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Contents

Editorial Notes

I hope you find something of value in this journal. There is an article by Phyllis Hoffman on the development of cardiac radiology that is of great interest. The paper by Rita Mason is somewhat more personal in style. Fathi Habashi contributes a paper on philatelic aspects of radiology.

Please send me any material of interest and in particular details of papers, books and web sites related to the history of X-rays and radioactivity.

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The RHHCT web site is to be found at:

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I am always interested in material for the web site. Please send me material which I will consider for inclusion.

Recent books and articles.

Marie Sklodowska Curie in America, 1921. Ann M. Lewicki, MD, MPH. Historical Perspectives © RSNA, 2002 (*Radiology* 2002; 223:299-303.) Ann Lewicki is from the Department of Radiology at Georgetown University School of Medicine, Washington, DC. (e-mail: ***alewicki@juno.com***). The paper is an interesting and illustrated account of the famous visit of Marie Curie to the USA in 1921 and of her meeting with President Harding.

Röntgen's X-rays as mirrored in public interest. Part 1: First reactions in 1896. Uwe Busch. Toshiba Medical Systems Journal. No 1 Vol 1. 2001 p61-64. Well-illustrated article on the initial response to X-rays. Uwe Busch is from the Deutsches Röntgen-Museum in Remscheid.

Röntgen's X-rays as mirrored in public interest. Part 2: X-rays in daily life. Uwe Busch. Toshiba Medical Systems Journal. No 2 Vol 2. 2002 p54-58. Very well illustrated article on X-rays in popular culture.

Faraday – the life. James Hamilton.
Harper Collins 2002 ISBN 0 00 257082 3 £25.00
Ian Hamilton is the curator of the University of Birmingham and Honorary Fellow of the Barber Institute of Art, Birmingham. His book on Turner was published in 1997. This biography of Michael Faraday is excellent. Faraday is a central figure to anyone with any interest in electricity.

From Alchemy to Atomic Bombs. Fathi Habashi (e-mail: Fathi.Habashi@gmn.ulaval.ca)
The book tells the story of the beginnings of chemistry and the extraction of metals from their ores, how these disciplines were reformed, developed, and became basic and applied sciences. In association with physicists, engineers, and technicians, chemists and metallurgists built the most terrible weapons of mass destruction. The book is in 365 pages with 220 illustrations, 30 of them in color. ISBN 2-922-686-00-0. Published September 2002. Price Can.$ 70 + postage.
Distributed by: *Laval University Bookstore "Zone"* Pavillon Maurice Pollack, Cité Universitaire, Sainte Foy, Québec, Canada G1K 7P4 e-mail: carl.beaulieu@zone.ul.qc.ca

Recollections of radiography in the 1970s

By Sue Gilson

(Dear Adrian)

I have found your articles in Synergy really interesting as, even though I qualified in the early 70s, we were still using red goggles for fluoroscopy, manual processing tanks and drying cabinets during that time. I've attached a description of some of my early recollections of processing.

Also at one of our outreach departments (although that term did not exist then) all x-rays were done on one very old Watson mobile. This was used with a table which did have a bucky but this was manually 'fired'. We had to pull a plunger at the side of the bucky which started it oscillating and then make the exposure before the bucky came to a halt. Ah, those were the days.

Regards, Sue (Gilson)

I started as a student radiographer in 1970 and some of my early memories centre around the A/E department, or 'Cas X-ray' as it was known.

There was a huge beast in the darkroom, I think called a 'Procomat Junior' which was a semiautomatic processor . Films had to be attached to hangers which had a row of vicious wire teeth. The hanger was put into a holder and a foot pedal was depressed to open the teeth. The film was placed in the teeth and the foot pedal released so that the teeth firmly gripped the film, and often part of a finger as well.

The hanger was then placed on a rack which had a series of chains like those on bicycles. A motor drove the chains and the film was dunked into tanks of developer, water, fixer, and water again, for a preset number of minutes. This process took about 10 minutes altogether then the hanger and film were taken out, the film was taken off the hanger and then fed into the dryer, the outlet of which was outside the darkroom into the 'finishing

room'. The equipment frequently broke down and it was the student's job to crawl into the machine and fish the film out of the tank before it was over developed.

In those days patients who came to hospital at the weekend with minor injuries were asked to return on Monday morning to have their x-ray. We could have up to a hundred patients during the morning and I cannot remember anyone complaining of the long wait. As a student I spent a lot of time in the darkroom processing films. At some time in mid morning a cup of coffee would be placed in the pass-through hatch for me, and I would emerge at lunchtime blinking into the daylight.

When this machine was eventually replaced by a fully automatic processor we felt as if we had really entered the twentieth century. Unfortunately I did not take a photo of the Procomat Junior but I think it was made by Pako, and, as I think Agfa engineers serviced it, they may have a picture of it somewhere in their archives.

When I qualified I did start taking photos of equipment as old kit was replaced and I now have four albums. The oldest piece is a CRT4 skull unit, circa 1966, which was transferred from a previous department and is still in service.

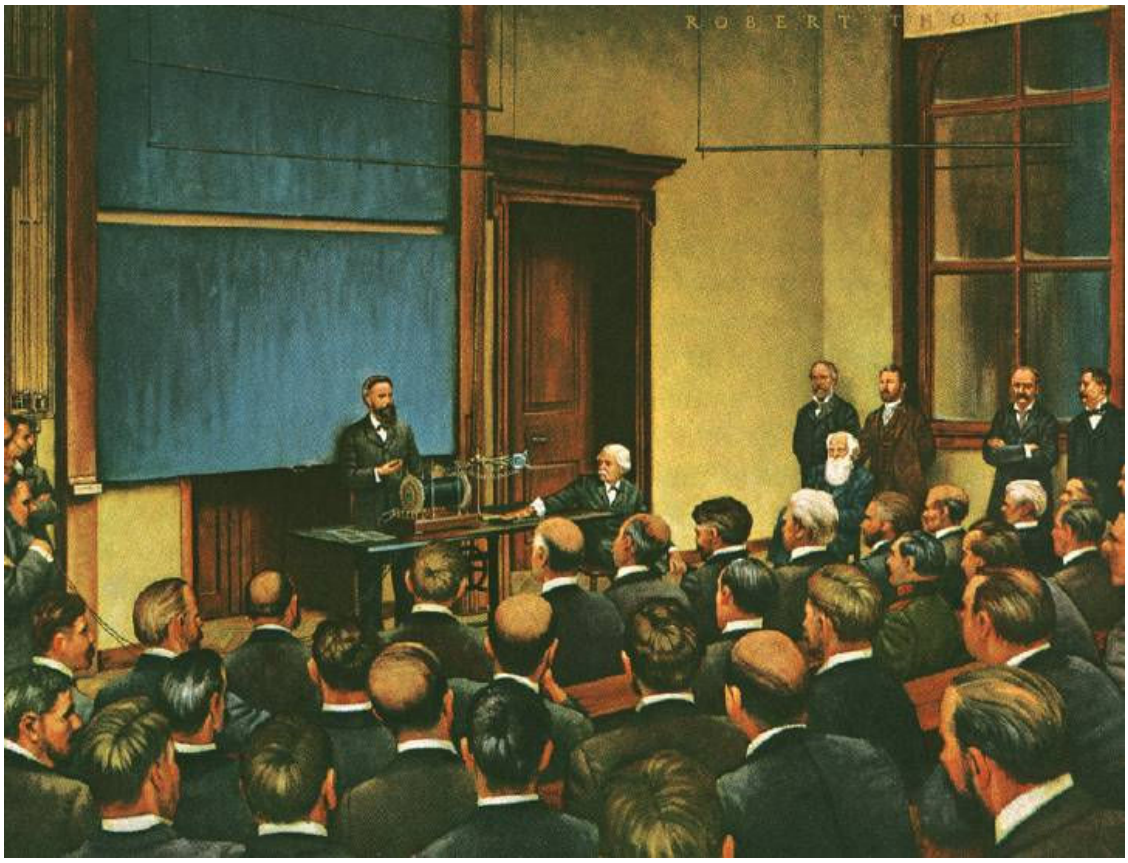
Another memory I have is about theatre radiography, again in the 1970s. At that time we did hip pinnings (pin and plate) with two mobiles, one set up for the AP and one for the lateral view. Processing was done in a small darkroom in the operating theatre and consisted of developer, fixer and wash tanks. An emersion heater, which was like a foot long kettle element, was placed in the developer tank to heat the developer to the correct working temperature. Inevitably the heater was left in too long while we did control films, and would be smoking by the time we brought the films for processing. It was sometime enough just to wave the film around in the fumes to produce an image.

We would hold the film up to the safelight to check the progress of development and have developer dripping down our arm. This was repeated for the placement of the guidewire and the actual pin, and we could then leave, as orthopaedic surgeons in those days did not require a check on the position of the plate. We would return to the main department redolent with the whiff of chemicals which seemed to hang about our person for days.

