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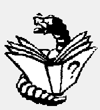

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From the Editors

BRAZIL!, we say again, but in a somewhat more restrained font in spite of ourselves, for ISRP 12 and the associated Radioprotection and Related Dosimetry Workshop will be upon us and quite soon.

Sooner yet are the associated abstract submissions (deadline **May 30**), review processes and so forth, but already organizers have assembled an impressive list of plenaries and topics, posted at the conference web site: http://www.cnen.gov.br/hs_isrp12/Default.asp (check the Symposium Program and Workshop links, along the right-hand side of the page).

Further information in this issue of the Bulletin includes a list of invited speakers and the Second Announcement for ISRP 12 and associated Workshop, which summarizes the submission and registration deadlines.

Part of the attraction of ISRP is the breadth of applications in radiation physics represented in the various talks, which is a reflection of the diverse interests and specialties of members of our Society. Thus, as something of a teaser for what awaits you in Rio de Janeiro this October, we are pleased to present two excellent Member contributions: a history of the early days of x-ray spectroscopy, by Leif Gerward, and, from Dudley Creagh, an account of his development of an x-ray computed tomography system for characterizing artifacts from a shipwreck off the coast of Australia.

A third item redirects our attention from the bottom of the ocean to the stars above with a brief summary of an article estimating the number of habitable planets within a few dozen light years from here: more than 100, you may be surprised to learn, but we have no idea what that may portend for ISRPs to come.

Before we close, we remind you to cast your vote for the triennial IRPS election of new officers and members of the Executive Council! Instructions for casting and submitting your votes are on the enclosed ballot form.

Ron Tosh & Larry Hudson

Member's Report

Leif Gerward

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The Making of X-Ray Spectroscopy

The birth of X-ray spectroscopy can be traced back to the first decade of the 1900s, when Barkla developed a kind of X-ray spectroscopy based on absorption of X-rays in matter. Although of indirect nature, his method delivered new and significant knowledge, e.g. the existence of absorption edges and the K and L series of characteristic radiations. As a sideline, the first table of mass absorption coefficients was published. The situation changed radically in the remarkable years 1912–14 with the observation of X-ray diffraction in crystals by Laue, Friedrich and Knipping; the Bragg equation; Moseley's law; and Bohr's theory of radiation and atomic structure. Modern X-ray spectroscopy took off in the 1920's aided by progress in experiment and theory.

Introduction

In his discovery paper, Wilhelm Conrad Röntgen (1896) published a table of 'equivalent thickness' of aluminum, zinc, platinum and lead, each of which attenuated by the same amount an X-ray beam produced by a 40 kV discharge from an unheated cathode. Röntgen's X-ray beam was not homogeneous in energy, and he did not specify the amount of attenuation. Nonetheless, we here have clearly the first quantitative estimates of X-ray absorption in matter (Hubbell, 1970). Charles Glover Barkla (1906a) demonstrated the polarization of X-rays. These experiments confirmed Thomson's classical theory of X-ray scattering and provided strong evidence for the electromagnetic wave nature of X-rays.

The absorption method

Röntgen also discovered secondary radiation from substances exposed to X-rays, and this subject was investigated by a number of distinguished experimenters, including Perrin, Curie and Langevin. The equipment required was minimal, consisting of an X-ray tube, a secondary target, and a detector in the form of a gold leaf electroscope for measuring the intensity of the slit-collimated X-ray beam. For almost two decades, absorption was practically the sole measurable quantity by which to characterize a given X-ray. The 'absorbability' was measured by inserting a thin foil (usually aluminum) in front of the electroscope.

Barkla (1906b) verified that secondary radiation from light substances differed very little from the primary producing them, while secondary radiation from heavier substances was more easily absorbed. The radiation from a given element was found to be independent of the physical state of the substance and of its mixture or even chemical combination with other elements. There was no connection between the character of the secondary radiation and temperature and other physical properties of the radiating substance. More promising was the attempt to plot the absorbability of the secondary radiation as a function of the atomic weight of the radiating element. Here, finally, was a functional dependence that could be visualized in a diagram.

Barkla and Sadler (1907) showed that the absorbability generally is a smooth function of the atomic weight of the radiator. There was a disturbing feature, however: Nickel behaved irregularly,

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only falling into line when an atomic weight considerably greater than that of cobalt was assigned to it. The exception to what otherwise seemed a general decline of absorbability with increasing atomic weight was so striking that the authors no doubt desperately sought for an explanation. Barkla was convinced that the underlying physical principles were sound, and he came up with a bold suggestion: There must be something wrong with the atomic weight of nickel! Instead of the then recommended value of 58.7, the atomic weight of nickel should rather be about 61.4, approximately mid-way between the atomic weights of cobalt and copper. J. J. Thomson put forward an alternative solution to the problem, suggesting that the accepted atomic weight of cobalt might be too high. The prospect of a drastically changed atomic-weight value for nickel or cobalt did not have any impact on the chemical community, though. The atomic weight, if any, is a quantity that is very carefully determined by the chemists. The recommended values for cobalt and nickel in the year 1900 were 59.0 and 58.7, respectively. In 1909, the corresponding values were quoted as 58.97 and 58.68, the minimal changes just reflecting the improved accuracy of the determinations. The US chemist and Nobel Prize Laureate Theodore W. Richards, known for his accurate determinations of atomic weights, summarized the case as seen by the chemists:

The result proved beyond cavil that cobalt really has a higher atomic weight than nickel – a result of much interest, since the properties of the two elements, as well as their atomic numbers recently determined by X-ray spectra, suggest the contrary sequence (Richards, 1919).

