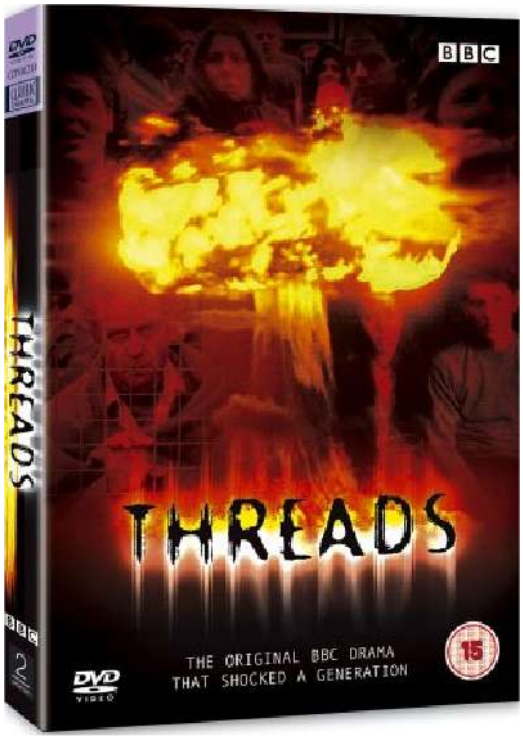


This is a drama about the unthinkable and catastrophic consequences of nuclear war. The plot covers the events in the mid-west before, during and after a nuclear war and its effects on the lives of ordinary people. It starred Jason Robards and JoBeth Williams and was directed by Nicholas Meyer. This is an interesting film on the effects of nuclear war. In vivid colour people are vapourised, burned and shattered. There is no hope or relief at the end of this film and most of the major characters like Jason Robards are left dying of radiation sickness, healthy young men and women drop like flies, hospitals are overrun, food runs out, looting and murder runs rampant.

One of the reviewers on Amazon said that "According to Gerard de Groot in his history of nuclear weapons 'The Bomb', this film affected Ronald Reagan so profoundly that it inspired him to abandon his bellicose stance towards the Soviet Union and begin arms limitation talks. If that's true, then this is one of the most important films ever made."

I had my copy from Amazon at £3.93 & Free Delivery with Amazon Prime.

Threads [DVD] [1984]



Threads was written by Barry Hines and is described as "the original BBC drama that shocked a generation." It stars Karen Meagher and Reece Dinsdale and is directed by Mick Jackson.

My copy was from Amazon at £4.99 & Free Delivery with Amazon Prime

The film describes the realistic account of a global nuclear war and its outcomes when 200 megatons of nuclear explosive falls on Sheffield on a Thursday. There follows a depiction of a brutalised post-war generation.

As an Amazon reviewer said: "standard 'horror' movies like Saw or Hostel are scary because you know all along that it's tomato ketchup. Threads is absolutely bloody terrifying, because the scenario it depicts could happen, did happen (to an extent) in 1945 and in all likelihood will probably happen again one day in the future. It takes an event that no-one would ever want to imagine or think about too deeply and hits you in the face with it, in all its harrowing, visceral, nightmarish hideousness."

Threads represents the pinnacle of the twentieth century British tradition of post-apocalyptic fiction, a genre of which I am a big fan, but unlike most books / movies in this category, the scenario remains highly plausible and there is not the faintest glimmer of hope at the end, not for anyone.

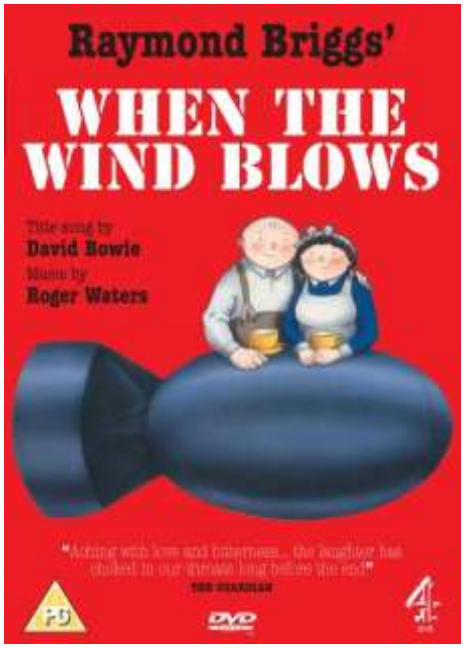
"A must-watch, but only if you think you can handle it."

When The Wind Blows [DVD]

This animated film starred Peggy Ashcroft, John Mills and was directed by Jimmy T. Murakami.

My price was £4.97 from Amazon & Free Delivery with Amazon Prime

There is a special feature on the making of the film and an interview with Raymond Briggs (who also made the classic animation *The Snowman*). Raymond Briggs' now famous bestselling comic cartoon book depicts the effects of a nuclear attack on an elderly couple in his usual humorous yet macabre way. Publisher: Penguin; New Ed edition (29 Jan 1987)



When The Wind Blows is an animation based on Raymond Briggs's comic cartoon book of the same name and was made in the mid 1980s. It follows Jim and Hilda, a typical retired couple, as they deal with the effects of a nuclear attack ('The Bomb') during the Third World War between the U.S.A and The Soviets. Music in the film is by Roger Waters but the title song comes from David Bowie.