We tried a daylight processing unit, called an Ansco, in theatre, but attempts at processing usually resulted in a pool of chemicals on the theatre floor so we abandoned it and returned to the more reliable manual process. The advent of mobile image intensifiers revolutionised theatre imaging.

Our early experiences with processors as students meant that, once qualified we could happily stripped down a processor and reassemble it without fear. I sometimes feel that students of today are missing out on this 'in depth' knowledge which we had. And having spent many hours scrubbing out developer and fixer tanks, 'in depth' is the appropriate term.

Roentgen's First Public Lecture



The artist Robert A. Thom painted a picture in 1966 showing Wilhelm Conrad Roentgen at his first public demonstration of the newly discovered X-rays in the evening of January 23, 1896.

The lecture took place at the Physics Department Auditorium of the University of Würzburg in Germany where Roentgen was the rector.

The painting shows Albert von Kölliker, professor of anatomy at the University putting his hand on a photographic plate to make an X-ray picture.

The painting is published in an interesting book entitled *Great Moments in Medicine* by Parke, Davis & Company, Northwood Institute Press, Detroit 1966.

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THE HISTORY OF ANGIOCARDIOGRAPHY IN THE UK SINCE 1895

Keywords: Angiocardiography
Cinèradiography
Contrast Medium
Film changers
X-ray Equipment

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SUMMARY

The centenary of Roentgen's momentous discovery has been marked throughout the world by retrospective evaluations of the effect of his 'new kind of rays' on the practice of medicine. This article attempts to summarise the history of angiocardiography in the last 100 years with particular reference to the pioneering work carried out in the UK. The literature of the period has been studied but many of the comments are from personal memory of the work of Dr John Dow, Consultant Radiologist at Guy's Hospital from 1952 to 1979, much of which was in partnership with the same Theatre Sister and Superintendent Radiographer.

Introduction

In the early years, after Roentgen's (22) discovery of "a new kind of rays" the most common use of X-rays was in the demonstration of fractures of the bones in the upper and lower limbs and also in the demonstration of foreign bodies – usually bullets or needles. It is not so well known that the first reported angiogram was performed in January 1896 by E Hascheck (14) and O Linderthol, who injected a chalky substance into the hand of a cadaver, but the demonstration of blood flow through the heart of a living patient was not to become a routine practice for many more years.

The first 50 years 1895 – 1945

The early work was all performed outside the UK but needs to be included here to set the scene for the post-war work in the UK. The demonstration of cardiac blood flow was hindered in these early years by many factors, not least the amount of radiation required to penetrate the normal thorax, but another problem was the identification of a substance that could be used to opacify the blood satisfactorily and was safe to inject into the blood stream. By the 3rd decade, potassium iodide had been used successfully by Heuser (15) in 1919 and a pyridone compound (Uroselectan) in 1929 but it was not until 1950 that a

better contrast medium, sodium metrizoate was produced and sold in the UK by May and Baker under the trade name of Diaginol.

Early experiments with catheterisation also took place outside the UK with credit for the first cardiac catheterisation going to Forsmann (12) who in 1929 succeeded in passing a ureteric catheter from his left arm into his right atrium. The first account of a pulmonary arteriogram was published in 1931 by Egas de Moniz (18) of Portugal while Robb (21) and Steinburg working together at the same time in the USA in 1938 succeeded in demonstrating all the cardiac chambers as well as the pulmonary artery. Castellanos (6) and his colleagues working in Havana in 1937 were actually performing bi-plane angiocardiography in infants by injections into an antecubital vein or carotid artery and Cournand (8) in 1941 was catheterising the heart to obtain haemodynamic data, used to diagnose valve stenoses and intracardiac shunts, and proved this was a safe diagnostic technique.

The UK contribution lay in the work of Howard Ruggles (23) who pioneered the first roll film changer in 1925, which astonishingly produced a filming rate of 15 exposures per second, reported in Radiology in 1925 and in use by Drs Chamberlain (7) and Dock in 1926. Dr Russell Reynolds (20) in 1935 was developing ciné radiography, which was to come into its own many years later.

The first post-war decade 1946 to 1955

Some of the first cardiac operations were performed during the Second World War, when pieces of shrapnel were successfully removed from the heart without causing the expected cessation of function. Alfred Blalock visited Guy's Hospital in 1947 and performed his anastomotic operation for Fallot's tetralogy on 10 patients, while Russell Brock (subsequently knighted and then created one of the early Life Peers) was introducing some of the first direct operations on the heart, performing closed mitral valvotomies both in the UK and in the USA. From this time on there was a leap frog effect between Cardio-thoracic surgery and Radiology, with the needs of the former spurring on the latter to devise better diagnostic techniques so that the surgeons could operate in confidence in the limited time available to them by extracorporeal blood cooling. The first cardiac by-pass units were not introduced until the late 50's.

The Radiologists pioneering angicardiography in the UK at this time were Dr K B Keele (17) and Dr (later Prof.) Robert Steiner (25) in 1948, Dr Francis Gardner (13) in 1949 and Dr Tom Hills in 1950, working with the Cardiologist Dr Maurice Campbell (5). Most of these angiocardiograms were performed by injection of contrast medium in peripheral veins or through catheters advanced towards but usually still outside the heart. Filming was by a variety of methods with Dr G M Ardran (1) and M S Tuckey in Oxford in 1952 developing a 35 mm cine camera with a frame speed of 25 per second, while at Guy's, Dr Hills had purchased in 1951 a Fairchild roll film camera, previously used by the US Airforce for aerial reconnaissance during the war, that was fitted beneath an ordinary flurographic table. This produced films of 9.5" x 9.5" at 2 per second, suitable for the young and adolescent heart and which caused anguish to the radiographers hand processing them in the old manual processors of that era. Undoubtedly the other most

important factor was the power of the X-ray generator, which was usually 200 mA at 120 KVp, but the Fairchild camera at Guy's was used in conjunction with an American generator manufactured by the firm Kele-Koet, which was capable of 500 mA and 150 KVp and produced films of remarkable quality for that time.

The contrast medium was also being improved with the first sodium and meglumine diatrizoates, in 3 different strengths, being marketed under the Trade names of Hypaque and Urografin by Winthrop and Schering AG respectively. These contrast media were better tolerated by the patients as well as being safer in use.

The second post-war decade 1956 to 1965

The beginning of this decade saw the advent of the 14" x 14" cut film changer designed by George Schonander of Sweden and sold in the UK originally by Sierex, and also of the Elema roll film changer, its greatest rival. Eventually, the two companies were to merge under the umbrella of the Siemens organisation and subsequently, George Fredzell designed a more compact 14" x 14" cut film changer, the PUCK, so named because George hoped it would emulate its namesake by becoming 'a helpful little fellow' in the X-ray departments of the world. The film speed on the Schonander unit was either 2, 4, or 6 films per second but it was not unusual for the faster speed to run into film jamming problems and so the lower speeds were used more often. If a control film was taken before the injection, the speed had to be changed by changing the position of the Vee-belts on the main drive pulleys, which was not easy to do in dim light conditions, while crouching underneath the outstretched arm of the patient with drapes and drips about ones head!

This was the era when peripheral vein injections were replaced by injections into the right side of the heart, usually through an NIH or Lehman cardiac catheter, which resulted in far better demonstration of the chambers of the heart when the catheter remained in the correct position. Hand injections had been replaced by pressure injectors, either the Talley or the Gidland, with the pressure set around 70 – 90 lbs/sq in, to enable approx. 30 – 40 ml of contrast to be delivered in 1 second, which was necessary to get a good bolus of contrast flowing through the heart. Often this pressure and the bias cut of the cardiac catheter resulted either in the tip of the catheter retracting back into the right atrium, or in extravasation of the contrast medium into the myocardium and on occasion even in rapture of the ventricle. At Guy's Dr John Dow (9) developed an alternative technique using a polythene tube replacing the conventional cardiac catheter. This tubing was relatively thin-walled with a low coefficient of friction and this enabled similar volumes of contrast to be delivered in the heart in half the time i.e. 0.5 sec at far lower pressures of around 40 lbs/sq in. These catheters had other advantages – they were very cheap to make and so were among the first disposable catheters, but could also have a pre-formed bend, tailored to the size of the patient's ventricle, which resulted in the catheter tip remaining in the right atrium almost 95% of the investigations.

The left side of the heart still presented problems of access and some intrepid operators performed left ventricular injections via a needle inserted directly into the left ventricle,

which was not without hazard to the patient and was more or less abandoned after some patients died. Others approached the left atrium via the bronchus but subsequently the left ventricle was found to be entered fairly easily through the aortic valve, following retrograde catheterisation of the aorta using Seldinger's percutaneous technique of the femoral artery. Still later, in-patients with very poor peripheral pulses, the left ventricle was entered via puncture of the atrial septum but this was seldom required, in general.