Nevertheless, Barkla kept using his own value of 61.4 for the atomic weight of nickel, since it gave his graphs a nicer appearance. It was left to Moseley to explain the apparent anomaly in terms of the atomic number.

Barkla and Sadler (1907) demonstrated the validity of Lambert's absorption law for X-rays. They noticed that the absorption by iron of secondary X-rays from iron and cobalt targets was much lower than expected. Also the absorption by copper of the radiation from copper was low. Actually, these were the first observations of what are now known as absorption edges. Barkla and Sadler (1909) published the first table of mass absorption coefficients for a number of elements and radiations. The average percentage difference between their values and present-day accepted values is no more than 6 %, which shows the skills of the experimenters, considering their crude equipment.

Barkla (1909) investigated the secondary radiations from the heavy elements Sn, Sb and I, and found that these consist of an easily absorbed radiation and a more penetrating radiation superposed. In his discovery paper, Barkla denoted the two series of radiation by the letters A and B (Fig. 1).

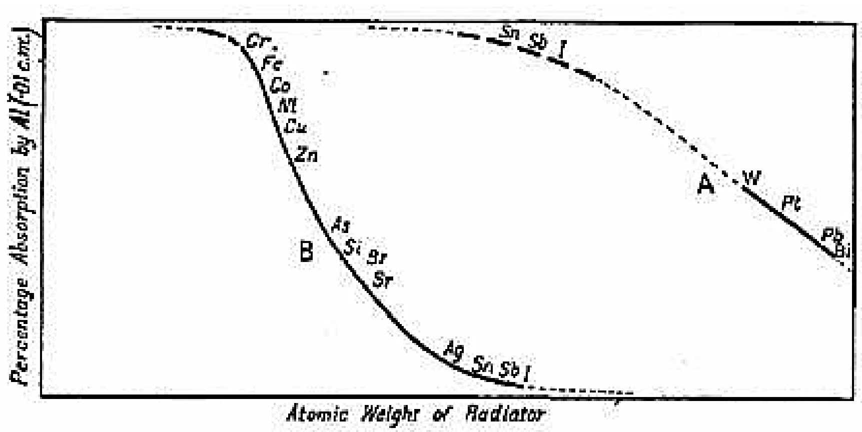

Fig. 1.
Graph showing the two series B and A of characteristic radiation (later renamed K and L). From Barkla (1909). The absorbability is measured as the percent absorption in 0.01 cm aluminum.

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It occurred to him that other series of radiations, both more absorbable and more penetrating, might exist, and in a later paper he renamed the above series K and L, the K radiation of a given element being more penetrating than the L radiation (Barkla, 1911). The only reason for choosing those particular letters was that they are situated in the middle of the alphabet, but the notation gained a firm footing and is still in common use.

Progress in the understanding of the secondary radiation was severely hampered by the lack of theory. Barkla was on firm ground when dealing with the scattered radiation from light elements, which was well described by J. J. Thomson's theory. In fact, Barkla's measurements yielded a reliable estimate of the number of electrons in each atom. For radiation from heavier elements, the situation was more complex, and no adequate theory was available at the time.

The crystal reflection method

The spacing of the atoms or molecules in crystals and the X-ray wavelengths are of the same order of magnitude. In 1912 Max von Laue got the bright idea of using the ordered arrangement as a 'grating' for the investigation of X-rays. He worked out the theory for a three-dimensional grating, and the younger physicists Walther Friedrich and Paul Knipping set out to record the expected interference pattern. The experiment was a great success (Friedrich, Knipping & Laue, 1913). William Henry Bragg and William Lawrence Bragg, father and son, gave an alternative interpretation, inferring that the spots in the Laue photographs were due to partial reflection of the incident beam in the lattice planes of the crystal (Bragg & Bragg, 1913). This is amply described by the well-known Bragg equation:

$$2d \sin\theta = n\lambda ,$$

where d is the lattice plane spacing, θ is the glancing angle, λ is the X-ray wavelength, and n is order of reflection.The Braggs found that cleavage planes of e.g. mica could be used as X-ray mirrors. They devised an apparatus resembling a spectrometer where an ionization chamber took the place of the telescope, and the revolving table in the center carried the crystal. Using a crystal with known lattice plane spacing, a given X-ray could now be associated with a true wave property, namely its wavelength (or frequency). The Braggs investigated the characteristic radiation emitted from a number of X-ray tube targets, and then went on to determine crystal structures. Their method founded X-ray crystallography.

Henry Gwen Jeffreys Moseley (1913, 1914) used the Bragg spectrometer but devised his own method of photographing the X-ray lines and measuring their wavelengths. In the first part of his paper, he studied the K lines of ten elements from Ca through Zn forming a continuous series with only one gap (Sc). The inclusion of Ni was of special interest because of its anomalous position in the periodic table. Moseley observed that the K spectrum consists of two lines that he denoted α and β. He showed that the square root of the frequency of the line belonging to any particular X-ray series is a linear function of the atomic number, a relation now known as Moseley's law. This law is in perfect agreement with Niels Bohr's theory, developed at that time (Bohr, 1913). In the two parts of his paper, Moseley clearly demonstrated that the atomic number is of more fundamental importance than the atomic weight. He also found gaps in his plots corresponding to yet undiscovered elements. Moseley was fully aware of the spectroscopic implications of his work:

The prevalence of lines due to impurities suggests that this may prove a powerful method of chemical analysis. Its advantage over ordinary spectroscopic methods lies in the simplicity of the spectra and the impossibility of one substance masking the radiation from another. It may even lead to the discovery of missing elements, as it will be possible to predict the position of their characteristic lines (Moseley, 1913).

