

This piece of work was mentioned at the last ACEM committee meeting & the committee thought that it would be of interest to the membership.

Dr John Kennaugh was therefore asked to write this article. We are very grateful for his efforts.

'A Sting in the Tail'

SCORPIONS AND RADIATION .

In 1960 France exploded nuclear weapons in the Sahara desert. Research of the area afterwards revealed that the only living and active creatures present were scorpions. It was suggested in a World Health magazine that if the reason for this could be discovered, people may be able to "scorpionise" themselves as a protection against the affects of radiation.

This report was of particular interest to me because in 1959 I had published a paper in the Quarterly Journal of Microscopical Science entitled 'An examination of the Cuticle of two Scorpions, *Pandinus imperator* and *Scorpiops hardwickii*'. The cuticle, or exoskeleton, is the outer covering of all insects, arachnids, crustacea and myriapods, collectively known as arthropods. I had previously studied the cuticles of cockroaches and maggots, histologically, and having access to some scorpions that were in a vivarium that was the interest of Professor H.Graham Cannon, Professor of Zoology in the Department of Zoology at Manchester University. I decided to look at the cuticle of these animals. This was largely because an ex-Ph.D. student at Manchester now working from the University of Madras reported that the structure of the cuticle of scorpions was not typical of other arthropods. I found that there was a layer, which I called the Hyaline Exocuticle because of its colourless nature on top of the usual exocuticle which is brown in colour due to its having undergone a process of tanning involving the cross linking of proteins by quinones. This makes the cuticle hard and resistant and very stable. The hyaline exocuticle was exceedingly stable and could only be dissolved by heating in concentrated nitric acid. It was also rich in sulphur, a feature of arachnid cuticles generally. When sections of cuticle were examined by polarised light, the hyaline exocuticle shone brightly and on consulting

Professor Rudall, in the Physics Dept. at Leeds university, who had worked on the structure and properties of cuticle he sug-

gested the layer was highly organised and composed of stabilised parallel protein chains. It also appeared that this same layer glowed green in UV light and this characteristic was used by hunters who sought scorpions at night by using a "black light" rich in U.V. and seeing them glowing green. This seems to be a feature of all scorpions.

Having a friend in the Nuclear Physics department at Manchester, I approached him with the suggestion that scorpion cuticle might be impenetrable to radiation and how could this be tested. He jumped at the idea of using this as a third year project and produced a set-up which involved pieces of cuticle being placed between a gamma radiation source and a detector. The first runs carried out were without the cuticle being in place and then the results of cuticle presence compared. The first test run with cuticle showed a higher radiation count that without cuticle which had us all considering the possibility of producing radiation. It turned out to be a freak burst of energy and after this first result it was found that the cuticle made no difference whatever to the passage of radiation.

Work by other researchers showed that there was no obstruction of radiation by the cuticle of live specimens and it was concluded that scorpions had survived the fall-out because they were primitive animals with very little in the way of important internal structures and the radiation passed through them without causing any serious damage.

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Paper available:
<http://jcs.biologists.org/cgi/reprint/s3-100/49/41>

ISSUE

07

JANUARY
2010

ASSOCIATION OF
CLINICAL
ELECTRON
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ACEMNews