In the middle of this decade, automatic bi-plane cut or roll film changers were introduced so that films could be produced in two planes – a basic principle of radiography – with only one injection of contrast medium. This required better stationary grids to deal with the cross radiation and cross hatch grids of 8:1 and 6.5: 1 were used for the AP and Lateral film changers. New generators were also required and the D66 manufactured by A E DEAN and Co was a 150KVp generator designed so that the mA could be split between the two X-ray tubes. This meant that 180mA was used for the AP projection, 240mA was used for the lateral the great drawback to this technique was that the same KVp had to be used for both projections. This resulted either in flat, grey films in the AP projection with good lateral films, or thin laterals with well exposed AP films and eventually, after trying many combinations of films, this technique had to be abandoned and two generators used instead.

New, larger sized Image Intensifiers became widely available for conventional fluorography and their use in angiocardiography re-awakened interest in the use of ciné film, either 35mm or 16mm, especially for the investigation of small children and much was learned in the field of congenital heart disease. Many children and some adults were successfully investigated for the relatively common conditions of ASD, pulmonary stenosis, Fallot's tetralogy, PDA, co-arctation of the aorta and VSD, usually under general anaesthetic and in conjunction with some haemodynamic studies. As the new techniques were mastered and found to have a low morbidity, it became possible to attempt to investigate even very small babies, such as a neonate weighing nearly 6 lbs., who had a retrograde aortogram performed in October 1961 for a suspected PDA, using 35mm ciné at 40fps. Fairly soon it was almost usual to be investigating at least one tiny baby each week and many more, less common, conditions were being diagnosed such as transposition of the great vessels, supravalvular aortic stenosis, truncus arteriosus and atrio-ventricular canal. Within a few months of diagnosing the first case of diaphragmatic sub-aortic stenosis, another was seen and a retrospective search of previous angiograms revealed yet another.

Other vascular conditions were also being investigated such as saccular and dissecting aneurysms of the thoracic aorta and many attempts were made to demonstrate the coronary arteries using a variety of methods, which included elevation of the intrabronchial pressure (19), turning the patient prone, in the hope that gravity might induce better filling of the coronary arteries and the use of a ring shaped catheter with side holes all around the ring, which was placed low down in the ascending aorta, just above the aortic cusps, but all proved unsatisfactory. Another method that was tried, in Guy's (10), was the use of a short, artificially induced cardiac arrest, using acetylcholine, followed immediately by a 50 ml injection of 85% contrast medium just at the level of

the coronary orifices with bi-plane films taken during the cardiac arrest. This method was based on the then held belief that the coronary arteries filled in diastole rather than systole, although how this came to be believed is not now clear. Needless to say, now that it is known not to be true, this method also produced no better filling of the illusive arteries and this radiographer was grateful when the method was abandoned after a series of 18 patients showed no superiority over conventional aortography.

Meanwhile the radiologists at the National Heart Hospital were experimenting with direct injection of the coronary artery during open-heart surgery, with a film, designed for intra-abdominal use to demonstrate the kidney, and placed in the thoracic cavity behind the exposed heart. But the definitive study, selective coronary arteriography was being pioneered in America by the Cardiologist, Dr Mason Sones Junior, working in Cleveland Ohio with the surgeon Donald Effler.

The third post-war decade 1966 to 1975.

This was the decade when there was an absolute explosion of new ideas, all of which were taken up in the field of angiocardiography to its benefit.

The first was the new techniques of Mason Sones (24) for selective injection of the coronary artery via a brachial arteriotomy, first described in 1959 and introduced into the UK by Dr John Dow (10) in 1964. This was swiftly followed in 1967 by the second method of selective injection, via a percutaneous puncture of the femoral artery, described by Dr Melvin Judkins (16) in 1967. These techniques and the demonstration of the coronary artery, were made possible by enormous improvements in the technical equipment for the investigation.

There were then three types of catheter available, the Sones, Judkins and Amplatz catheters that soon made it comparatively easy for any radiologist or cardiologist to cannulate the coronary artery with ease. The preferred imaging medium was 35mm ciné-radiography at 50 fps, using a 150 mm lens, used in parallel with a video-tape recorder which allowed rapid assessment of the quality of the examination before the film was developed. Several different projections, designed to show all the arteries, were easily and swiftly obtained using a rotating cradle. This could have resulted in a corresponding increase in the radiation dose to the patient but the equipment manufacturers were now producing ciné pulse generators, which replaced the continuous X-rays of the previous generation with very rapid pulsing of the X-ray beam.

X-ray tubes also underwent enormous change at this time with the advent of the high speed tube which allowed greater loading at smaller focal spots so that the fine focus was now 0.6 mm and the broad focus 1.2 mm replacing the old 1 mm and 2 mm tubes. The first of these units was installed in the X-ray Theatre department of Guy's Hospital in 1967, with a generous research and development grant from the Department of Health.

The ciné films were at first processed either by feeding them through the automatic processor, by now installed in most departments for the cut or roll film, but sometimes

company such as George Humphries in London. Later, Agfa Gevaert produced a compact ciné developer especially designed for use in the X-ray department, the Gevamatic, many of which are in use to the present day. The need for consistent processing conditions to ensure the best quality ciné films, in turn lead to quality control measures being introduced as routine in all the departments using this method of processing. The films were viewed on an analysing projector and many departments used that manufactured by Tag Arno before the Vanguard XR35 was designed that also allowed some degree of evaluation of the ejection fraction of the left ventricle, from the left ventricular injection which became a standard part of every coronary arteriogram.

I should not proceed without mentioning that all the staff working in these departments needed to be trained in resuscitation techniques, for although mortality rates were very low, treatment for cardiac arrest and ventricular fibrillation were soon to be a normal part of everyday life in these departments and it was not unusual for the radiographer to be the nominated person who prepared the defibrillator for use, while the nursing and medical staff administered the drugs and then the electrical shock that restored normal function of the patient's heart.

These new techniques were soon to form the bulk of the work in most cardiac departments with adult patients, to such an extent that now many housemen and contract staff regard cardiac catheterisation to be synonymous with coronary arteriography. Haemodynamic and angiographic techniques were no longer required to investigate stenosis and incompetence of the aortic and mitral valves, which were being studied with the new technique using ultrasound, termed Echocardiography.

Radiologists were still investigating the pulmonary arteries and thoracic aorta with large sized films and the work in this area was greatly enhanced by the advent of new fluorescent screens and films designed to reduce the radiation dose to the patient. All the major film companies produced rare earth screens which, when used in conjunction with the appropriate fine grain film, allowed good contrast images to be obtained with shorter exposure times using high KV techniques. Previously it had been difficult to obtain sufficiently 'contrasty' images which showed the contrast medium well without blackening out the other structures in the chest and there was always a conflict between the shorter exposure times required of high speed imaging (6 or 12 per sec.) which necessitated the use f high KVs, and the satisfactory demonstration of the injected contrast medium. New Contrast media were still being developed and about this time, the sodium and meglumine iothalamates appeared, manufactured by May and Baker Ltd under the trade name of Conray. There were also new, electrically operated, automatic injectors such as the Contrac and Cordis injectors, that preheated the contrast to the optimum temperature for injection and allowed precise amounts to be injected, which were a great improvement on the old pressure injectors.

During this period too, there were exciting developments in the field of Nuclear Medicine although radioisotope studies of the heart had been described in the first 50 years by Blumgart (4) and Weiss as early as 1927. Many patients presenting with a diagnosis of pulmonary embolism had either a pulmonary arteriogram or isotope perfusion studies and

sometimes both; the results of which did not always correlate. However, it was not until the fourth post-war decade that isotope studies began to play a significant part in the study and imaging of myocardial perfusion with the demonstration of myocardial infarcts.

The fourth post-war decade 1976 to 1985

This decade saw the consolidation of the techniques previously described so that they became available in many departments of Cardiology all over the country instead of in just a limited number of main centres but there was a resurgence of interest in obtaining better imaging techniques for congenital heart disease led by the work of Bargeron (3) in the USA and used in Guy's and other centres since 1975, who used compound angulation techniques to replace the traditional AP and lateral projections used previously. These techniques, which were known under the generic title of axial cine-angiography, were devised to align the axis of the heart, rather than the body, with the X-ray beam. The RAO view was used to show the aortic and mitral valves in tangent and the LAO showed the two valves openings in the plane of the film. These new bi-plane techniques required bi-plane image intensifiers and X-ray tubes and the angiographic suites installed at this time began to look quite intimidating, with ceiling suspended tubes and Image Intensifiers, surrounding a fixed plane couch. There was a further development of bi-plane C-arm and U-arm units, which allow the patient to remain stationary while the equipment is angled in two planes about the patient. The compound angles advocated by Bargeron were usually achieved by angling the patient' body using oblique foam pads while the X-ray tubes and Image Intensifiers were fixed and thus the 4-chamber view, where the patient is slanted on the table in a LAO position and the left shoulder elevated, with the long axis of the heart aligned to the couch and the long-axial oblique view of the patient n the RAO position with elevation of the right shoulder produced the most beautiful demonstrations of blood flow across septal defects as well as demonstrating the action of the valves of the heart.