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Unfortunately, Moseley's brilliant scientific career was cut short when he volunteered as a signaling officer during World War I and was killed in action during the attack on Gallipoli in the Dardanelles 1915. He was almost 28 years old.

Before long, the new crystal reflection technique superseded the absorption method. Barkla, however, kept using his method. He was convinced of having observed a hitherto unobserved 'J series' of radiation. Unfortunately, it was a blind alley, and the development was to take another turn. In 1922 Arthur H. Compton made the first spectrometric investigations of the secondary X-rays from light elements. He observed that the primary beam was split into two parts, one of the original wavelength and another one of increased wavelength. The experimental results indicated that the phenomenon was a kind of scattering of the incident X-rays, and Compton (1923) suggested an X-ray quantum losing energy to an electron in a collision process. His revolutionary interpretation was first disputed, but the collision model soon became well established and known as the Compton effect.

It is interesting to notice that already in 1910 there had been a heated debate between Barkla and W. H. Bragg about the nature of X-rays. Barkla defended the idea that X-rays are waves like light, but Bragg thought they consist of streams of little bullets. The debate came to a standstill in 1912 with Laue's discovery of X-ray diffraction in crystals. That experiment, as it seemed, firmly established the wave nature of X-rays. However, a decade later, the Compton effect was a decisive proof of the wave-particle duality of light.

One of the missing elements predicted by Moseley was the element with atomic number 72. It was generally believed that this element was a rare-earth metal. However, Bohr's theory of the atomic structure and the periodic system clearly indicated that element 72 should be a zirconium homologue. Dirk Coster and Georg von Hevesy, at that time staying at Bohr's institute in Copenhagen, set out to find the missing element in zirconium minerals. Coster, an X-ray expert, borrowed a spectrometer from Manne Siegbahn's laboratory in nearby Lund. In the very first experiment, the $L\alpha_1$ and $L\beta_1$ lines were found at the wavelengths predicted by the Moseley plot. More lines appeared with increasing purification of the sample. At the end, nine lines in the L spectrum of element 72 had been identified. The chemist Hevesy worked hard to isolate the new element, and to determine its atomic weight and other properties. At this point, Bohr left for Stockholm to receive the Nobel Prize in Physics for 1922. After some telephone calls with his colleagues in Copenhagen, Bohr proudly announced – at the end of his Nobel Lecture – the discovery of "a new element with atomic number 72, the chemical properties of which show a great similarity to those of zirconium and a decided difference from those of the rare-earths".

According to common practice, the name of the new element should allude to the place or country where the discovery had been made. Coster's wife, being a teacher, suggested *hafnium* (Hafniae is the Latin form of Copenhagen), and this name was proposed in the discovery letter to *Nature*. Hevesy and Bohr, however, preferred *danium*, and they persuaded Coster to change the name at the proofreading stage. As it happened, the Editor of *Nature* overlooked the correction, and the letter appeared in print (Coster & Hevesy, 1923) with the name *hafnium* for the new element. It was now too late to change anything, and element 72 is called hafnium (Hf) ever since.

In the 1920's, X-ray spectroscopy took off, becoming an established branch of science. New and more advanced X-ray spectrometers were devised and built by Maurice de Broglie (a brother of the theoretician Louis de Broglie), Siegbahn, Compton and others. New spectral ranges became accessible, e.g. soft X-rays. Siegbahn (1916) made the first observation of the M series, and also

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the N series was discovered in his laboratory (Dolejsek, 1922). On the theoretical side, Bohr's quantum theory of radiation and the atomic structure was worked out and extended in great detail (Bohr & Coster, 1923).

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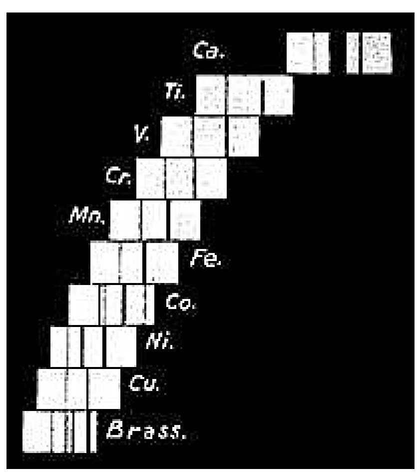

Fig. 2. Photographs of the K spectral lines of successive elements. From Moseley (1913).

Member's Paper

Dudley Creagh

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Investigating an historic ship wreck: the Australian Historic Shipwrecks Preservation Project

In this year, the centenary of the sinking of the Titanic, a new project which seeks to develop an new methodology for the study of shipwrecks is being undertaken. The subject is not so grand and opulent as the Titanic, which was a large, steel built steam driven vessel, with three screws (882' long, 52,310 tons displacement), had glamorous fittings, and carried the cream of English and American society as passengers. It sank travelling at high speed after a collision with an iceberg, killing 1514 people.

No. Our subject is more modest. Constructed on the Williams River (Northern New South Wales, Australia) in 1841 using timber unfamiliar to the shipwright, the Clarence was a mere 67 ton displacement. It was a wooden two-masted carvel-built schooner, described as having a square stern, standing bowsprit, no galleries and one deck. It sank in Port Phillip Bay (Victoria, Australia), having broken its mooring during a storm, foundering on a sandbank. Its passengers were 131 ewes. Clarence was indeed not glamorous. It is, however, the best preserved accessible wreck of an early colonial vessel constructed using Australian timbers.

The Australian Historic Shipwrecks Preservation Project (http://www.ahspp.org.au/clarence/) is the result of the successful bid by Professor Peter Veth (University of Western Australia) and others for funds from the Australian Research Council. The funding granted (A$500,000) is small compared to that required to undertake the project. A large number of government instrumentalities, universities, private firms, and volunteers have contributed time, effort, and their own funds into enabling the project to proceed. About 70 people are contributing their efforts to the project. There are 14 participating organizations.