this issue

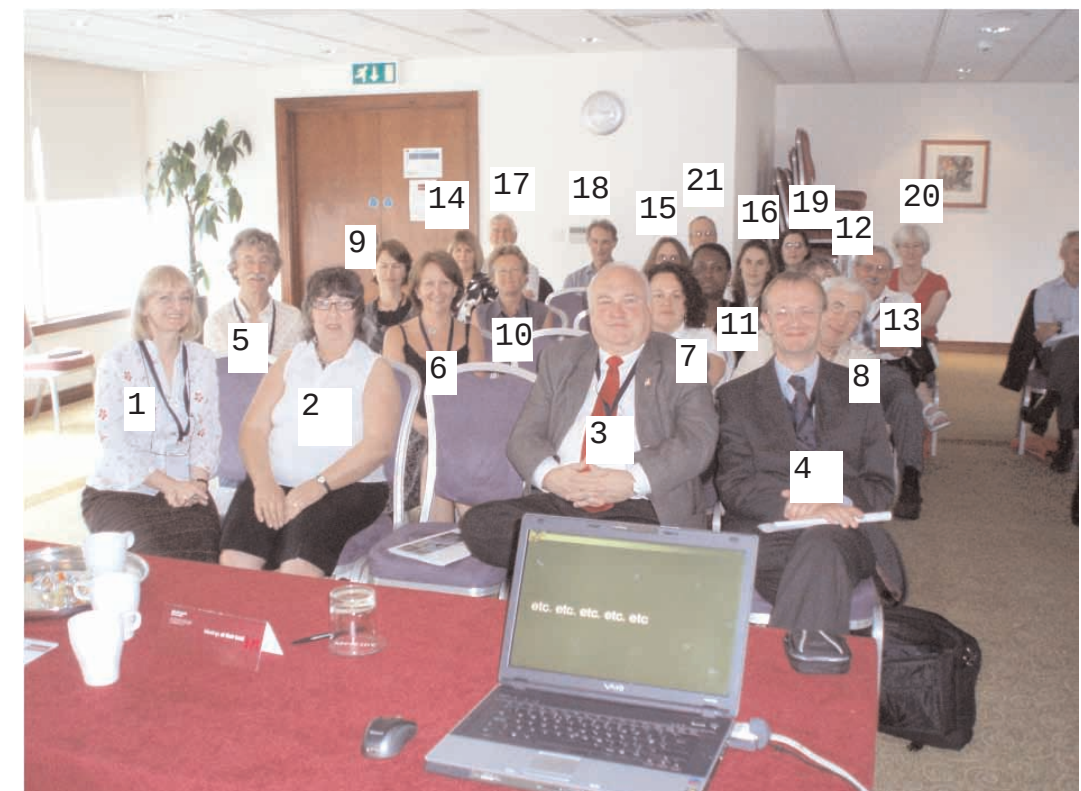
Cardiff Meeting P.1

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ACEM meeting Cardiff - 2nd July 2009



John Stirling, one of two Australian ACEM members, (top picture) was able to attend the Cardiff meeting and give a talk. This must be the longest journey undertaken by an ACEM member to attend our annual meeting – well done John! This year's annual meeting will be at St.Andrew's in Scotland on Thursday 1st July. Those ACEM members interested in golf may want to bring their clubs!

Key to photograph

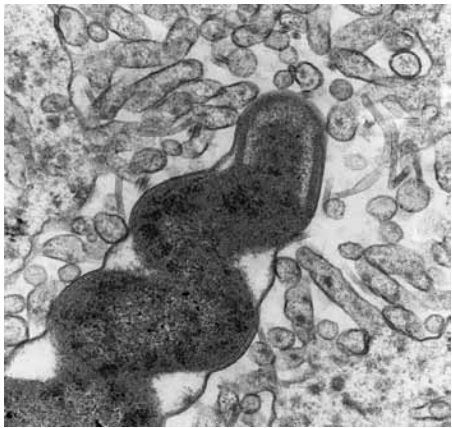
1 Lynn O'Rourke	Salford
2 Pat Tarpey	Manchester
3 Guillermo Herrera	Arizona
4 Bart Wagner	Sheffield
5 John Stirling	Adelaide
6 Ruth Pitman	Cardiff
7 Alison Lupton	Glasgow
8 Josef Schroeder	Regensburg
9 Monika Balys	Guy's, London
10 Joanna Browning	Brighton
11 Jenny Smith	Birmingham
12 Liz Curtis	Birmingham
13 Derek Lovell	Guy's, London
14 ??	
15 Jamie Crees	Stoke on Trent
16 Marie Pointon	Stoke on Trent
17 Ray Griffin	France
18 ??	Bristol
19 Fiona Winning	Guy's, London
20 Trish Lovell	StThoLondon
21 ??	