Angiocardiography was now mostly performed by Cardiologists in Cardiology Departments, often divorced from main imaging or vascular departments used by Radiologists. Radiologists continued to refine and develop techniques for Cardiac and great vessel imaging through the advent of CT scanning. While the Cardiologists were concentrating on the heart and coronary arteries, together with the associated interventional, therapeutic techniques, the Radiologists were often left with the difficult cases of dissecting aneurysms and found that the intimal flaps could be readily identified by CT without the need for invasive procedures that often were carried out with a minimum of staff at night and at the week-end, which seemed to be the usual time of to referral of these patients to the large hospitals.

This decade also saw many advances in the field of Isotope Imaging with much of the work being led by departments in the UK as well as in the USA. Perfusion imaging measured the distribution of regional blood flow at the capillary level in the heart and was used for the detection and localisation of myocardial ischaemia. These studies used either intracoronary injection of labelled microspheres or the injection of an inert gas,

such a 133Xe, dissolved in saline, which by measuring the rate of washout gives a measure of the rate of blood flow to the myocardium. Thallium injected intravenously, allows the identification of myocardial ischaemia by comparing the results of rest – and exercise – injected studies or by comparing initial and 'redistribution' images following exercise injection.

The fifth post-war decade 1986 to 1995

The last 10 years have seen further changes in radiographic and radiographic techniques due to the installation of digital subtraction units which have largely replaced the film changers previously in use for vascular radiography and which are now used in parallel with cine-angiography in Cardiac units. Although at the beginning, intravenous injections were used to image the abdominal and thoracic aortae and their branches, it soon became obvious that even better images could be obtained by selective injections of very small quantities of contrast medium, often now the non-ionic media, injected through very small-bored modern catheters and all these units now produce films of a quality that could not have been envisaged by the early pioneers.

Positron Emission Tomography (PET) is now used to record tomographic images and gives far greater sensitivity than the single-photon emission devices. However, the early pioneers would have been even more startled to see the images of the heart and blood vessels made without the use of X-radiation in any form, but using the second and third generation Magnetic Resonance Imaging systems.

This leads one to think of the future but in 1973-Dr Adran (2) wrote "It is quite possible that in 75 years' time ciné fluorography, as we now know it, will be completely obsolete". In 1992, only nineteen years later, Dr JF Dyet (11) and colleagues published an article in the BJR entitled "Digital Cardiac Imaging – the death knell of cine-angiography?" After that example it would be foolhardy to try to make any predictions at all. Instead I would like too offer my sincere apologies too any radiologist or cardiologist who feels slighted by not having their work mentioned specifically by name and my thanks to all of my former colleagues and friends who have helped me to prepare this article. In particular, I would like to thank all the staff who worked with me in the Cardio-vascular departments of Guy's Hospital during what will always be for me, the best years of my life.

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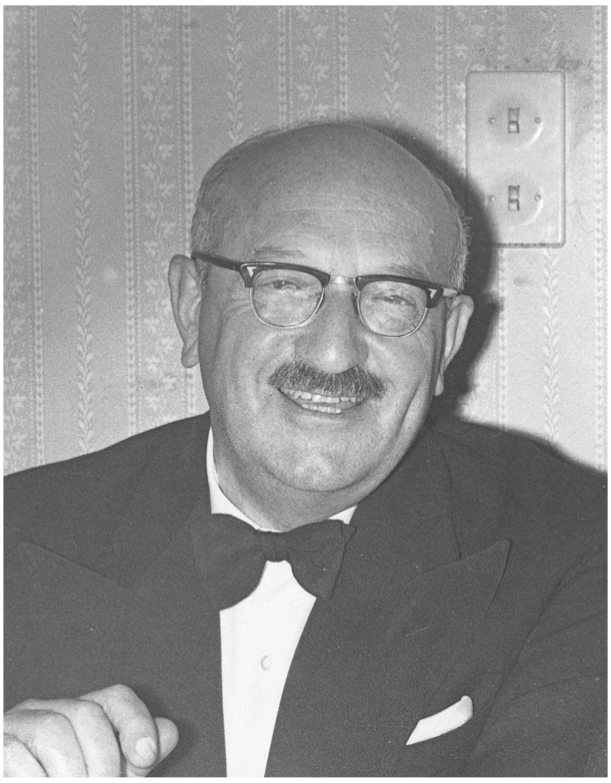
A Family Affair

By Rita Mason,

Bristol, UK

Sydney Blackman, the Consultant Radiologist at the Royal Dental Hospital, London, from 1931 until 1967, is recognised for his essential contributions to the development of dento-maxillofacial radiology. He promoted the production of the "Rotograph", the first commercially available dental panoramic machine, put dental radiology on a par with medical radiology and was instrumental in founding the British Society of Dental and Maxillofacial Radiology.



Sidney Blackman

Sydney Blackman was born in Hackney, London. His parents had emigrated from Poland towards the end of the nineteenth century and his father was a cantor at the South Hackney Synagogue. He was educated at the local Grocers' Company School. In 1915, he entered the London Hospital Medical School, graduating LRCP MRCS in 1920. His undergraduate experience included six months as a private in the Royal Auxiliary Medical Corps from January1919, which must have widened his horizons considerably beyond the confines of medical school. He was an extrovert and even as a student enjoyed 'performing'. There is a photograph of him as a Pierrot in a London Hospital Christmas Show (see next page).

Sidney Blackman

The London Hospital was then a frontrunner in the medical applications of X-rays in Britain and as one of his first hospital appointments was in dermatology, he would have seen it used for therapy as well as for diagnosis. Although he went into general medical practice, first in Hackney (where he claimed to have brought the playwright Harold Pinter into the world) and later in Hampstead Garden Suburb, he maintained his interest in radiology. When he married in 1923, he was described as an "x-ray doctor" by the local newspaper. He was a clinical assistant in radiology at the Hospital for Diseases of the Skin, Blackfriars, and at the Middlesex Hospital, obtaining his DMRE in 1928, then the only qualification in medical radiology. He was subsequently appointed as Honorary Consultant to the Hospital for Diseases of the Skin, and in 1931 to the Royal Dental Hospital. During the Second World War he worked for the Emergency Medical Service at Maidstone. He was a man who enjoyed challenging his knowledge and was also a natural teacher, so that when in 1948 at the start of the National Health Service, he had to choose between general medical practice and radiology, he had no problem in choosing the latter. In addition to his other appointments, he became a Senior Radiologist at St Olave's Hospital, Rotherhithe in 1955.

Radiography and radiology

Sydney Blackman did not merely report films in isolation. If the radiographs were significant, he always saw the patient. As a general medical practitioner he was a good communicator, but what set him apart, and above, other radiologists was his wide knowledge of pathology. As early as 1931 he published a paper on radio-pathology of the mandible. Radiography of the tempero-mandibular joints continued to interest him throughout his career.
In the early fifties he devised a small free-standing cephalostat for radiography of the joints, using a dental x-ray tube. This allowed a series of closed, open and rest views to

be taken of each side on one film. The results were excellent, reducing the irradiation fields significantly.

He was a good radiographer and would take full mouth radiographs at his private clinic, then dismiss the patient and bring the radiographs to the Royal Dental Hospital for processing, a practice few, if any, of his successors would feel confident enough to do that today. His confidence came partly from his knowledge of anatomy, which had been reinforced during his time as a Demonstrator in Anatomy at the LHMC, so that in confronting the problems of intra-oral dental radiography, he recognised the need to standardise as many factors as possible. He advocated the use of film-holding beam alignment devices, designing a comprehensive set which were eventually marketed in 1960 by Cuthbert Andrews as the Blackman Dental Filmholders. He also recognised that there must be a consistent position for the head to counteract the variable angulation of the teeth within the dental arches. He taught these principles to dental students and radiographers

In the 1950s Sydney Blackman was given the option to re -equip the X-ray-Department at the RDH, but he had to have a qualified Superintendent Radiographer. He had two very efficient trained dental technicians, but that wasn't good enough. So he asked his daughter Rita, a qualified radiographer, to come and work for a year. This improved their relationship; they had respect for each other professionally, not just father and daughter.

Rita Mason had come into Radiography by a curious stroke of fate. She matriculated during the war, and though her favoured subject was History and in another time would have wished to go to University to read History this was not possible during the war. So encouraged by her father she studied for her 1st M B. at Holloway College London, and to take the entrance examination to study Medicine. At that time there were few places for women in Medical Colleges, 8 at Kings College Hospital and 12 at University College Hospital. She was offered a place to do Dentistry at UCH, but she decided she did not want to 'muck around in other peoples mouths'! The only other offer she got was at The Royal Free Hospital Medical School. She turned this down as she could not face spending 5 years with a lot of women!

She then decided to join the 'Wrens', but would finish that year's course. The family was fearful of her going into 'The Forces' and Sydney persuaded her to do Radiography, but did not expect her to start until the autumn 1943. Unexpectedly some one must have dropped out and a place came up in May/June. This created a difficult decision, because she could not complete the 1st MB. Nevertheless she started the Radiography Course at King's College Hospital, 6 weeks late, which included Therapy as well as Diagnostic Radiography and the Diploma was only an 18months Course. The timing was such that the 2nd Front was 4th June 1944 during her training, and she was sent to a Casualty Clearing Station at Leatherhead. She stayed there for about 4-6 weeks and found it was the best way to learn practical Radiography, better than reading Katie Clarke!