When artefacts are retrieved from a shipwreck they are extremely vulnerable to degradation and deformation. Great care has to be taken to ensure that the structural and chemical integrity of the specimen is maintained. This is a costly, time-consuming process, and collecting institutions do not have either the physical or financial capability to discharge their responsibility to maintain the artefacts in air.

It is essential that an alternative strategy be adopted: one in which the artefacts are retrieved and characterized, and then returned whence they came, for reburial. The Clarence project aims to develop a capability for rapid recovery, documentation, assessment and reburial that meets object conservation requirements. It will provide a forensic approach to data collection and management in a GIS database. Specifically it will develop a sophisticated protocol for the rapid excavation, detailed recording and reburial of significant shipwrecks at risk, fostering a strategic national approach for shipwreck management. To achieve the aims of the protocol the project will: develop innovative techniques to rapidly record vessel fittings and objects using 3D imaging; record the

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sedimentary and biological context of the wreck and monitor its condition following reburial; trial, monitor and evaluate the reburial of "at-risk" materials away from the site in more stable conditions; correlate underwater experimental data with data obtained from geo-archaeology on land; and collect palaeo-environmental samples to inform on voyaging tracks, ports of call and previous cargos.

In this project the platform from which the diving will take place, and on which the bulk of the analyses will take place, is a jacked-up barge sited close to the wreck of Clarence (Fig. 1). The three 20' shipping containers provide on its deck: a storage area for diving equipment, a facility in which artefacts are studied by the conservators, and a laboratory to house the data analysis and X-ray imaging equipment.

Fig. 1. Jacked up barge in position to the wreck of the Clarence. The dark blue container contains the data analysis room and the X-ray enclosure.

Many techniques will be used to analyze the artefacts retrieved from the wreck. Of these, X-ray and photographic imaging techniques will be major components of the specimen characterization process. In what follows the X-ray and 3D camera system will be described.

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The X-ray facility occupies half the blue container in Fig. 1. The 20' insulated shipping container has been divided by a 2mm thick steel wall to provide an X-ray system compartment and another room where the data will be analyzed and logged into the master catalogue.

Each X-ray image is a 2-dimensional X-ray representation of the material in the artefact. To construct a 3-dimensional computed tomography (CT) X-ray image the artefact must be rotated in the beam. Special algorithms enable the data set resulting from the 2D images taken at, for instance, 4^0 intervals in a full rotation of the artefact, to be converted into a 3D image.

For each position of the artefact mounted on the rotating stage a 3D photographic image is taken using a Sony Cybershot DSC TX10 camera, which is positioned in the same location as the X-ray source and points along the axis of the X-ray system. For every X-ray image a 3D photographic image will exist.

The Australian Federal Police provided the X-ray source (GE XR200) and a portable imaging plate scanner (GE CR25P) and the personnel to operate them. This portable system is usually used to examine suspicious parcels in public places. For this scenario the AFP can set up a large exclusion zone to protect the public from the effects of a possible explosion and to minimize the radiation hazard. On the barge such an exclusion zone cannot be established. To enable operation on the barge Professor Creagh designed an enclosure to house the X-ray system to meet Australian radiation safety regulations. This bespoke enclosure (Fig.2) was fabricated by a team led by Ben Nash of the Australian National University (Faculty of Engineering and Information Technology).

Fig. 2. X-ray enclosure showing the access doors for the X-ray source, the specimen stage, and the imaging plates. The X-ray source has been removed, and the camera inserted. The photographic image, presented on the viewing screen of the camera can be seen.

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The X-ray protection system is essentially a box within a box. The outer box (1700mm X 600mm X600mm) is clad with 2mm stainless steel covered with 2mm lead. There are four doors. From bottom to top: source access door, two side access doors to enable the artefact to be mounted on the rotary stage, and a door to allow the loading of the imaging plate. Within the box a 25mm thick aluminium plate is mounted on four vibration isolators. This carries the box in which the source is mounted, the rotary stage, and the imaging plate carrier. The source box itself is made from 2mm stainless steel clad with 2mm lead. The front of the box, in which the beam-defining aperture is cut, has an additional 2mm of lead applied. The beam defining aperture restricts the beam so that it only illuminates the imaging plate. None of the emitted X-ray beam can directly illuminate the sides, top, or bottom of the outer box. In Fig.2 the top of the source box and the source have been removed, and the back of the 3D camera can be seen. This camera is removed when X-ray imaging is undertaken (Fig.3).

Fig.3 shows the box with the X-ray source in position.

Fig. 3. The X-ray source in the source box, with the 3D camera removed.
The beam defining aperture can be seen.

After the each of the X-ray data sets have been taken for a particular artefact the artefact is then photographed using a 3D camera (Cybershot DSC TX10) placed in the position of the X-ray source for each orientation of the artefact. This 3D dataset has a one-to-one correspondence with each 2D X-ray image, and, by extension, the 3D X-ray image.

Excavating the Clarence will not produce the glittering artefacts which would be found in the wreck of the Titanic. A recent find is shown in Fig.4.

The corresponding X-ray image is shown in Fig.5.