Front page photos & key courtesy of
Bart Wagner

ACEM Committee Matters

Pat Tarpey who currently is ACEM secretary wishes to step down this year, so nominations please.

This is Alan Curry's last 'stint' at editor of the ACEM Newsletter and, again, a replacement needs to be identified.



Spiral bacterium in the baboon stomach

The following article was written by the editor to fill a gap in the Newsletter - hopefully ACEM members will find it of historical interest.

A career in electron microscopy - reminiscences of

Alan Curry

Forty years is a long time to be involved in anything and to have spent most of my working life in electron microscopy has been a fascinating adventure. Outlined below are some of the memorable experiences in my career as an electron microscopist:

1) My first experience of electron microscopy was as an undergraduate at Manchester University (a final year project) and this was followed by obtaining funding for a PhD. The funding came from an endowment left to the Zoology Department at Manchester University by Professor JS Dunkerly ('The JS Dunkerly Research Fellowship in Protozoology'). John Dunkerly was interested in protozoa but had died prematurely (in 1920s) of injuries sustained in WW1 when the aircraft he was flying was shot down. This funding was available to study protozoa and what better way of studying protozoa than by electron microscopy! This was 1970 and EM was the investigative method to be involved in. In these early days, the Zoology/Botany EM unit had but a single microscope – an AEI EM6B. Good though this was, funding was obtained by the head of the unit (Dr RD Butler) to

update this microscope and to buy an additional instrument. The experimental officer responsible for the EM equipment was John Hutton (many of you will be familiar with this name as John still supplies much of the glass strips we use for making knives) who was an ex-AEI service engineer. John's influence meant that the new equipment also came from AEI, who had a factory at Trafford Park (actually Barton Dock) in Manchester. As far as I'm aware, this resulted in a unique microscope being built for the unit. The basic EM6B was retained, but it was fitted with an AEI EM801 objective lens. This resulted in the lab having an 'EM80B' microscope. The advantage of this modification was that we could load six specimens at once and obtain stunning high-contrast images. In addition, an interim AEI EM6G was delivered and then an AEI EM802 microscope.

2) In 1972, at the end of my second year of PhD work, a local hospital (Withington Hospital – then one of the largest teaching hospitals in Europe) advertised for an electron microscopist. Even though I had a year to run before I could complete my PhD, I was offered the job.

However, the university would not release me a year early. Perhaps fortunately, the unit at Withington could not find another electron microscopist and I was informed that they were happy to wait a year for me to start. The EM unit at Withington Hospital, unlike many units being set up in the 1970s, was from the onset a joint Microbiology/Histopathology facility. This was due to the foresight of the PHLS director, Dr John Tobin, and the senior Histopathology consultant, Dr Eddie Tapp. The unit was equipped with an AEI EM801, a superb instrument that eventually lasted thirty years (mainly thanks to Don Fry and Electron Optical Services). A second instrument (an old AEI EM6B*) was purchased in the late 1970s and this served the unit well until replaced in the 1980s by a new Philips EM420. One of the downsides of microscopy in the 1970s was the 'dreaded 10 day service' which always seemed to last three weeks (three weeks without a microscope would be totally unacceptable these days). Being on site for so long, the AEI service engineers, such as Harry James and Cyril Critchly became good friends.

3) In the early days, in

addition to the diagnostic work, much of what we did was 'curiosity driven' – unusual tumours, interesting viruses in cell culture, unusual cultured microorganisms etc – and this not only increased ones' experience of ultrastructure, but also generated tremendous enthusiasm for EM. The Histopathologist, Eddie Tapp, got involved in the examination of Egyptian mummies in the mid-1970s and, of course, he expected EM to be involved. We looked at human organs found in canopic jars as well as material from an autopsy undertaken on a mummy. As expected, preservation of this mummified material was poor, but we did have some surprises, particularly finding well preserved centrioles in a 3000 year old piece of liver tissue. Because of the proximity of the AEI factory at Trafford Park, the Withington EM unit had close links with the microscope demonstration staff, such as Dawn Chescoe, and also some of the microscope development staff. The links with AEI were put to good use at this time, as they were developing variants of their AEI Corinth electron microscope. In particular, an analytical microscope called Cora (Corinth AnalYTical)