She qualified at 19-years old in November 1944, did a locum at UCH and took up her first permanent post at the Miller General Hospital, south of the Thames, at the time of the "Doodle bugs". She was deeply involved with the resultant casualties. She had

accommodation at the Hospital and could always hear when one was about to 'land' nearby. This meant that she was almost continually 'on call'

She was on duty on 'D day' 8th May 1945 which was a public holiday. She remembers an elderly patient coming from Casualty and the form asked for R foot, which was vague so when she asked him why he came to the hospital, he replied "I had nothing else to do today". She stayed at The Miller until she went to Kenya in1947.

She had met a doctor at King's with whom she became 'friendly'. In February 1945 he was due to take Embarkation Leave, from the RAMC and was to be posted to Mombassa Kenya. They were married in February 1945. She joined him after the war was over in April 1947 She went by sea on the SS Alcantara calling at Naples, where she went to Pompeii. Where at that moment in time one could buy almost anything with a pair of nylon stockings! Then they proceeded through the Suez Canal to East Africa.

Shortly after arriving in Mombassa she went to the local Native Civil Hospital and offered to work there. The radiographer there had had no leave during the war and asked her to do a locum so he and his wife could go to South Africa for 6 months. She gladly accepted, in particular because they offered her their house free at as long as she looked after their 2 dogs—Dachshunds! This started her love for these dogs, which she consequently bought in England, and owned for the next 30 years of her life. The house was 3 miles outside the boundaries of the town in a beautiful situation. So she needed a car and learnt to drive in a week! The salary paid to her by the Kenya Health Service was not equaled back in England for many years! The post was very responsible, as she was alone and there was no Radiologist. The consultant Physician and Surgeons read their own radiographs. In the cases where they wanted a radiological opinion, she had to send the films to the Radiologist who was in Nairobi.

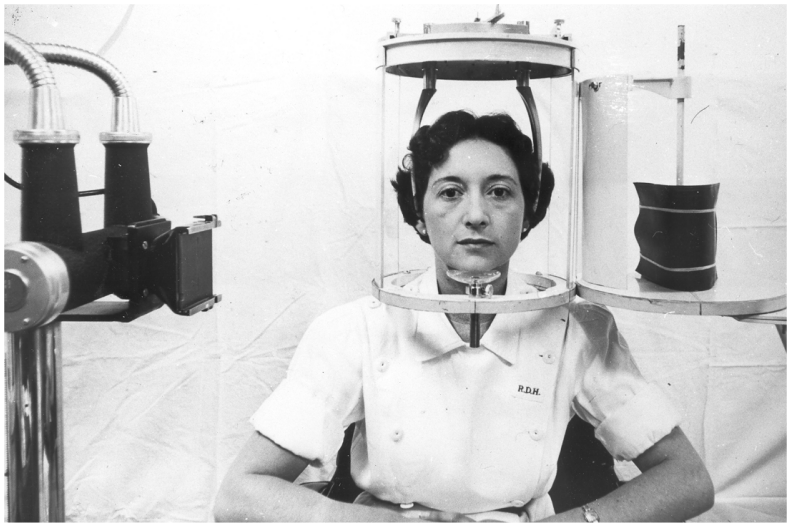
There was also a Private Hospital in Mombassa, but without X-ray equipment. So when they wanted radiological examinations she had to take the Portable apparatus, again a challenge. She was also asked to radiograph patients with problems on visiting ships, because Mombassa was a large port. This was a very remunerate business, because it was not part of her contract!

She enjoyed her time in Africa, traveling within Kenya and beyond, Tanganyika {now Tanzania) and Zanzibar. She joined the Sailing Club and sailed every Sunday on a big inland waterway from the port of Mombassa - Port Reitz. At the end of the locum, she was offered a post in Durban S Africa, but she decided to go back to the UK in early summer1948

When she returned home her father Sydney Blackman having decided on Radiology as there were to be no more Honorary Consultants was living in Kensington. She started off staying with her parents but before long moved to a flat in Campden Hill. She took a post at the Bolingbroke Hospital, and stayed there until her father persuaded her to go to join him at The Royal Dental Hospital. She found Dental Radiography a challenge because everywhere else in the body X-ray techniques could be standardised and the film and x-

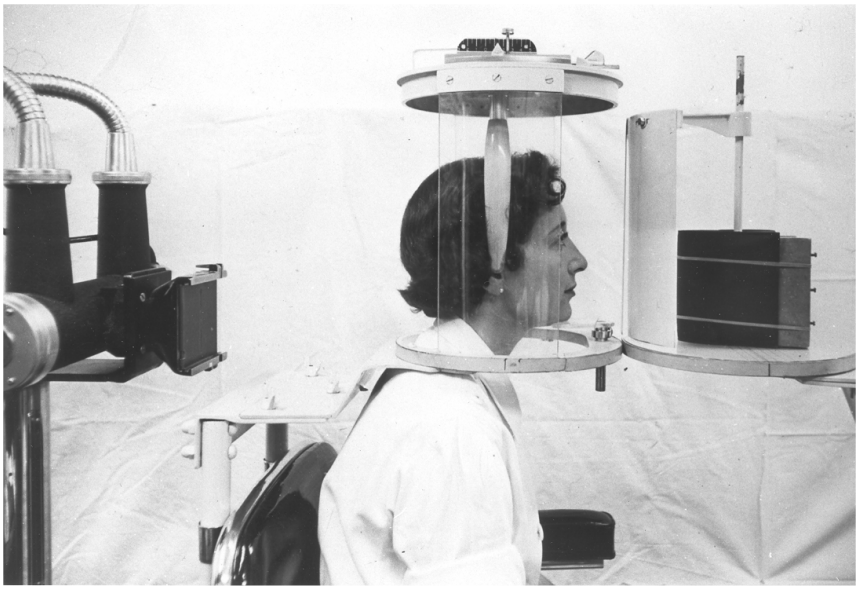
ray beam maintaining the same relationship to the anatomy (Katie Clarke). In the dental arches no 2 people are identical, even identical twins. Consequently she decided to stay at the Royal Dental Hospital She helped design the new Department, some of the apparatus had been very old and Sydney Blackman made many innovative improvements. Rita started teaching the Dental students in Radiography so that her father could concentrate on the Radiology. She also approached the Radiography School at St. George's Hospital to include the Dental field in their course. They sent their radiographic students to The Royal for training .There had been an association between the 2 Hospitals since the inauguration of the NHS. She worked at the RDH for 7years. In 1953 she won the Archibald Reid Memorial Competition Prize with a paper on Radiography of the Mandible.

Development of panoramic radiography.

Rita Mason 

She was instrumental in introducing her father to the rotographic film. She had a friend, Clifford Ballard, who was an Orthodontic Consultant at the Eastman Dental Hospital He went to Finland in 1953 and saw these films taken by Yrjo Paatero and thought that Sydney would be interested in them so he brought them back and gave them to Rita. These films demonstrated a rotating tomographic projection of the dental arches.
Of course Sydney Blackman was very interested and immediately arranged to visit Paatero in Helsinki. He went to visit Paatero's department in August 1954 and returned with enough technical details, promising to attempt to persuade an English x-ray firm to invest at least in a prototype. Blackman managed to interest one of the few English firms then manufacturing x-ray apparatus, Watson & Sons. Paatero came to England to work with Jim Steadman, one of their engineers. The result was an initial prototype which was demonstrated at the Royal Dental Hospital in 1954 to an enthusiastic audience. As a result, Watson's were persuaded to develop a production model, the Rotograph, and this was manufactured in the following year. The machine used a single centre of rotation and was the first to produce a continuous image of the jaws from condyle to condyle. He believed that this new machine had considerable potential, writing that "the ultimate aim is to introduce a form of mass dental radiography", similar to that employed in the

investigation of pulmonary conditions, to locate and control dental disease, especially in the growing child. But in fact it was immediately taken up by many Dental Hospitals as an easy and quick alternative to 'full mouth' radiographs. Not perhaps so detailed all round but particularly accurate in the ramus, molar and incisor regions. The premolar regions were overlapping. The Rotograph was superseded in Europe when Paatero, working with Siemens, developed the three-centre of rotation apparatus, the Orthopantomograph. An example of the type of image produced by the Rotograph is now enshrined in the Presidential medal of the British Society of Dental and Maxillofacial Radiology.


Lateral view

Blackman worked with Watson's again to develop the Panagraph, a rod anode machine for intra-oral panoramic radiography. The initial clinical results were good but despite its subsequent adoption by both Siemens and Phillips, this technique never found widespread acceptance. The relatively large radiation dose led him to write with J R Greening, a medical physicist at St George's Hospital, one of the early papers on the dangers of ionising radiation from dental radiography, stressing the need to limit the dosage. In March 1957 he took part in a round table discussion on the same subject at the FDI in Rome.