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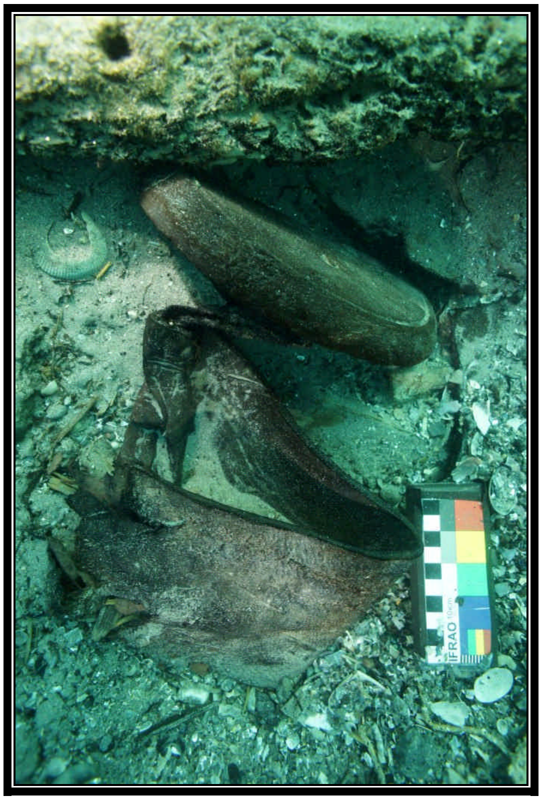


Fig.4 Leather items and half of a wooden lid.

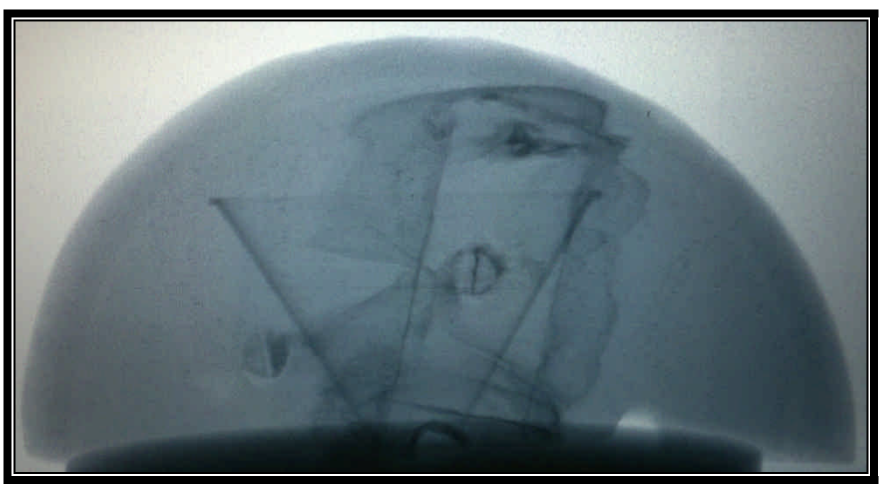


Fig. 5 X-ray image of the half of the wooden lid.

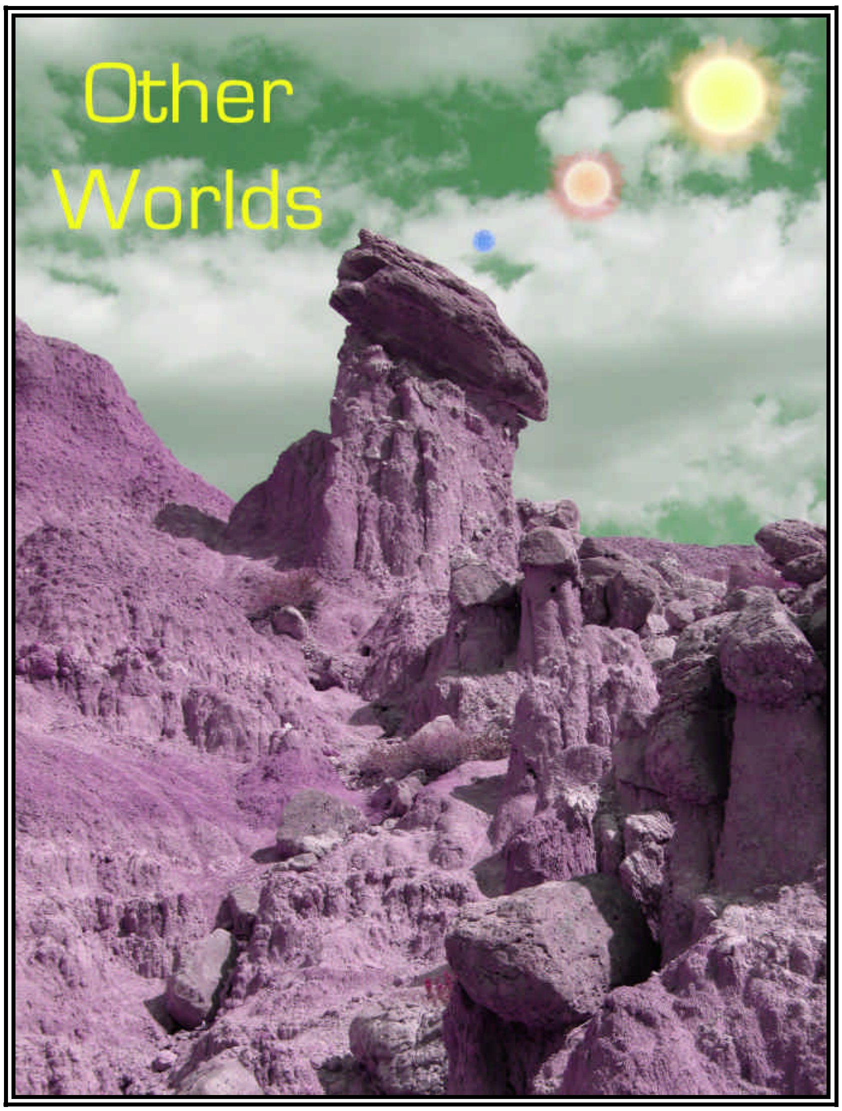
But it will yield valuable information about the construction techniques of early Colonial shipwrights. And, above all, it will establish the methodology for the future excavation of the many wrecks which are to be found along the Australian coastline.