"This graphical novel is set in England during the Regan-Thatcher years of the early eighties. It covers the final days of Jim and Hilda Bloggs as they are caught up in a global nuclear war.

In Britain at this time there was much public concern over the increased tension between NATO and the Warsaw pact nations and the deployment of short range nuclear weapons by both blocs raised these tensions. In this atmosphere, the British government published a set of leaflets setting out what precautions could be taken by the public to reduce the effects of a nuclear strike."

Radiology Sweets #3: Harcos Labs Nuclear Energy Powder Fuel Rod Pack

E-bay: Item number: 250767911371

I have seen radiology sweets before from 'Toxic Waste ultra-sour flavour Nuclear Sludge' (popular on the BSHR stand at UKRC!) and 'Trolli 995 fat free X-ray Fish.'

The full variety of Nuclear Energy Powders from Harcos Laboratories in one dangerously radioactive bundle!

"Nuclear Energy Powder is a delicious way to avoid a meltdown. Go nuke yourself with all 5 of the fruity (and cake-y) flavours of Nuclear Energy Powder in one dangerously colourful bundle."

Radium Raspberry Lemonade Nuclear Energy Powder

"Energize yourself with Radium Nuclear Energy Powder in a tangy Raspberry Lemonade flavour - contains 90mg of caffeine!

Nuclear Energy Powder is a delicious way to avoid a meltdown. This Radium Raspberry Lemonade fuel rod contains 90mg of caffeine delivered by pouring the powder into your mouth and enjoying the ensuing explosion of taste while leaving your mouth with a radioactive blue tint!"

"Nuclear Energy Powder is a delicious way to avoid a meltdown. Go nuke yourself with all 5 of the fruity (and cake-y) flavours of Nuclear Energy Powder in one dangerously colourful bundle."

Radiological Medals (A series): Wilhelm Conrad Roentgen.

This charming medal was struck in 1995 and the box records it as from Philips Medical Systems (Philips Polska).

Obverse: On the convex and sunken planes inscription: XXXIV ZJAZD RADIOLOGÓW POLSKICH ((English: XXXIV MEETING OF POLISH RADIOLOGISTS). On the right side is an inscription: ŁÓDŹ 15 - 19.X. 1995.

Reverse: In an arc of curved recessed surfaces there is a bust of a bearded man (Wilhelm Conrad Röntgen 27 March 1845 – 10 February 1923) in a right X-RAYS

The medal is unsigned and was designed and made by Bogdan Wajberg.

Dimensions: 38 x 59 mm; Medal in original box. Metal: Bronze Weight: 107 grams.

Who was Ernest Harnack?

By Adrian Thomas

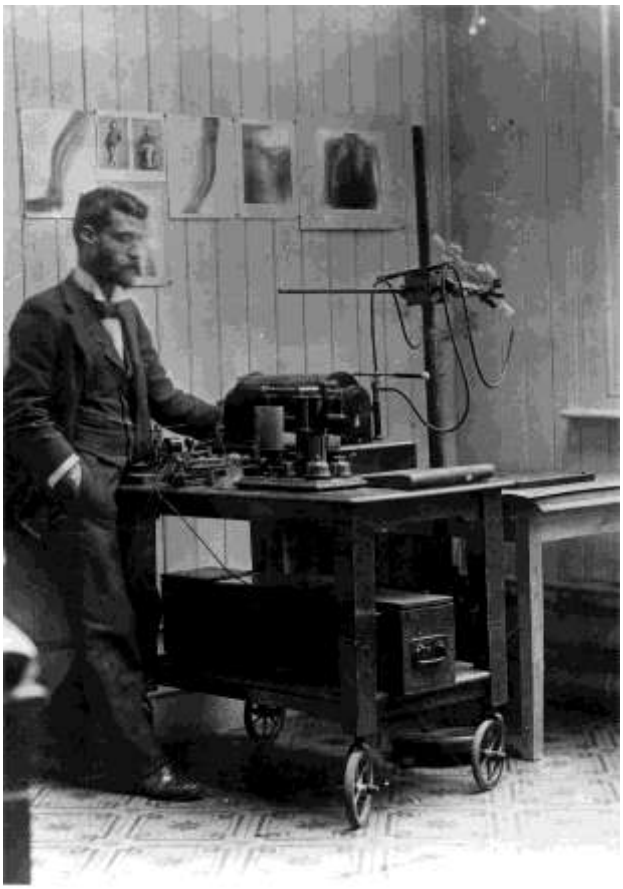
We were contacted by Sandie Powner who wrote that she found the British Society for the History of Radiology website. Sandie is tracing her husband's family history and has discovered he is related to Ernest Henry Harnack, one of the pioneers of radiology at the London Hospital.

Many hospitals obtained X-ray apparatus shortly following the discovery of the new rays by Röntgen in 1895. Initial experiments at the London Hospital were undertaken by a physician, Dr Page and a surgeon, Mr Harold Barnard. The initial interest was centred around a photographic club within the hospital. Ernest Harnack was senior Clerk to the Medical & Surgical Registrars and his hobby was electricity. He quickly volunteered his services and the first radiograph was taken which was of a needle in a nurse's foot and was made in May 1896. This radiograph was taken by Dr Hedley

assisted by Harnack and involved an exposure time of 20 minutes. Harnack retired from the Registrar's office and gave his whole time to the new X-ray department.