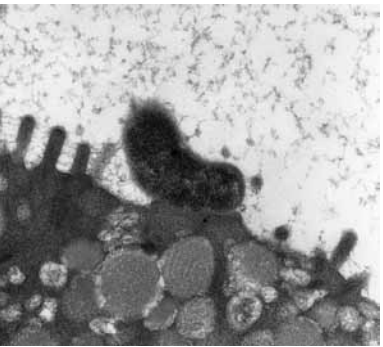
was in development and the prototype was used in the investigations on mummified lung tissue. As the 'mummy project' was to be filmed, it was amazing that the unpanelled Cora prototype suddenly got 'tidied up' almost overnight when the cameras came to film the work!

A scanning development of Corinth was also used – this was named CESA (Corinth Electron Scanning Attachment) and was used to photograph the many dried insects found on and within the mummified tissues. I remember one of the designers asking advice about cameras to record the SEM images – he thought that a Kodak Instamatic should be used (and may have been perfectly adequate), but I persuaded him that this would not portray the image of a 'quality' instrument. I therefore suggested that a Pentax SLR be used, but eventually a cheaper Praktica SLR was specified! Sadly AEI stopped development work and production of electron microscopes in the late 1970s.

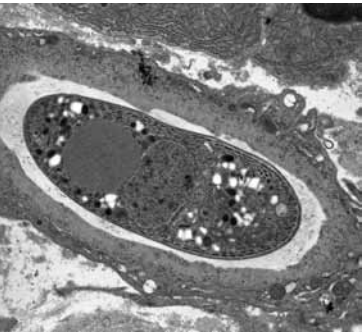
4) During 1979, in another curiosity-driven study, a local cytopathologist, Dr Cynthia Stanbridge, had found what she believed to be virus particles within cell nuclei of cervical cells

in cases of cervical dysplasia. She had discovered these viruses in thin-sections of resin embedded material, but was unable to identify them any further and wondered if I could help. Fortunately she still had some spare tissue fixed in formalin and an attempt was made to release the virus particles by maceration so that they could be viewed by negative staining. Free virus particles were found and these were morphologically identical to papilloma viruses. Thirty years on, a vaccine against these viruses (HPV 16 and HPV 18) is now being given to girls to protect against cervical cancer. Our study was published in 1981 and was one of the first to link papilloma viruses with cervical dysplasia.

5) In the late 1970s and for most of the 1980s there were so many EM units in the Manchester area that an EM society was set up called MEMSOC (Manchester EM Society). MEMSOC members came from hospital EM units and university EM units. We had regular meetings and top class speakers. One in particular was Audrey Glauert who described an early experiment using a high voltage electron microscope to image



Helicobacter pylori in the human stomach



Isospora belli in the small intestine of an AIDS patient.

Paradox

The British paradox – Britain is a nation of meat eating animal lovers!

motile bacteria within a thin-walled environmental chamber. She described the ‘behaviour’ of the organisms being examined as distinctly unexpected. The unexpected behaviour was eventually explained once she had a mathematician work out the radiation level within the environmental chamber. To quote – “it was like you or I standing 100 yards from a one megaton atomic bomb explosion” – no wonder the bacteria were behaving oddly – we would have been vapourised!