For further details of this project see http://www.ahspp.org.au/clarence/. Video footage will be available on YouTube.

Something Out of this World !

Have you noticed the increasing frequency of reports of extra-solar planets, and even earth-size planets? For the first time, the frequency of habitable planets in our galaxy can be estimated based upon direct measurements, and not a number extrapolated from numbers of more massive and/or shorter-period planets. Here "habitable" means that the temperature is such that liquid water can exist on the planet's surface, a necessary condition for life as we know it.

A recent article calculates [http://arxiv.org/abs/1111.5019] the frequency of habitable planets orbiting red dwarf stars to be about 40 % [0.41+0.54/-0.13]. This suggests there may be as many as 60 billion habitable planets in our Milky Way galaxy alone (in red-dwarf systems), and at least 100 of these planets as close as 30 light-years away. Red dwarfs comprise 70 % of the stars in the universe (our sun is a yellow dwarf, and comprises 5 % of the total). The habitable zones of red dwarfs are expected to be smaller than yellow dwarfs, but given the higher number of the former, the two types are thought to have about equal total habitable-zone areas. So while one should be cautious about extrapolating from limited data sets, it would appear the above is a lower bound for the number of other worlds awaiting a visit!



SECOND ANNOUNCEMENT

SIDE EVENT

WORKSHOP ON RADIOPROTECTION AND RELATED DOSIMETRY

04-05 OCTOBER, 2012, SÃO PAULO

We would like to reinforce our invitation to attend the upcoming 12th International Symposium on Radiation Physics (ISRP-12) and the associated Workshop on Radioprotection and Related Dosimetry.

DEADLINES

Abstract submission: May 30, 2012

Early Bird Registration for the Symposium: July 10, 2012

Early Bird Registration for the Workshop: July 10, 2012

Standard Registration for the Symposium: September 10, 2012

Paper and Poster Submission: September 10, 2012

PROCEEDINGS:

The Proceedings will be published in electronic media. Selected papers submitted to ISRP-12 will be published in Radiation Physics and Chemistry

MORE INFORMATION:

For registration and other details please visit the ISRP-12 and Workshop web site at www.cnen.gov.br/hs_ISRP12 or send a message to isrp12@if.ufrj.br.

In order to help us to organize a better Symposium, if you intend to participate we kindly ask you to send a message to mailto:isrp12.pre.inscricao@if.ufrj.br with your name, e-mail address, affiliation and status of participation.

12th International Symposium on Radiation Physics

07 to 12 October 2012 - Rio de Janeiro

INVITED SPEAKERS

Speaker	Affiliation
Birgit Kanngiesser	Technische Universität Berlin, Germany
Dudley Creagh	University of Canberra, Australia
Gary Royle	University College of London, England
Hongjie Xu	Thorium Molten Salt Reactor Nuclear Energy System Center, China
Joris Dik	Delft University of Technology, Netherlands
José Roque	Laboratório Nacional de Luz Synchrotron, Brazil
J. Y. Buffiere	Université de Lion, France
Larry DeWerd	University of Wisconsin, Madison
M. H. Tabacniks	University of Sao Paulo, Brazil
Marcel Reginatto	PTB Braunschweig, Germany
P. Artaxo	University of Sao Paulo, Brazil
Paulo Fonte	University of Coimbra, Portugal
Richard Pratt	University of Pittsburgh, USA
Renee VanGrieken	University of Antwerp, Belgium
Tadashi Yoshida	Tokyo City University, Japan
T. Calligaro	Centre de Recherche et de Restauration des Musées de France/ Palais Du Louvre, France
Zsolt Podolyak	University of Surrey, Guildford, United Kingdom

ELECTION BALLOT FORM

Ballots must be received by the Secretary by 15 September, 2012

Bios of members standing for election are in the previous Bulletin (January 2012).

For all posts, except those of executive councillors, vote for one by marking the appropriate box.
For executive councillors, you may vote for up to four candidates who are running for the full six-year term and one candidate for a three-year slot to fill a vacancy.
For all positions you may write in names of other members of the Society and cast your ballot for them.

President (vote for one)

Ladislav Musílek (Czech Rep.) ☐

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Secretary (vote for one)

Jorge Fernandez (Italy) ☐

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Treasurer (vote for one)

William Dunn (USA) ☐

________________________ ☐

Vice Presidents:

Western Europe (vote for one)

Jose Rodenas (Spain) ☐

________________________ ☐

Central & Eastern Europe (vote for one)

Ines Krajcar Bronic (Croatia) ☐

________________________ ☐

F.S.U. (vote for one)

Igor Shamanin (Russia) ☐

________________________ ☐

North America (vote for one)

Larry Hudson (USA) ☐

________________________ ☐

South & Central America (vote for one)

Marcelo Rubio (Argentina) ☐

________________________ ☐

South East Asia (vote for one)

Suprakash C. Roy (India) ☐

________________________ ☐

North East Asia (vote for one)

Ziyu Wu (P.R. China) ☐

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Africa & Middle East (vote for one)

Mohamed Gomaa (Egypt) ☐

________________________ ☐

Australasia (vote for one)

Chris Chantler (Australia) ☐

________________________ ☐

Executive Councillors:

Six years term (vote for four)

Richard Hugtenberg (UK) ☐

Avneet Sood (USA) ☐

James Tickner (Australia) ☐

Peter K N Yu (Hong Kong) ☐

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Three years term (vote for one)

Esam Hussein (Canada) ☐

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Please use this ballot to vote. Instructions for return:

1) regular mail: use the double-envelope system (place ballot in a small, unsigned envelope, and enclose the latter in a larger envelope, signing and printing your name and return address on the latter to authenticate your anonymous ballot), and send to:

Prof Michael Farquharson, IRPS Secretary
Department of Medical Physics and Applied Radiation Sciences, McMaster University
1280 Main Street West, Hamilton, Ontario, Canada L8S 4K1

2) electronic submission: scan your completed ballot and email the image to: farquhm@mcmaster.ca

Ballots must be received by the Secretary by 15 September, 2012.