Initially there was no X-ray room and the patients were examined using a special trolley designed by Harnack probably in about 1897 and which was made on site. The trolley was very heavy with a marble top and had several accumulators on the lower shelf. It was shown at the first meeting of the Röntgen Society held in St Martin's Town Hall in October 1898 and was used in the hospital for many years. The charging of the batteries for the apparatus was difficult and had to be undertaken at the People's Palace, an educational establishment across the road, since at this time there was no electricity available within the hospital. Harnack was in entire charge of the work and unfortunately he developed an X-ray dermatitis due to repeated exposures.

In 1897 the first X-ray department was established in the 'Tin Sheds' shared with the electrical department. These were in use until 1903 when the work was transferred to the new out-patients building.



Ernest Harnack and the mobile X-ray machine at the London Hospital.

Harnack had three assistants. Initially there was Ernest Wilson, a photographer, joining him in 1899. Reginald Blackall joined in 1900, who was mainly involved in therapy work, and Harold Suggars who joined in 1902. All four of these lay X-ray assistants or radiographers suffered from injuries and became X-ray martyrs. Their names are recorded on the memorial to X-ray and radium martyrs in the grounds of

St. George's Hospital, Hamburg. By 1909 Harnack had been forced to retire from practical work because of his injuries and finally had both hands amputated.

In later years Ernest Harnack was well known as a teacher of Radiography.

Harnack designed an X-ray couch in collaboration with the pioneer X-ray manufacturer A.E.Dean. This was listed in A.E.Dean's catalogue for 1904.

A history of the Hereford Hospitals.

By the late Derek Guttery.

Derek Guttery wrote to following in response to a question by a Mr. Renton about the history of Hereford Hospital:

First, a few somewhat prolix generalities:

The X-ray unit donated to Hereford Infirmary in 1896 would have consisted of a high voltage induction coil, Crookes' gas discharge or primitive form of X-ray tube (depending upon how early in 1896 the donation was made), and a simple tube holder (usually adapted from a laboratory retort stand). In addition, the installation would almost certainly have included a barium-platinocyanide fluorescent screen (usually, about 10" x 8") mounted in a wood frame. Exposures in early 1896 would have been made on standard photographic glass plates placed in camera plate holders (normally incorporating aluminium or fibre dark-slides). Plate sizes then readily available for photography – and size-wise also very suitable for many X ray examinations – were 4¼ x 3¾, 6½ x 8½, 10 x 8 and 12 x 10 in. Larger sizes were

uncommon until later. Plate manufacturers introduced thicker emulsions specifically compounded for X-ray use from about May, 1896 onwards but glass as the supporting medium continued in general use until about 1918 when satisfactory X-ray film became available. Processing of the plates would have been undertaken by a local photographer or photographic chemist as it is extremely unlikely that the Infirmary would have had darkroom facilities. The complete X-ray equipment would have cost the donor from £30 to £120. [I'm curious to know why Mr Renton quotes a figure of £25,000].

The important point to remember is that dedicated X ray "sets" did not arrive on the scene until after late 1897 and that what the supplier delivered prior to then – either assembled by him or by the user – was a collection of separate components that had been employed in academic, private and commercial laboratories since about 1880. In fact, it was the ready availability of all the necessary bits and pieces – apart from the fluorescent screen – combined with a practical knowledge of photography that enabled several enthusiastic amateur experimentalist to make X ray images within a very short time following the first announcement of Röntgen's discovery in the London press on 6 and 7 January 1896. Most of them already possessed a darkroom together with a source of high-voltage (induction coil or Wimshurst machine) and one or more Crookes' gas-discharge tubes and were thus enabled to replicate the press descriptions of the discovery almost immediately. The first English translation of Röntgen's 10-page paper EINE NEUE ART VON STRAHLEN setting out the facts of his discovery appeared in the journal NATURE on 23 January and by a different translator in the ELECTRICIAN the following day but by then at least two of the first experimentalists had already publicly demonstrated successful generation of X-rays and sent accounts of their work to photographic journals – thus the "new photography".

The 1896 equipment at Hereford would have been energised from either a set of primary batteries (usually evil-smelling Grove cells) or, more probably, from a set of secondary accumulators. The input voltage would have been in the range 6 to 20 V. Accumulators were charged from a dynamo where no mains electricity was available. There would have been no form of radiation shielding for the patient or the operator. The process of taking a radiograph would have been very "hit and miss" with failure more common than success. The relatively low power of an 1896 equipment – combined with the very low sensitivity of single-emulsion photographic plates to X radiation – would have limited most practicable examinations to the location of foreign bodies in soft tissue and fracture in the bones of extremities. As example, a very similar installation of an induction coil equipment donated to my local [Bedford General] Hospital in 1901 by the town's Medical Society [at a cost between £60 and £70] was used for 134 X ray examinations during the first year of operation apportioned as follows [Annual Reports, 1899-1904]:

Fractures, dislocations & injuries	98 cases
Foreign bodies: nails, needles, etc.	26 cases
Chest	6 cases
Stones in kidney, bladder	3 cases
Treatment of lupus by ?many/?heavy exposures	1 case

Much of the exploratory work would have been undertaken – especially when looking for foreign bodies – with a fluorescent screen and a permanent photographic record was often not considered necessary. Plate exposures for a human hand ranged from 1 minute to 10-minutes and for denser parts of the body could extend to 45-60 minutes making such examinations quite impracticable. Plates were expensive and by virtue of their fragility – especially in the larger sizes – not easily referable elsewhere. For the occasional referral, positive contact prints could be made from the original glass negative or reduced-size prints with a camera.