6) Diagnostic EM work has gone through various phases. One of the reasons for this is the development of alternative techniques, such as immunofluorescence, immunoperoxidase and molecular diagnostic techniques have had an impact on diagnostic EM. Certainly some of these techniques are more specific or are capable of some form of automation and most require less physical (and interpretive) skill! Within histopathology, tumour ultrastructure has diminished in importance, except in certain specialist centres. Within microbiology we have seen the gastroenteritis era and the HIV/AIDS era come and go (almost!). Viruses associated with infantile gastroenteritis (GE) and outbreaks of D&V were discovered and described during the 1970s and EM remained an important diagnostic method for detecting some of these viruses until fairly recently. Dr Tom Flewett in Birmingham was one of the UK pioneers in looking at viruses associated with GE (and he named the Rotavirus, the most important virus associated with GE in children and a major killer within the developing world) and he volunteered me to spend five weeks in Calcutta, India teaching staff at the National Institute for Cholera and Enteric Diseases (NICED) about

EM methods and virus identification. This British Council sponsored trip was an interesting experience as I was shown India warts and all! However, one of the disappointments of this trip was asking for some diarrhoeal samples to be collected from infants to coincide with my arrival. Infantile diarrhoea is a big problem in certain areas of India and I was disappointed that they had only managed to collect three samples! Fortunately, one of these proved to be positive for Rotavirus!

7) The second director of the Withington lab, Dr Dennis Jones, was also an EM enthusiast and was interested in Campylobacters, Helicobacters and other spiral bacterial organisms that live in the stomachs and GI tract of animals and humans. From the mid-1980s until the mid-1990s a considerable amount of effort went into research into these organisms. As some of the bacteria being investigated could not be cultured, EM investigation was one of the few techniques able to give an insight into the biology and life cycle of these organisms. One particular study stands out – the stomach, which secretes hydrochloric acid, is an extremely dangerous environment for most microorganisms and the fact that some are adapted to life in the stomach shows that they can avoid or counteract the affects of stomach acidity. Perhaps the most extreme adaptations were found in a bacterium living in the baboon stomach. This uncultivable and un-named organism was found living in the acid-filled canaliculi of the acid secreting oxyntic cells! From the ultrastructural studies, it appeared as if this organism actively sought out these cells – a remarkable and highly adapted organism!

8) As my original training was in protozoology, the HIV/AIDS era proved to be very productive. This diagnostic phase started about 1980 and a succession of organisms were able to be diagnosed by EM – *Pneumocystis carinii* (now called *P. jiroveci*), *Cryptosporidium*, *Iso spor a*, *Leishmania*, *Giardia*, microsporidia etc. During this era, I was able to visit the USA and gain some first-hand experience from individuals involved in identifying and treating infections in AIDS patients. This knowledge was put to good use as I was involved in publishing the first reports of microsporidial infections occurring in AIDS patients in the UK. With the introduction of antiretroviral treatment, few microsporidial infections are now diagnosed in AIDS patients, but microsporidia are now emerging as a significant cause of disease in ophthalmic patients who are not immunocompromised. This work on parasites has allowed me to take a few trips to talk at meetings in exotic locations and generated several contacts that have been useful in furthering the work on these poorly understood micro-organisms.

9) Since the late 1980’s I’ve had the privilege of working with Professor Elizabeth Canning of Imperial College and Professor Beth Okamura (who was at Reading University and is now at the Natural History Museum). As I had experience of looking at human microsporidial organisms, I was asked if I would undertake examination of some aquatic animal material (Bryozoa) to determine if it was infected by microsporidia. The bryozoan material was found to be infected by microsporidia, but there was also another unexpected type of parasite in this material as well. Ultrastructural investigations

showed that this second parasite was a Myxozoan. Myxozoa largely parasitize fish (although a few have been identified in humans) and the source of a particularly significant fish disease named proliferative kidney disease (PKD) in salmonids had eluded investigation for many years. PKD infection was not passed from fish to fish and it was eventually determined that the myxozoan parasite found in the lowly bryozoan was the source of this the PKD infection.

10) Within microbiology, arguably one of the best reference works is Topley and Wilson’s Microbiology & Microbial Infections (now in its 10th edition). Never did I think that I would meet Sir Graham Wilson or contribute to his great book! In the mid-1980s a select group of senior staff at Withington Hospital were summoned at short notice to the director’s office to meet Sir Graham who was visiting the lab. We were all introduced to this elderly gentleman who was still very interested and aware of what was going on within microbiology and bright as a button for someone in their late eighties! On leaving the meeting, one of my microbiology colleagues just looked down at his right hand and said “I’ve just shaken the hand of Graham Wilson” – such was the reverence for this man who had been responsible for much of the public health contingencies during the second world war and who was instrumental in setting up The Public Health Laboratory Service (now superseded by the Health Protection Agency). Certainly one of the highlights of my professional career was to be asked to contribute to the Topley and Wilson tome. It took me almost a year to write a chapter on ‘Microsporidians’ for the 9th edition of this book and it was reassuring to be asked to update and revamp the original chapter for the latest edition.