The results will be announced at ISRP-12 in Rio de Janeiro, Brazil, 07-12 October, 2012

Atomic Energy Authority

National Network of Radiation Physics

11th Radiation Physics and Protection Conference

25 -28 November 2012, Ismailia , Egypt

Under the Auspices of His Ex. Minister of Electricity & Energy

Dr Eng Hassan Yoinus

Conference Honorary Chairman President Atomic Energy Authority

Prof. M.E.Abd El-Azim

Conference Scientific Secretary

Prof. M. A. M. Gomaa

NNRP, IRPA EGYPT

CONFERENCE TOPICS

1) Natural and Man Made Radiation Sources
2) Radiation Damage and Radiation Effects
3) Radiation Detection and Measurements.
4) Applied Radiation Physics in Industry and Earth Sciences.
5) Radiation Medical Physics & Biophysics
6) Radiation Dosimetery
7) Environmental Radioactivity.
8) Operational Health Physics.
9) Radiation Shielding
10) Transport of Radioactive Material.
11) Waste Disposal and Waste residue.
12) Decommissioning of Facilities
13) Training and Education.
14) Radiation Protection Regulations
15) Public Protection against radiological attack

CALL FOR REGISTRATION, PAPERS & PUBLICATIONS

Papers covering original work not published previously are accepted for participation in the conference, **Abstract** of not more than 250 words on A4 paper should be sent **on line at** (**www. rphysp.com**) by 15 July 2012. For registration, please **submit registration form on line by 15th July 2012**. The full paper must be submitted via Internet according to instructions to authors and should be received by 15 September 2012 Conference Proceedings shall be published in Arab J. of Nuclear Sciences &Applications and on conferences websites.

CONFERENCE FEES

Egyptian participants	LE 1000	Non Egyptian participants	€ 500

CORRESPONDENCE

All correspondence should be via Internet to

Email: radmedphys@yahoo.com

Prof. MOHAMED A.M. GOMAA

ATOMIC ENERGY AUTHORITY

3 Ahmad El Zomor St., El Zohoor Dist., Nasr City,

Children Village P.O.B., P. code 11787, Cairo, Egypt.

Fax: 002-02-22728813/ 002-02-22876031 M, /01001457161

Atomic Energy Authority

National Network of Radiation Physics

IRPA

EGYPT

11th Radiation Physics and Protection Conference

25 -28 November 2012, Ismailia , Egypt

REGISTRATION FORM

Name	Prof./ Dr. /Mr./ Ms.:
Passport No. & Date Country	
Organization	
Specialization	
Paper title	
Registration Fees	€ 500 per person for non Egyptians LE 1000 for Egyptians
Type of presentation	Oral ☐ Poster ☐
E-Mail address	
Phone and Fax number	

Eighth International Conference on Atomic and Molecular Data and Their Applications (ICAMDATA 2012)

30 September - 4 October, 2012

SECOND ANNOUNCEMENT

Venue

NIST Administration Building
© Robert Rathe

Washington D.C.
© Shutterstock/fstockfoto

ICAMDATA 2012 continues the series of international conferences since 1997 that promotes the use of atomic and molecular (AM) data in various fields of science and technology, and provides the principal forum for the interaction of AM data producers, data users, data compilers, and database developers. The conference will cover topics like:

I. Application and needs of atomic and molecular data:

- Astrophysics and atmospheric physics
- Inertial and magnetic fusion
- Low and high temperature laboratory plasma and industrial plasmas
- Lighting sciences and technology
- Biomedicine and biophysics
- Combustion and environmental sciences and technology
- Surface physics, gaseous electronics, solid state optics and spectroscopy, optoelectronics, etc.

II. Atomic and molecular data production:

- Data collection, assessment, exchange and dissemination
- Standardization of data formats
- AM databases, activities of data centers.

III. Experimental and theoretical methods for atomic and molecular data generation

- Atomic and molecular structure, spectroscopy and radiative processes
- Electron and photon collisions with atoms and molecules
- Heavy particle collisions
- Particle - surface interactions.

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Calendar

Deadline for submission of abstracts for invited talks : June 1, 2012

Deadline for submission of poster abstracts :July 30, 2012

Deadline for hotel reservations : August 25, 2012

Deadline for registration (full refund possible before this date) : August 31, 2012

Late registration deadline (5:00 PM EST)* : September 25, 2012

Conference Dates : Sept 30-Oct 4, 2012

Manuscripts from invited speakers due : November 1, 2012

To register, please use the online link: www.fbcinc.com/nist/ICAM.
Visa, Mastercard, and American Express credit cards are accepted.

*Due to security regulations, no on-site registrations will be accepted and all attendees must be pre-registered prior to 5 PM EST September 25, 2012.