A number of handbooks on X-ray equipment and the practical aspects of radiography were published during 1896. Two of the best and most commonly available texts were H. Snowdon Ward's Practical Radiography published in April and Arthur Thornton's The X Rays, published in May. Numerous "do it yourself" articles also appeared in the photographic journals. Technical assistance might also be available from local photographers or the science master of the local Grammar School or technical college. For example, Arthur Thornton, author of The X rays (written while he was senior science master at Bradford Grammar school) personally installed the first X-ray unit at the Lloyds Hospital in Bridlington as he was the only person in the area with the necessary technical knowledge. There are other instances of similar technical skills being available locally.

I am surprised that mains electricity was not installed at Hereford Infirmary until as late as 1905 as I am fairly sure that the town had a 220 V direct current supply for lighting from at least 1901. The supply was still direct current in 1913. Outside London, direct current predominated over alternating current by a factor of more than 2:1 until the 'twenties and persisted in several towns until the late 'forties. The predominance of direct current mains supplies in Britain is one of the reasons why induction-coil X-ray units continued in fairly general use for nearly two decades following introduction by the American C. H. Snook of the closed circuit A.C. transformer in 1907.

Incidentally, it is quite possible that the 1896 equipment at Hereford was purchased from the long-established photographic and scientific instrument dealer, Philip Harris of Edmund Street, Birmingham as his company was one of the principal suppliers outside London. Apart from the company's relative proximity to Hereford, it may also

be significant that the Birmingham Harris family is thought to have been descended from "Flying Wagons" Philip Harris, the late 18th century Hereford carrier. Philip Harris is still very much in business today as a plc supplier of medical, chemical and scientific laboratory equipment.

When Hereford equipped its new "Electric and X-ray Department" in 1907 the equipment would still have been based on a high voltage induction coil as the first British-made (Newton & Co.) closed-circuit high-voltage transformers were not available until that year and took some time to be accepted in Britain even by the larger London hospitals. The equipment was probably mains operated and the D.C. mains voltage would have been reduced to the approximately 20-volts required for the coil with a wall-mounted control panel incorporating a voltage-dropping series resistance, voltmeter, ammeter and switches for the mains supply and for initiating and terminating the exposure.

The X-ray tube would still have been the "gas" type derived from Crookes' original gas discharge tubes but by 1907 was quite a sophisticated instrument and relatively reliable. In practice, the department probably possessed 4, 5, 6 or even more tubes of different degrees of "hardness" to meet the penetration requirements of the different parts of the body. The tubes would have been stored in a neat row on a wall-mounted rack and carefully selected by the operator to suit individual applications. Exposure times would have been considerably shortened since 1896 but would still be measured with a clock or stop-watch or by counting the swings of a 9¾in. ½-second string pendulum. The tube holder would have provided both for angulation and vertical and horizontal adjustment; there would also have been some form of wooden examination table. Radiation protection for the operator and patient continued to be non-existent or, at best, rudimentary and radiographs would still be on glass plates. "Eastman's X ray Paper", introduced in March 1907 as an early alternative to glass plates, does not seem to have achieved more than limited acceptance. The enclosed copy pages from Newton & Co.'s 1910-1911 catalogue should give Mr Renton some idea of the range of equipment available as improvements made between 1907 and 1910 are insignificant in the present context.

The total cost of equipping the new department would still have been below £250. Other equipment in the same department would almost certainly have included a Finsen light apparatus for the treatment of lupus.

The records of Bedford County Hospital illustrate a situation probably very similar to that at Hereford. In early 1912 the Medical Committee decided to replace the original 1901 equipment with a complete new installation and invited tenders from three leading suppliers with results as follows:

Watson's	£182 8 6d
Schall	£178 0 0d
Siemens [Bros.]	£214 8 6d

Schall's quotation was accepted after existing users of the three makes of equipment had been canvassed. Installation of the new equipment was completed on 25 November, 1912 and local medical practitioners were advised –

The old X-ray apparatus which was presented to the hospital by the members of the Bedford Medical Society having proved itself inadequate has been replaced by a thoroughly modern installation supplied by Messrs Schall & Son with all the appliances necessary for every variety of radiography and electric therapeutics. The apparatus has been housed in a new annex readily accessible from the wards and provided with a dressing room. — Minute Book of the Medical Committee, 1910-1919

The Schall equipment continued in use until 1930 while the original 1901 equipment was offered to "one of the educational establishments of the town" [Bedford School] for £20.