He also realised that dentists in general practice tended to delegate the taking of radiographs to their dental nurses. Since there was no way at that time such delegation could be prohibited, he thought it should be possible for such staff to have the opportunity to be trained appropriately. This was not achieved in the UK until twenty years later, when dental therapists at the Royal London Hospital became the first group of dental auxiliaries to be taught dental radiography. His daughter Rita Mason, who was then a lecturer at the London Hospital Dental Institute, took up this challenge with The Society of Radiographers. She and Mr Peter Bird, the Dental Radiologist at the Dental School in Liverpool had had several meetings with S of R to inform them of the differences in 'dental nurses'. Dental Therapists were highly trained to help dentists in

many ways e.g. ‘scaling and polishing teeth’. It was also essential that they should be properly trained in radiography. They were taking dental films anyway, instructed by their dentist. This was unsatisfactory as it depended on the skill of the Dentist! Stuart Morganstein, the Head of the School of Dental Auxiliaries, was very encouraging. So Rita contacted the head of the School of Radiography at The London Hospital, Roger Hicks. Between them they set up a Syllabus for the course, Roger teaching the theory and Rita the practical. Eventually a selected group came from the Society of Radiography came to The Dental Hospital Institute and approved of the course in 1986. Subsequently having approved of the London Hospital course, there was recognition in 1990 jointly between The Dental Surgery Assistants Standards and The Training Advisory Board and the General Dental Council and The College of Radiographers that radiographers should be included in Training Courses.

Sydney Blackman was a great advocate of the spoken word. An extrovert, he enjoyed lecturing and always tried to make his points with humour. He was much in demand in both Europe and the USA. None of the undergraduates at the Royal Dental Hospital ever forgot him or, most importantly, what he taught them. He was always referred to affectionately as “Sydney” and when as chairman of the Refectory Committee he persuaded the Hospital Secretary to open a refectory, it was known as “Sid’s caff”.

Sydney Blackman published two textbooks which made a considerable contribution to the development of the specialty. His Atlas of Dental and Oral Radiology (1959) became a standard reference book and was characterised by the high quality reproduction of the radiographs Of course Rita was involved in many ways within the Dental profession with her teaching of Dental Radiography and was asked by the British Dental Journal to write some articles on the subject. She left before she could achieve this and became otherwise occupied, but she had written many notes, which her father afterwards used to write his book on Dental Radiography for John Wright & Co. Manual of Dental and Oral Radiography (1963), emphasising his principles of standard intraoral and extraoral radiography. He wrote this book with H G Poynton. This was the companion volume for the ‘Atlas’

From the outset of his long association with the Royal Dental Hospital, he wrote frequent articles for dental and radiological journals. He recognised the importance of radiological diagnosis for practising dentists and wrote several papers he considered to be of particular interest to them

The British Society of Dental and Maxillo-facial Radiology

In the early fifties as the field of medical radiology became more specialised Sydney Blackman realised that medical radiologists would cease to be interested in dental radiology. The increasingly sophistication of maxillo-facial surgery together with orthodontics demanded more radiographic monitoring .Consequently not only would the general radiologist not have the time to be involved in ‘Dental’ Radiology but more importantly, would not have the necessary knowledge of oral pathology Blackman realised that it would be difficult if not impossible to break the ‘restrictive practices’ of

medical radiologists to recognise and accept dentists within their field Consequently in 1957 he called a meeting of the teachers of Dental Radiology at London teaching Hospitals, to The Royal Dental Hospital. .He then extended the consultation to teachers from the rest of the UK for their support. Consequently he helped to found the British Society of Dental Radiology and was elected as its first President.

The objective was to foster the spread of knowledge of dental radiology and to improve the standard of dental radiography. Blackman with the consensus of the Society believed the future teachers of dental radiology depended upon the establishment of a formal postgraduate qualification. His original concept was for this to be accepted by the Royal College of Surgeons. Unfortunately this was turned down and so the Society then drafted Regulations Part I & Part II for an examination in Radiology to be awarded as a Fellowship of the British Society of Dental Radiology. Professor Hitchen made a very significant contribution in drafting these. Sydney Blackman was not to see this come to pass, but without his initiative and foresight it might well not have happened. It was not achieved until 1985 with the creation of the D.D.R (Diploma of Dental Radiology}, centred at Kings' College Hospital and initiated by Professor David Smith.

Blackman set his sights even wider and envisaged a European Association of Dental Radiology. He had been lecturing in Europe for many years and so had no difficulty in arranging a meeting in Bonn in 1962 with many practitioners in the field. Those present included Karl-Ake Omnell, Gustav Korkhaus, Jan van Aken, Eberhart Sonnabend and Till Jung. Again he did not see this enterprise come to fruition. It was over 20 years before another Englishman Professor David Smith invited his European colleagues, including Jan van Aken, to attend a British Society Dental Radiology Association in London to propose starting a European Society.

Sydney Blackman made his mark in the history of Dento-maxillofacial Radiology as an entrepreneur and innovator. The key to his success was his ebullient personality and considerable charm, enormous drive and enthusiasm. He was able to seize an idea and involve others to bring the project to fruition. He had great foresight and once he was convinced of the rightness of a particular path, he used his substantial persuasive powers to make progress with that particular project. Perhaps it was this 'ruthlessness of purpose' which upset his colleagues so that he was never given proper recognition in his lifetime. However it was Sydney Blackman, who helped to make the production of The Rotograph possible, and demonstrated the enormous leap forward that the panoramic radiography would make in radiological diagnosis.
It was only when he retired from the Royal Dental Hospital in 1967 that he was appointed Professor of Dental Radiology at the North Western University in Chicago, Illinois in which he remained until his death in 1971.

As a colleague at the Royal Dental Hospital wrote in his Obituary:
"There can be no question regarding the contribution of Sydney Blackman to dental radiology. Had he had a less forceful character he might have received, in his lifetime, the credit he deserved, but when dental historians piece together the story of dental radiology

there is a place assured for Sydney Blackman." In: British Dental Journal 1971 Vol. 130 No. 8 April 20th.

Rita Mason as she was now, left The Royal Dental Hospital in 1957 because she had married again in October 1956; an Orthopaedic surgeon attached to Whipps Cross Hospital in Leytonstone and was 6 months pregnant. She spent the next few years looking after her family. She had 3 children, 2 girls and a boy. When she thought she knew that her father was due to retire in 1963, she went back to make sure she had not lost her skills as a Dental Radiographer .In fact as it was impossible to find a successor to replace him, he was asked to stay on.

Of course Rita did go up on the earlier occasion when the Queen honoured the Hospital with a visit. Of course the Queen went to the X-ray Department to view the innovative Rotograph. Sydney Blackman was most impressed how well she had been briefed and the intelligent questioned she asked. On her1963 visit Rita happened to see the Orthodontic Surgeon Professor Philip Walther (whose daughter was the 'patient' in the Rotograph, on the Royal visit} He was pleased to see her and when he discovered she was not working, he asked her if she would like to apply for a part-time post in the X-ray Department at Great Ormond Street Hospital for Children. He worked there part time, in their Dental Department, and was frustrated because there was no radiographer in the department who could operate the Rotograph apparatus satisfactorily or were sufficiently skilled to take intra-oral films on small children. She decided to have a look. She contacted the Senior Radiologist Dr John Sutcliffe and arranged an interview.

Again this was a challenge, so she agreed to do 3sessions, a full day on Wednesday when Professor Walther worked, and Thursday morning to coincide with the oral-surgeons. Originally it was Dr Tom Craddock Henry (brother of the Craddock Henry who had been at RDH of bimolar 'fame'. When 'uncle Tom' retired he was succeeded by Dr Jock Plint who came from S. Africa and was not happy with the political situation vis a vis apartheid She found working there at Great Ormond Street very convenient, because in an emergency with her child minding support failed she could always take the child with her! Her son loved sitting in the dental chair pretending that the Kingsway dental tube head pointing the opposite way was a gun. She worked there for about 8 years. She enjoyed the post and learned a lot about paediatric techniques. How to radiograph the under-3 year olds with the help of the mother adequately 'protected'. Older children were often more co-operative without their parent in the room. But on the other side she saw the terrible conditions some of these children suffered, mainly inherited and was very sympathetic to the parents. She had 3 relatively 'normal' children. In many ways she felt it was easier for radiographers without children to work at GOS.

She left because her husband was dying of Cancer and she knew that she could not look after her children and work with children. Her husband worked with 2 Dento-maxillo-facial Surgeons, at local hospitals in Essex who also worked at The London Hospital Dental. Institute, In fact as she lived in Woodford Green, Essex, and The London was nearer than GOS. In fact Rita had known both of them because of their connections in the past with RDH She was also aware of Professor Gordon Seward, who was the head of the

Dento-maxillofacial Department at The London. She remembered him coming as a young man, 20years previously, to ask advice and learn from Sydney Blackman when she was at the RDH.