11) In the early 1980s I was encouraged to write a book on microscopy for the amateur market with some ex-university colleagues. One of my co-authors, who I had known for over 10 years, decided, for whatever personal reasons, to contribute very little, ignore publication deadlines and threatened legal action if his role as an author was in any way questioned. This was a sad occurrence and this individual is not a friend any more! The good thing that came out of writing this book was that it contained a design for a ‘home made’ light microscope. Several years

after publication, I received a letter from an organisation involved in training individuals from developing countries informing me that during one their courses they had built one of these microscopes and astounded the attendees that a usable light microscope with good quality optics could be built so cheaply. After the traumas of writing the book, this letter brought me some satisfaction.

And Finally -

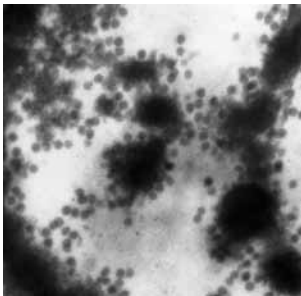
During 2001 and 2002, the Withington EM unit moved to Manchester Royal Infirmary to form a new joint Histopathology/HPA/ Virology facility (and during 2009 we have also added the Royal Manchester Children’s Hospital EM unit). However, this is a much changed world from when I started in EM forty years ago. I still enjoy ‘looking down the microscope’ and writing papers, but attitudes to EM, particularly in virology, have changed significantly. The fickle nature of a few of my Virology colleagues whose memory of the previous usefulness of EM has lasted nanoseconds is insulting. Virology is, in my opinion, unthinkable without some EM input. The future of diagnostic microbiology (including virology) is undoubtedly molecular, but EM still has a role as it is independent of contained nucleic acid or expressed antigenicity. Some colleagues now regard EM as ‘a problem’ and ‘a waste of public money’! This ignorant and narrow-minded view lacks any kind of thought as EM should be considered as part of a ‘balanced’ national diagnostic capability. Histopathology still needs EM and will continue to do so for the foreseeable future, but I fear that the perception in some UK virology laboratories that EM is no longer relevant is going to be a problem to its survival. It is going to take support in high places if it is to avoid extinction! Even with significant support, diagnostic EM within Virology is realistically only going to be available within a few specialist centres or within combined and centralised units.

*The AEI EM6B was a very early production version built at Trafford Park and this is now in store at the Manchester Museum of Science and Industry awaiting display because of its Manchester links.

Selected Publications:

‘The Manchester Museum Mummy Project’ Edited by AR David. 1979. Published by Manchester Museum. ISBN 0-7190-1293-7. Stanbridge CM, Mather J, Curry A and Blanche Butler E (1981) The Demonstration of Papilloma Virus Particles in Cervical and Vaginal Scrape Material. A report of 10 cases. *J. Clin. Pathol.* **34**: 524—531. Curry A, Grayson RF, Hosey GR. (1982). ‘Under the Microscope’ Blandford Press. ISBN 0 7137 1030 6. Curry A, McWilliam LJ, Haboubi NY, Mandal B. (1988). Microsporidiosis in a British patient with AIDS. *J. Clin. Pathol.* **41**, 477-478. Metcalfe TW, Doran RML, Rowland PL, Curry A and Lacey CJN. (1992). Microsporidial keratoconjunctivitis in a patient with AIDS. *Br. J. Ophthalmol.* **76**: 177—178. Curry A, Jones DM and Skelton-Stroud P (1989) Novel Ultrastructural Findings in a Helical Bacterium Found in the Baboon (*Papio anubis*) Stomach. *J. Gen. Microbiol.* **135**: 2223-2231. Canning EU, Curry A, Feist SW, Longshaw M, Okamura B. (1999). *Tetracapsula bryosalmonae* n.sp. for PKX organism the cause of PKD in salmonid fish. *Bull. Eur. Ass. Fish. Pathol.* **19**(2),1-3. Curry A. (2005). ‘Microsporidiosis’ chapter 25 in the Parasitology volume of Topley & Wilson’s Microbiology & Microbial Infections. Eds FEG Cox, D Wakelin, SH Gillespie & DD Despommier. Hodder Arnold. ISBN-10 0 340 885 688.