To get a "feel" for the period, Mr Renton could do no better than read the enclosed copies of two very relevant papers by the eminent X-ray pioneer, radiologist and sometime surgeon, C. Thurstan Holland. His article "X-rays in 1896" (first published in the Liverpool Medico-Chirurgical Journal in 1937) and Silvanus Thompson Memorial Lecture "X-rays and Diagnosis" (delivered in 1923) give a valuable personal account of the use of X-rays in medicine from almost immediately following their discovery. The two papers contain some duplication but should be read as separate accounts. The copies are included for text only as clear reproduction of half-tones is beyond the capability of my machine.

Three relevant photographic prints and a single electrostatic copy page enclosed with this letter show:

- Schematic arrangement of an induction coil, pear-shaped 2-electrode Crookes' tube and photographic plate arranged for the X-ray examination of a human hand. The tube pre-dates the 3-electrode "focus" tube introduced in mid-March 1896 and the X-ray emission would have originated at the domed end of the glass envelope. (Derived from an advertisement by E. Ducretet and L. Le Jeune of Paris which also appeared in the [London] Electrical Review, 27 March 1896)

- Artist's impression of a lady in bombazine dress having her hand radiographed. The primitive 2-electrode Crookes' type tube suspended over the lady's hand is connected to an induction coil. The associated batteries shown on the floor are mounted in two carrying frames. The male figure is Gaston Séguy who

is reputed to have taken the first X-ray pictures in France at Francois Pierre Le Roux's laboratory at the Ecole Supérieure de Pharmacie, Paris. (Enlarged from a picture reproduced in Scientific American Supplement, 41:16910, 11 April, 1896)

 Depiction of the X-ray fluoroscopic examination of a young lady's heavily be-ringed hand "staged" sometime during early to mid-1896. The induction coil is sitting on the end of the table and the X-ray tube is mounted in a basic laboratory retort stand with two sash-window counterweights for additional stability. The primary batteries or accumulators are beneath the table. The hand-held fluorescent screen is mounted in a card-backed wood frame and lacking any form of dark viewing hood or radiation protection. In practice, the examination would have been undertaken in a darkened room and the only light would have been the apple-green fluorescence emitted by the screen and the soda-glass envelope of the X-ray tube. The radiograph shown beneath is of the same lady's be-ringed hand. For some reason she decided to don a stitched kid glove before it was taken. (Picture of unknown provenance)

 Philip Harris press advertisement (April 1896) for "X RAYS, Induction Coils, Batteries, and Accumulators [and] Tubes all Patterns . . ."

And now to specifics:

The MULTOSTAT queried by Mr Renton was the trade name of a multi-function electro-medical instrument providing galvanic, faradic, sinusoidal and other electrical treatments from a single source. It was manufactured by Elektrizitätsgesellschaft Sanitas of Berlin and sold in Britain through its London branch, Sanitas Electrical Company. Sanitas was also deeply involved in the manufacture and supply of X-ray equipment. Perhaps Hereford's 1907 X-ray installation came from the same source.

The London branch of Sanitas opened in 1902-04 under the control of two Germans, Willi H. Schwedler and Arthur Strich. The first office and showroom was in Soho Square but in 1907 the company moved to more suitable premises at 61 Cavendish Street. Its workshops and test rooms were at 9 & 10 Bentinck Mews. The MULTOSTAT was probably introduced to London in about 1907. At the declaration of the 1914-18 war, the London branch was confiscated by the Custodian of Enemy Property in accordance with the Enemy Trading Act and in fact never re-opened. Consequently, the history of the MULTOSTAT in Britain is relatively short and it is extremely unlikely that any British versions of the instrument have survived.

The MULTOSTAT was one of a family of similar instruments offered by various manufacturers and marketed under names such as PANTOSTAT and POLYSTAT. The design concept – irrespective of manufacturer – was, firstly, to allow "earth-free" electrical treatment to be made from a D.C. mains supply without the possibility of the patient receiving the unpleasant and sometimes fatal electrical shocks that could occur with treatment energised direct from the mains and, secondly, to provide for several different types of treatment from the same instrument.

Subsequently, some manufacturers offered similar "universal" machines for A.C. mains and battery operation.

The key features of D.C. mains-operated versions of "earth-free" instruments were an electric motor and generator insulated from each other and typically wound side-by-side on the same shaft and within the same housing. Some manufacturers mounted the two components separately. The A.C. current from the generator was transformed to a lower A.C. voltage for sinusoidal applications and for heating a cautery or the filament of a surgical lamp and a separate insulated winding on the motor gave a reduced D.C. output for galvanization, ionization and the testing of nerve and muscle. In some models, the motor (usually about 1/8 horse power) could be employed to drive a flexible shaft for mechanical massage and for powering drills, trephines and circular saws for surgery. Generically, the instruments fully justified the commonly applied appellation "Universal".

The first "Earth-free" instrument was the PANTOSTAT designed and manufactured by Reiniger, Gebbert and Schall (R.G.S.) of Erlangen and introduced to London by Karl Schall (then at 55 Wigmore Street) in 1903. British-made versions of the PANTOSTAT continued to be offered by Karl Schall's successor company, Schall & Son, for at least another forty years and were, without doubt, the make most widely used in British hospitals and private practices.