One of them Terence English, offered to speak to Gordon Seward. Consequently he arranged for a meeting. At that time the maxillo-facial lecturers undertook all the undergraduate radiographic teaching. This was not very satisfactory as though Gordon was as knowledgeable about Radiology and Radiography as Oral Surgery, the same could not be said about his departmental lecturers. So he was delighted to see Rita Mason and pass the undergraduate radiographic teaching over to her. When she started she was not officially part of the Teaching staff, but a Hospital Radiographer. She worked 4 days a week, but was expected to undertake the hospital patients as well as teach the students. They were divided into 7 groups and she taught by demonstration on the patients. The students had to work sessions in the holidays for their practical experience.

After a year she complained and was then transferred to the University staff and could give a tutorial in an allotted room within the Dento-maxillo Surgery department before bringing in the patients into the X-ray rooms. They still had to undertake a specific number of practical sessions in the interterm periods. It was often commented upon that the London Dental Graduates were the most practically competent in radiography when they went into Dental Practice, The tradition has continued. Shortly after joining the London Hospital Dental School she applied to join the BSDMFR. They accepted her, but only as an Associate member, as she was not a dentist. It was not for about 10 years that the Association dispensed with their restrictive ideology and let radiographers become full members and are now on the Board. In fact they have given her honorary membership. On the other hand the Americans and Europeans did not have the same attitudes for the Associations allied to dentistry and she was a full member when she joined the IADMFR in the late ‘70s and was deeply involved in 1985 when we hosted the 8th Congress in London.

In 1972 David McGowan, who was the Senior Registrar in Oral Surgery suggested that she should get in touch with the Publishers John Wright and Co to see if they would be interested to include a book on Dental Radiography .for their Dental Practitioners Handbook Series. This could be an up to date edition of her father’s book. She wrote a specimen chapter on Occlusal Radiography, {which hardly altered over the following 3 editions}. Rita was then asked to meet with Donald Derrick, who was their Dental Advisor. They both agreed that dentists don’t read! So it was decided that the book should be in the paperback edition and be economical with words, but include many more illustrations than the Sydney Blackman book. It was No.27 in The Dental Practitioners Handbook Series and came out in1978. John Wright’s were taken over by Butterworth’s and they published the 2nd edition in 1980. This was the first book they published in this series so they had to make it good and the illustrations were excellent. It was translated into Spanish (mainly for the South American market). By the 3rd edition in 1988 Reid’s were overall in control. Rita Mason retired to Bristol in1988, but her Dental Practice Practitioner encouraged her to write a further edition, mainly to include the ‘new’

working position but unfortunately this had many problems and never really took-off! It was sold in the undergraduate market at too high a price.

Forensic Odontology

The other area that Rita Mason has made her contribution was in Forensic Odontology. In the seventies the main means of identification for the dead who had had an accident was to compare the skull or teeth to an image from previous radiographic films. There was a Forensic Department at The London, jointly between medicine and dentistry — Dr Malcolm Cameron and Mr Bernard Simms. She obviously worked hard with Mr Simms the dentist and was part of the Forensic teaching staff. The most famous case was the elderly lady in a Grace and Favour apartment at Hampton Court who inadvertently set fire to her apartment while reading by candle light in bed! She contributed a chapter to a book on Forensic Medicine edited by Derek Clarke, Practical Forensic Odontology, published by Churchill Livingstone

British Council Consultancy in Malaysia

In 1990 she was offered a Consultancy in Malaysia, based at the University of Malaya, Kuala Lumpur. She was honoured and accepted happily. This was a very interesting experience to be amongst a truly multiracial society. She saw this very soon after arrival when she was invited to the 'Freshers' party. The Muslim Malaysians, who were in the majority, were in both traditional and European clothes. The Chinese and Indian students were largely in European dress. The atmosphere that came over was a happy group of students with a great sense of humour. She taught mainly in the Faculty to Undergraduates. Apart from giving Lectures, she taught, as she found the most useful, with practical seminars. This could sometimes be a little difficult as Islamic teaching includes, respect for your elders, and not to question their word. She had to explain that often you could learn more from making mistakes! She also gave day courses in the Continuation Dental Education Department and went to Malacca and Ipoh to talk to the local General Dental Practice Associations. She found all this a fascinating experience and has made some good friends. It was a lovely country and she explored it as much as she could Penang, Kota Bharu, and the Cameroon Highlands. She also went to Singapore for an International Dental Meeting. Malacca in many ways epitomised the country, she stayed with a 9th generation Chinese Dentist. The town is on the trade route between China and India and it was from here that Islam really arrived. There is one road that has every religion's worshipping space from a pink Portuguese Church, Hindu Temple, Islamic Mosque and a Traditional old Chinese House.

NRPB

She also advised the Radiation Protection Department of the Dental Services on the necessity for Dental Practitioners to make changes in both their equipment and radiographic techniques, and also some of the departments within the Faculty of Dentistry. She strongly re-enforced the suggestion that all dental practitioners should learn from their mistakes and employ the Image Quality Assurance practice.

Overall, she realises that she has been very fortunate to have had a very varied working life, and which was originally due to having Sydney Blackman for her father.

ROENTGEN'S ALBUM

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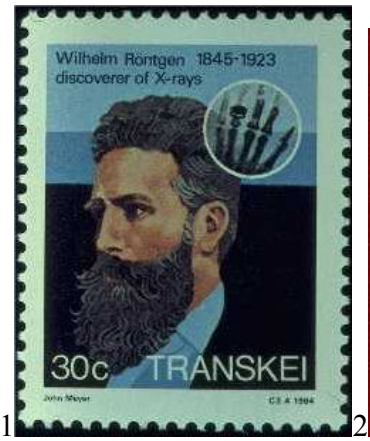
Wilhelm Conrad Roentgen was born in Lennep, Germany, on 27 March 1845. He obtained a degree in physics in 1869. While conducting research at Wurzburg University, he made his famous discovery in 1895 of the unknown radiation "X-rays", which resulted in the discovery of radioactivity and the beginning of a new era in science.

The discovery is commemorated on three stamps (1-3).



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He was awarded the first Nobel Prize in Physics in 1901 which is documented on two stamps (4, 5).

4

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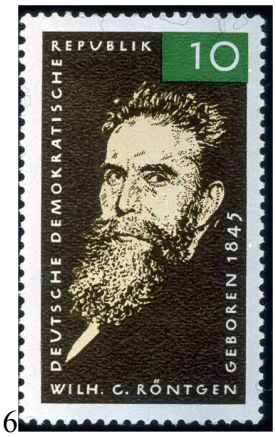
The anniversary of his 120th birthday is celebrated by the former German Democratic Republic (6)



6

The application of his discovery in examining patients is shown on a number of stamps (7-11).

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11

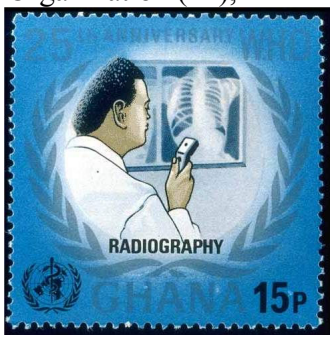
An Indian stamp honors Marie Curie (1867-1934) who equipped the first mobile X-ray van and traveled from one hospital to the next teaching radiography (12).

12 

A French stamp honors Antoine Béclere (1856-1939) the first French radiologist (13).

13 

Other occasions involving X-rays were also commemorated on stamps. For example the 25th anniversary of World Health Organization (14),

14 

Fighting tuberculosis (15, 16),

15 

16 

Health care for the Nigerian people (17), X-rays and socialism in Hungary (18),

17 

18 

The first European Congress on Radiography in 1991 (19, 20), X-rays and rheumatism.

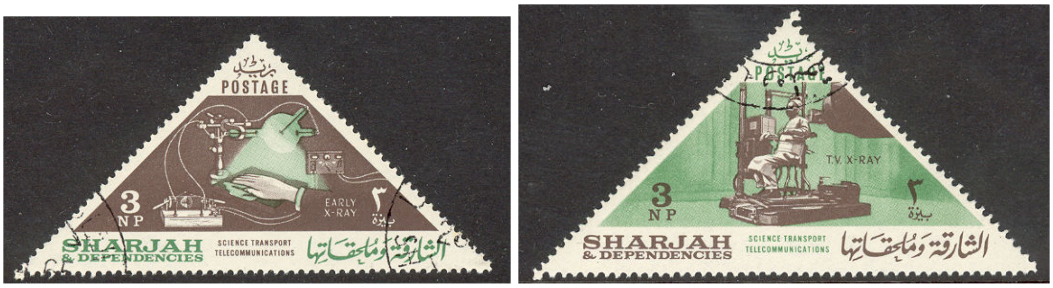
19 

20 

Uganda issued on her independence on October 9, 1962 a stamp showing a Ugandan technician wearing a lead apron and examining a patient by X-rays (22).

22 

The improvement in X-ray technology is shown on two stamps from Sharjah in the Persian Gulf: one stamp illustrates early X-ray equipment while the other modern TV X-ray equipment (23).