Alan Curry (alan.curry@cmft.nhs.uk) December 2009



Papilloma viruses in the nucleus of a cervical cell.

Publications

The latest list of publications

1

Ru YX, Eyden B, Li QH, Mao BY, Liu EB, Pang TX

Myofibroblast transformation in metastatic extramedullary chronic myeloid leukemia: a case report.

Ultrastructural Pathology 33: 136-140, 2009

2

Salman WD, Eyden B, Shelton D, Howatt A, Al-Dawould A, Twaij Z

An EMA-negative, desmin positive malignant mesothelioma: limitations of immunohistochemistry?

Journal of Clinical Pathology 62: 651-652, 2009

3

Eyden B

Editorial: are there myofibroblasts in normal bladder?

European Urology 56: 427-429, 2009

4

Eyden B

The myofibroblast, electron microscopy and cancer research [letter]

International Journal of Cancer 125: 1743-1745, 2009

5

Charlett A, Dobbs R John, Dobbs Sylvia M, Weller Clive, Ibrahim Mohammad

AA, Dew Tracy, Sherwood Roy, Oxlade Norman L, Plant J Malcolm,

Bowthorpe James, Lawson Andrew J, Curry Alan, Peterson Dale W,

Bjarnason Ingvar T

Blood profile holds clues to role of infection in a premonitory state for idiopathic parkinsonism and of gastrointestinal infection in established disease.

Gut Pathogens 2009: 1:20

The Future of Small Professional Bodies?

The Association of Clinical Microbiologists (ACM) has about three times the membership of ACEM. This professional body has decided to disband and reform as a new specialist group for microbiology under the umbrella of the Association for Clinical Biochemistry (ACB). To more accurately reflect the incorporation of ACM into the ACB, it is likely that the ACB will change its name to cover the interests of Clinical Scientists working in Laboratory Medicine. This is an interesting merger, but reflects the challenges that all professional bodies will have to face, particularly in progressing the process of Modernising Scientific Careers within the NHS. The ACB, which is a relatively big organisation, has considerable ‘clout’ and full time administrative staff. Representing an expanded range of laboratory staff probably means that changes can be discussed rather than imposed. The ACM committee and membership are to be congratulated for taking this brave step into the unknown. Other professional bodies will probably follow. ACEM’s membership comprises of both clinical scientists and biomedical scientists, so joining the ACB is not currently possible. However, as we are all to become ‘healthcare scientists’, this distinction between staff will blur. Perhaps sometime in the future the ACEM committee may engage with the ACB to explore amalgamation. Equally, as the clinical scientist component of ACEM diminishes through retirement, ACEM may forge links with the Institute of Biomedical Sciences to enhance our future survival as a professional body representing clinical electron microscopy.

The Financial Crisis

I’m sure that we all enjoyed our Christmas bonuses (ha, ha!). The NHS, like many other organisations, is going to be affected by the current financial crisis precipitated by ‘risk taking’ and stupidity of individuals in our banking system. For several years ahead, money is going to be in short supply and many activities will be scrutinised to see if they offer ‘value for money’. Electron microscopy is particularly vulnerable here, particularly units without a big routine workload. Equally, the lack of money in the system may delay planned investment and as many of us are working with microscopes (and other equipment) that are past their prime, we may have to soldier on nursing this equipment until better times return (there’s optimism for you!)