The MULTOSTAT and PANTOSTAT appeared during a period when German manufacturers tended to give medical instruments descriptive trade names compounded from Latin and Greek elements. One very descriptive but otherwise unrelated example was the name TRIDORUS GIGANTUS given to a powerful 3-phase X-ray generator introduced during the early 'thirties by Siemens-Reiniger Werke. The two languages were often combined in a single name and sometimes derived from questionable etymology. However, the universality of classical languages made them memorable and acceptable in a world-wide medical instrument export market more or less dominated by German companies.

Two of the enclosed photographic prints show:

- Four versions of an advertisement for the Sanitas Electrical MULTOSTAT "Earth-free Universal Apparatus" published in the January, May and July 1909 and July 1911 issues of the Journal of the Röntgen Society. The advertisements illustrate a change in design introduced sometime between January and May 1909. [Advertisements reproduced same-size].

- Illustration and description of the PANTOSTAT "Universal Apparatus" taken from page 145 of the 16th (December 1914) edition of Schall & Son's catalogue Electro-Medical Instruments and their Management. [Reproduced slightly reduced].

I hope I've provided your enquirer with answers to some of his questions. If he has any further queries, please do not hesitate to let me know. I've included duplicates

of the enclosure for your files and propose delivering the complete package to your desk on Friday 24 April.

Yours sincerely

D. R. Guttery.

Note 1: The first British account of Röntgen's discovery appeared in the DAILY CHRONICLE on Monday, 6 January, 1896 ["Remarkable Scientific Discovery"] and was followed by a similar but slightly more detailed account in THE STANDARD morning newspaper the following day ("A Photographic Discovery"). Both accounts contained sufficient detail {"Light emitted from one of Crookes' vacuum tubes"] to enable a number of readers to attempt to confirm Röntgen's discovery which, initially, was viewed with some scepticism. The first successful experimenter was A.A.Campbell Swinton who produced a very faint X ray image of a coin during the evening of 7 January and followed with two clear images of various metallic and fibrous objects the following day and of a human hand on 13 January. The radiographs were exhibited by him at a meeting of the Camera Club at 21 Bedford Street, Covent Garden on 16 January and a few days later at the Royal Institution. Swinton's letter confirming "the truth of Professor Röntgen's discovery" appeared in the STANDARD newspaper on 10 January. The original glass plate negatives of Swinton's radiographs of 8 and 13 January are now located in the B.I.R. archives.

The second person to take a radiograph in Britain was J.W.Gifford, a wealthy Chard lace manufacture and amateur scientist, who – following several earlier attempts to produce X-rays following his reading of the press notices – produced a radiograph of his ten year old son's hand on Saturday 18 January. His wife, Emma, recalled the circumstances thirty-six years later in a letter to the TIMES – "I well remember the excitement when my husband came out of the darkroom with the dripping negative in his hand and said 'You can see the bones!'

Note 2: Elektrizitäts-Gesellschaft Sanitas of Berlin probably originated before 1900 and by 1910 had branches in London, Brussels, Paris, Oporto, Vienna, Prague, St. Petersburg, Moscow, Odessa, Kiev and Warsaw. In 1933 it introduced the world's first commercial X-ray tomographic equipment based on a design by Gustav Grodssmann. By then, the company was employing approximately 1000 workers and devoting approximately 50% of its production to cosmetic products such as hair dryers, massage equipment and ultra-violet and infra-red lamps. In November 1945, allied bombs completely destroyed the Sanitas factory in the northern part of Berlin and the engineering staff was moved to Asch in the Sudetan district of Czechoslovakia where production was restarted on a small scale with about 68 staff. The company returned to Berlin after the war but finally closed in 1960 following bankruptcy.

PUBLIC PERCEPTION of RADIOLOGY - 1896

To Meet the Röntgen Rays - A Country House Pastime

[Published in THE ROCKET, October 15, 1896, p.239][ ]

"Want to see the kink in your little finger?" asked the radiographer. "Well, take care you don't touch any of these wires, or our pleasant party may end in an inquest. I am going to turn out the lights."

"What wires?" I gasped.

The table beside which I sat, and on which an elaborate apparatus lay, was littered with a mass of wires, connecting mysterious cylinders and boxes. It was more than a bit alarming. I had never been to such a queer entertainment as this, to meet the "Röntgen Rays" before. "You hear that?" asked the operator. "That" was a hissing frizzling sound. It seemed to emanate from a particularly wicked-looking green light that burned with vivid fervour inside a small glass bulb.

"That is the electric current," he added.

Through a species of stereoscope[ ] I was directed to gaze, my hand having previously been guided to a proper and safe position by my mentor in a splayed-out attitude at the other end of the tunnel. What an unprepossessing sight met my eyes. There was my hand in skeleton, every knuckle and bone, both small and great, displayed to view. The bones looked black. My rings circled the fleshless stumps with an effect little short of ghastly. Of course I saw distinctly the bend in the little finger bone of that crooked member.

"Now we will take a photograph," remarked my host, who is an eminent man of science. "Let's see what your foot looks like to the rays. No, there isn't the slightest need for you to remove either boot or stocking. The rays don't object to them, I assure you. They penetrate flesh, you see; so leather and hosiery are mere nothings to them."