23 

The Anglesey Bonesetters

By Adrian Thomas

I wrote this in response to a question and these notes may be of more general interest.

Thank you for contacting me. The subject of the bonesetters is one of great interest to me - If I recollect correctly, there was a recent article on the bonesetters in the BBC History magazine.

I have recently been reading "The Life of Sir Robert Jones" 1857-1933 (the great UK pioneer orthopaedic surgeon) written by Frederick Watson. Robert Jones, senior (father of Sir Robert Jones) had a sister called Elizabeth and in 1864 she married Hugh Owen Thomas 1834-1891 - his father was Evan Thomas, the last of the great bonesetters. Hugh Owen Thomas qualified as a doctor in Edinburgh and became a Member of the Royal College of Surgeons in 1857. He undertook further training in the management of bone disease in Paris. In 1858 he moved to Liverpool and assisted his father Evan Thomas the bonesetter. Hugh Owen Thomas never had a hospital appointment and treated all his patients in a surgery in his own home. Sir Robert Jones qualified in 1878 and worked with Hugh Owen Thomas until 1891. Liverpool was a major centre for orthopaedics (and also orthopaedic radiology under Thurstan Holland).

The whole relationship between the emerging discipline of Orthopaedic Surgery (then in its infancy) and the background of "unqualified" bonesetters is of great interest. Although the bonesetters were called "unqualified" they were often very skilful. Presumably it often became a family profession - Hugh Owen Thomas was the eighth in direct descent of a line of bonesetters - the techniques of the trade being passed on from father to son, generation following generation. In the latter-19th century things were changing - the Medical Register Act was passed in 1858. The medical profession was defining who could and who could not practice.

Prior to the time of Evan Thomas the "unqualified" practitioners were "well-to-do farmers" and were well respected throughout Anglesey. They had an ancestral calling and practiced mainly for love "con amore". It is difficult to know after so many years what the results were that were obtained by these medically unqualified practitioners. They did however have a good local reputation and an experience based upon many generations of the practice of manipulation. Frederick Watson (writing in 1934) stated that the hostility of the medical profession to the unqualified (medically) manipulative practitioner was comparatively recent. For centuries the bonesetters were a respected group on the border of medical practice. Watson felt that the results of the bonesetters "compared favourably enough with that of his professional colleagues" - my personal view is that the results may have been better due to experience and specialisation. Certainly there are records of medical practitioners sending their patients to the medically unqualified bonesetters - In the 18th century it is recorded that Cheseldon (1688-1752)(and author of "The Anatomy of the Human Body") sent patients to Presgrove who was a famous bonesetter. It is also recorded that in Victorian times Wharton Hood (a qualified doctor) was very happy to learn techniques of treatment from the unqualified bonesetter Hutton.

Evan Thomas (father of Hugh Owen Thomas) was obviously aware that times were changing - Evan Thomas was already subject to the animosity of the medically qualified practitioners - and he sent all five of his sons to medical schools to qualify, not wanting them to become unqualified bonesetters.

It should also be noted that orthopaedics was starting to develop at this time - this was in part due to the antiseptic surgery of Lister, the bacteriology of Pasteur and Semmelweis and to the introduction of anaesthesia. My interest is in the use of x-rays (discovered in 1895). It was also the case that orthopaedic surgery was not particularly attractive to medical practitioners - Frederick Watson stated that "Orthopaedics was very much the ugly duckling of surgery, promising little distinction for anyone identified with it". Watson felt that although Hugh Owen Thomas and Wharton Hood were both specialists in orthopaedics that Hugh Owen Thomas had the advantage of being able to combine the traditional skills of the bonesetters with the advances of modern professional medical practice. Hugh Owen Thomas took what was good in the traditional bonesetters practice and used it in his medical practice. As an example, the bonesetters made their own splints and Hugh Owen Thomas made splints and appliances in a workshop attached to his surgery - indeed Hugh Owen Thomas would make a splint tailored for the need of a particular patient.

Hugh Owen Thomas spoke highly of his father Evan Thomas and his skill. Hugh Owen Thomas stated that in some matters the bonesetters were superior to their qualified contemporaries. Hugh Owen Thomas felt that in general their management of joint diseases was inadequate. The main contribution of the bonesetter was in the management of injuries and not joint disease (arthritis). The industrial expansion in the UK (industrial revolution) resulted in a very large number of injuries (no modern "health & safety" legislation). Transport and industrial injuries produced many casualties and the ordinary general surgeon had little experience in these cases. The bonesetters had an important role.

THE ACADEMIC PEREGRINATIONS OF W.C.RÖNTGEN 1845-1923

Compiled by the late Derek Guttery

LENNEP: 1845-1848 B
Born in Lennep, Rhine Province, 27 March 1845

APPELDOORN: 1848
Family moved to Appeldorn, Holland: Childhood, youth and schooldays

UTRECHT: 1862
Entered Utrecht Technical School to audit courses on mechanical engineering

ZURICH: 1865-1871
Student of mechanical engineering at the Polytechnic High School. Met future wife, Anna Bertha Ludwig, in Switzerland, 1866. Diploma in Mechanical Engineering, 1868. PhD degree 1869. Appointed assistant to Professor August Kundt.

WÜRZBURG: 1871-1872
Still as assistant to Professor Kundt, moved with him to Julius-Maximilians-Universität at Würzburg

STRASSBURG: 1872-1875
Married Anna Bertha Ludwig in Appleldorn, 1872; still as assistant to Kundt, moved with him to the Kaiser-Wilhelm-Universität at Strassburg; became privat-dozent in physics at Strassburg University, 1874

HOHENHEIM: 1875-1876
Appointed Professor of Physics and Mathematics at the Academy of Agriculture, Hohenheim, Württemburg

STRASSBURG: 1876-1879
Returned to University of Strassburg as associate Professor of theoretical physics

GIESSEN: 1879-1888
Appointed Professor of Physics at the Hessian Ludwigs-Universität at Giessen; declined offer of chair of physics at the Friedrich-Schiller-Universität at Jena, 1886; took Josephine Berta, his 6-year old niece, into his home, 1887 and adopted her when she became 21; declined chair of physics at the University of Utrecht, 1888

WÜRZBURG: 1888-1900
Appointed Professor of Experimental Physics and Director of the Institute of Physics at the Julius-Maximilians-Universität at Würzburg, October, 1888; Professor Kundt died, May, 1894; began experiments with cathode rays in June1894; declined offer of chair of

physics at the Albert-Ludwigs-Universität in Freiburg, February, 1895; discovered strange effects due to a "new kind of ray", on 8 November, 1895; submitted manuscript "Preliminary Communication" to the Würzburg Physical-Medical Society for publication, 28 December; sent reprints of "Preliminary Communication" to colleagues in Germany and abroad, 1 January, 1896; first X-ray pictures exhibited at Berlin Physical Society, 4 January, 1896; first newspaper report of the discovery in *Wiener Presse,* 5 January, 1896; news of discovery cabled all over the world, 6 January, 1896; visited the Kaiser at Berlin and demonstrated new rays, 13 January, 1896; lectured on his discovery before the Würzburg Physical-Medical Society, 23 January, 1896; declined to lecture before the German Reichstag and several scientific societies, 30 January, 1896; received honorary degree of Doctor of Medicine from the University of Würzburg, 3 March, 1896; submitted manuscript of "Second Communication" to the Physical-Medical Society 9 March, 1896; submitted "Third Communication" to the Prussian Academy of Sciences, Berlin, 10 March, 1897; declined chair of physics at the University of Leipzig, 1899

MUNICH: 1900-1923
Appointed Professor of Physics and Director of the Physical Institute at the Royal University, Munich, 1 April, 1900; received first Nobel Prize for Physics in Stockholm, 10 December, 1901; declined invitation from Carnegie Institute in Washington to use its laboratory for special research, 1902; declined offer of presidency of Physikalisch-Technische Reichsanstalt, Berlin-Charlottenburg, 1904; declined offer of professorship at Prussian Academy of Sciences, Berlin, 1912; retired from University of Munich and became Professor Emeritus, 1920; died at Munich, 10 February, 1923.

Useful Web-Sites

National Radiological Protection Board. www.nrpb.org
Advice and information on radiation protection in the UK.

A significant update to the web site has been completed. Contents lists, abstracts, author index and subject index details are complete for all 2002 publications. The latter indexes now provide links from paper titles to ALL abstracts from 1981 onwards. Advance details for publications in 2003 and 2004 are also posted. The following links will assist in identifying the updates.
http://www.ntp.org.uk/rpdprint.html Radiation Protection Dosimetry issues in print
http://www.ntp.org.uk/prod/prodind.html Updated listing of all publications to the end of 2004
http://www.ntp.org.uk/prod/priceboo.html Update price list of all publications (More than 150)
http://www.ntp.org.uk/icru/icrureports.html Updated listing of ICRU reports.

Finally, a questionnaire is being sent to all current and recent past subscribers to Radiation Protection Dosimetry to establish what form of on-line availability would be most desirable to subscribers.

Sunday, December 08, 2002