For more details, see the conference website: http://physics.nist.gov/icamdata2012

Calendar

2012

30th September - 4th October, 2012

Eighth International Conference on Atomic and Molecular Data and Their Applications (ICAMDATA 2012)

Washington DC, USA

Full information on pages 20 and 21 of this journal

7th - 12th October, 2012

12th International Symposium on Radiation Physics

Rio De Janiero, Brazil

and Side Event

WORKSHOP ON RADIOPROTECTION AND RELATED DOSIMETRY

4th - 5th October, 2012
Säo Paulo, Brazil

Full information on pages 15 and 16 of this journal

25th - 28th November, 2012

11th Radiation Physics and Protection Conference

Ismailia, Egypt

Full information and registration form on pages 18 and 19 of this Journal

Contact : Prof. Mohamed A.M. Gomaa
Atomic Energy Authority
3 Ahmed Al-Zomor St.
El-Zohoor District, Nasr City, Egypt

Email : radmedphys@yahoo.com

INTERNATIONAL RADIATION PHYSICS SOCIETY

The primary objective of the International Radiation Physics Society (IRPS) is to promote the global exchange and integration of scientific information pertaining to the interdisciplinary subject of radiation physics, including the promotion of (i) theoretical and experimental research in radiation physics, (ii) investigation of physical aspects of interactions of radiations with living systems, (iii) education in radiation physics, and (iv) utilization of radiations for peaceful purposes.

The Constitution of the IRPS defines Radiation Physics as "the branch of science which deals with the physical aspects of interactions of radiations (both electromagnetic and particulate) with matter." It thus differs in emphasis both from atomic and nuclear physics and from radiation biology and medicine, instead focusing on the radiations.

The International Radiation Physics Society (IRPS) was founded in 1985 in Ferrara, Italy at the 3rd International Symposium on Radiation Physics (ISRP-3, 1985), following Symposia in Calcutta, India (ISRP-1, 1974) and in Penang, Malaysia (ISRP-2, 1982). Further Symposia have been held in Sao Paulo, Brazil (ISRP-4, 1988), Dubrovnik, Croatia (ISRP-5, 1991) Rabat, Morocco (1SRP-6, 1994), Jaipur, India (ISRP-7 1997), Prague, Czech Republic (ISRP-8, 2000), Cape Town, South Africa (ISRP-9, 2003), Coimbra, Portugal(ISRP-10, 2006), Australia (ISRP-11, 2009) and ISRP-12 will be in Rio de Janiero, Brazil in 2012. The IRPS also sponsors regional Radiation Physics Symposia.

The **IRPS Bulletin** is published quarterly and sent to all IRPS members.

The IRPS Secretariat is : Prof. M.J. Farquharson, (IRPS Secretary),
Department of Medical Physics and Applied Radiation Sciences
McMaster University, Main Street West, Hamilton, Ontario, Canada.
Phone : 001 905 525 9140 ext 23021 *email:* farquhm@mcmaster.ca

The IRPS welcomes your participation in this "global radiation physics family."

INTERNATIONAL RADIATION PHYSICS SOCIETY

Membership Registration Form

1. Name : ______________________________
(First) (Initial) (Last)

2. Date and Place of Birth : ______________________________

3. Business Address : ______________________________

____
(Post Code) (Country)

Telephone:__________ Email: __________ Fax: __________

4. Current Title or Academic Rank (Please also indicate if Miss, Mrs., or Ms.): __________

5. Field(s) of interest in Radiation Physics (Please attach a list of your publications, if any, in the field:

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6. Please list any national or international organization(s) involved in one or more branches of Radiation Physics, of which you are a member, also your status (e.g., student member, member, fellow, emeritus):

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7. The IRPS has no entrance fee requirement, only triennial (3-year) membership dues. In view of the IRPS unusually low-cost dues, the one-year dues option has been eliminated (by Council action October 1996), commencing January 1, 1997. Also, dues periods will henceforth be by calendar years, to allow annual dues notices. For new members joining prior to July 1 in a given year, their memberships will be considered to be effective January 1 of that year, otherwise January 1 of the following year. For current members, their dues anniversary dates have been similarly shifted to January 1.

Membership dues (stated in US dollars - circle equivalent-amount sent):

Full Voting Member: 3 years	Student Member: 3 years
Developed country $75.00 Developing country$30.00	Developed country $25.00 Developing country $10.00

Acceptable modes of IRPS membership dues payment, to start or to continue IRPS membership, are listed below. Please check payment-mode used, enter amount (in currency-type used), and follow instructions in item 8 below. (For currency conversion, please consult newspaper financial pages, at the time of payment). All cheques should be made payable to :

International Radiation Physics Society.

(For payments via credit card - http://www.irps.net/registration.html)

[ ] *(in U.S. dollars, drawn on a U.S. bank)*: Send to Dr W.L. Dunn, Dept. Mechanical and Nuclear Engineering, Kansas State University, 3002 Rathbone Hall, Manhattan, KS, 66506-5205. U.S.A.

Amount paid (in U.S. dollars) ____________________

[ ] *(in U.K. pounds):* Send to Prof. Malcolm J. Cooper, (IRPS Treasurer), Physics Dept., University of Warwick, Coventry, CV4 7AL, U.K.. Bank transfer details: Account number: 30330701. Bank and Branch code: Barclays, code 20-23-55. Eurochecks in U.K. pounds, sent to Prof. Cooper, also acceptable.

Amount paid (in U.K. pounds) ____________________

8. Send this Membership Registration Form ***AND*** a copy of your bank transfer receipt (or copy of your cheque) to the Membership Coordinator:

Dr Elaine Ryan
Department of Radiation Sciences
University of Sydney
75 East Street, (P.O. Box 170)
Lidcombe, N.S.W. 1825, Australia
email: elaine.ryan@sydney.edu.au

9. ____ ____________________

Signature *Date*