I was placed in a chair, and my right foot was put to rest on a slab of aluminium. The photographic plate was underneath, and the rays were directed at it. The room now was flooded with the electric light. For seven long minutes I sat and cooked. When I say "cooked," I don't mean that I felt hot, but that the apparatus, with its crackling, frizzling splutters, made me feel exactly as if my foot were a mutton chop.

While the plate was being developed in the dark room, the operator and I sat and talked.

"Yes," said he, "the rays are veritably private detectives of the most relentless type. Useful? They are indeed. They are able to discover the whereabouts of bullets that defy surgical investigation, buttons, or bones swallowed inadvertently, broken bones, and even adulterations in wine. That is one of their latest achievements; but every

day develops their powers, or rather the investigations of scientists bring these to light."

"Of course it is all very wonderful; but then electricity is the wonder of our age. All the big hospitals are working with the shadowgram; private operators, too, are kept intensely busy. The fashion is not only to have parties, like this one, at which the attraction is the new photography, but to intoduce [sic] the process as a novelty at bazaars. The Duke of Newcastle[ ] is an expert shadowgrapher. At a bazaar the other day the Duke and Duchess of Connaught submitted their hands to his tender mercies. The Prince of Wales[ ] has also been operated upon, and was delighted with the result. It is you ladies who are so dissatisfied with your bone portraits. I asked why, but a queer little smirk was the only answer I received. I was soon to comprehend it.

"What, that my foot?" I exclaimed presently in indignation.

"That horrid bundle of twisted bones - beetle crushers of the beetlest crushing description? Never!"

I threw the photo from me. My host was in paroxysms of mirth.

"I told your so," laughed he. "As a matter of fact the radiograph is not flattering — it is too absurdly true."

"But this is a deformity," I urged ruefully.

"It merely shows for what you have to thank shoe-leather. I assure you that these bones of yours are by no means so distorted as those of many feet I have taken. You would like your hand bones very little more, and if I were to take your skeleton entire I doubt if it would please you."....

Notes (by the late Derek guttery):

The original story in THE ROCKET is not illustrated. The illustrations shown here on pages 1 and 4 were selected as appropriate from the following:

Page 1 — the French physicist Gaston Séguy (among the first people in France to take a radiograph) is shown examining the hand of a female subject in Le Roux's laboratory at the École Supérieure de Pharmacie in Paris. He is using a primitive Crookes tube energized by a battery operated induction coil. The scene dates from January-February, 1896 and was reproduced in the 11 April, 1896 issue of the Scientific American Supplement.

Page 4, top-left — A woodcut illustration of a hand being radiographed with Crookes tube. The illustration first appeared in Germany in January, 1896 but derivatives and variants of the same illustration appeared in other countries later.

Page 4, top-right — a curious advertisement from the July, 1896 issue of The Strand Magazine in which "Dr." Van Buskirk obviously hopes to promote sales of his

mouthwash SOZODONT by associating himself with the public craze for the new "Röntgen rays". Two skeletal hands are seen in the background together with a mercury vacuum pump and an imaginary X-ray tube which seems to have confused itself with a floodlamp.

Page 4, mid-left — "Notes of the Week" from the 7 March, 1896 issue of The Ladies Gazette containing a short note about Röntgen's discovery illustrated by a skeletal lady beneath an elegant tea-gown.

Page 4, bottom right - X-ray examination of the hand in early 1896. The top view shows the hand being examined on a wood-framed fluorescent screen and the bottom view after recording on a photographic plate. Photographs showing a screen without viewing hood in use are extremely uncommon as hoods were generally adopted within a few weeks of the discovery. The induction coil looks like a respected model manufactured by Newton & Co. of No.3 Fleet street. The tube is a standard Crookes. The photograph was taken in Glasgow but has not otherwise been identified.

A rare, interesting and accurate account of the public's perception of X-rays within a few months of the announcement of their discovery.

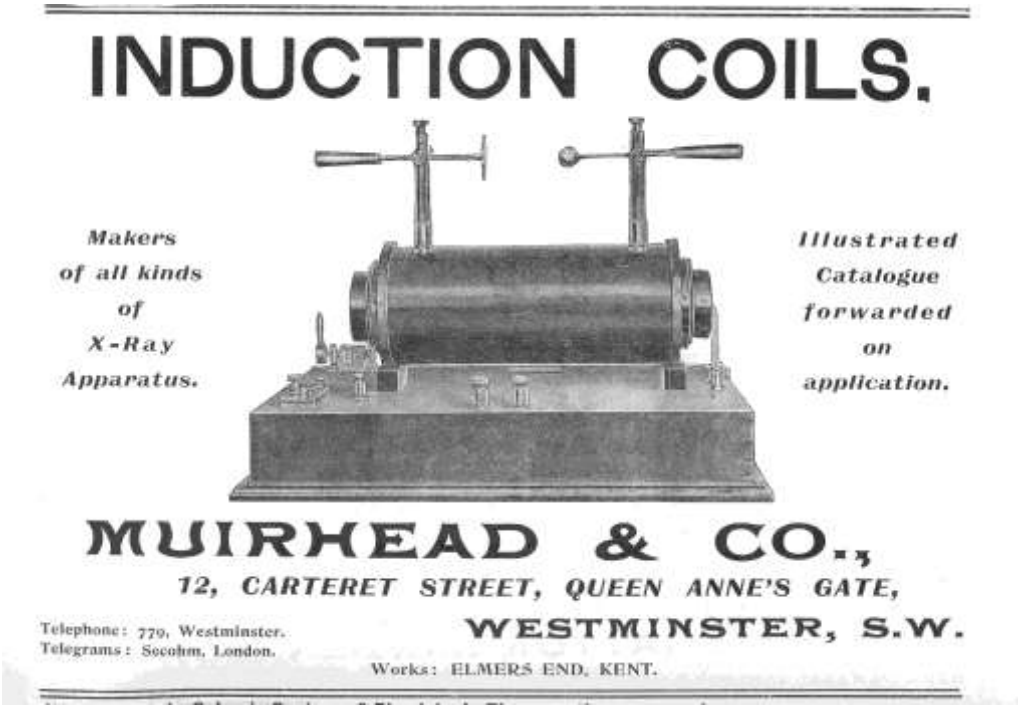
The Rocket, price one penny, was a weekly journal with the subtitle "The Most Enjoyable Paper of the Day". It had a short life as it only ran from Thursday, 13 August, 1896 to 16 April, 1898. (London: Vol.1, No.1 to Vol.3, No.21). The copyright set at the British Library, Colindale includes a Registration issue dated 9 July. The scurrilous Editorial pages of each issue are entirely devoted to detailed facts, figures and outspoken comments relating to the income and expenditure of Queen Victoria's household and the aristocracy of the day as, for example, the cost of maintaining and refurbishing the then four Royal yachts. The Rocket contains no further references to X-rays but is worthy of closer examination as a surprisingly outspoken social document of the period.

The "species of stereoscope" referred to is obviously an example of a Crypto scope - a barium platinocyanide screen mounted at the base end of a light tight truncated cardboard cone enabling the operator to view a positive fluorescent image of the object being examined through the open end. The device was introduced by Professor Salvioni of Perugia in February 1896 and immediately copied by every X ray user and is only described in the article as a [photographic] 'stereoscope' because that is what it must have looked like to the writer and when described as such would have been recognisable to most readers of the time.

"The Duke of Newcastle, who is an enthusiast in photography, has taken up the Röntgen rays and is demonstrating them." The Photographic Review, July 1896, p.243a.

"At the reception in aid of Guy's Hospital at the Imperial Institute on Wednesday, June 10 [1896], a demonstration of the X-rays was given by Mr Le Conteur and

Messrs Houghton & Son, with the apparatus supplied by the latter. A very successful negative was taken of the hand of H.R.H. the Prince of Wales, who took great interest in the apparatus, this being the first time he had seen a demonstration of the Röntgen rays. Messrs Houghton & Son had five complete apparatus at work, and Mr Joyce, of Oxford, Mr Gray, and Mr Martin were all present with the apparatus". British Journal of Photography, June 19, 1896, p.396b. The same reception is reported in The Photographic News, Friday, June 19, 1896. XL, 25, p.385. A.A.Campbell Swinton's account in his Autobiographical and other Writings (1930) - retold by M.Jupe in "Early days of Radiology in Britain" (Clinical Radiology, 12, 148b) - that Edward, Prince of Wales, exclaimed "How disgusting!" when shown a radiograph of Swinton's hand in 1896 is probably apocryphal.



Sir James Mackenzie Davidson.

Malcolm Davidson wrote that when clearing out his brother's flat, he found this bust. It is a small one and is 20cm high by R Bonet in 1912. Malcolm cannot find anything about the sculptor at present. The bust was done soon after the knighthood in 1910 and has his Armorials on the base.

Sir James Mackenzie Davidson (1857-1919).

Sir James was born in Buenos Aires in Argentina. His parents were Scottish. He graduated in Medicine in 1882 (Aberdeen University). In 1886 he was elected Honorary Ophthalmic Surgeon to Aberdeen Royal Infirmary. Following the discovery of X-rays in 1895 he became interested in X-ray work. In February 1896 he took a picture of a broken needle in a foot. Examples of his work appeared in the first issue of The Archives of Clinical Skiagraphy (Edited by Sidney Rowland), the journal that ultimately became the British Journal of Radiology. Whilst in Aberdeen he developed his famous localisation device (cross-thread) for localising foreign bodies in the eye. He moved to London in 1897 to continue his work in X-rays and was elected "Consulting Surgeon to the X-ray Department" and he remained at Charing Cross until he died. In 1903 he designed his own X-ray couch which was built by Muirhead and company. Davidson was very interested in the physics of x-ray work and developed apparatus in clung a motor-driven paddle mercury interrupter. The cross-thread localised was used by the British Army both in South Africa and in the Great War. He also contributed to the development of stereoscopic viewing of radiographic images. He became the leading Radiologist in the UK and many radiologists travelled to the UK to meet him. He was knighted for his services to medicine in 1912. He was a founder member of the Rontgen Society (that became the British Institute of Radiology). He was President of the BIR in 1912-1913. Following his death his library was presented to the British Institute of Radiology as the MacKenzie Davidson Memorial Library.

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