The newsletter for the Education Section of the BSHS

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Contents

Editorial

Martin Monk

It is back to the chalk face for many of our Education Forum readers. The BSHS conference in York, if you attended, will now be memory. Peter Fowler lets us in on some of his impressions and thoughts following the York Conference. As a revived activity of the BSHS it was generally thought to be very worthwhile. Let's hope that it will appear as a regular Forthcoming Event in future issues of Education Forum. For the rest of this issue we return to the mix of articles, reviews, resources etc. that characterises our newsletter. The newsletter is OUR newsletter. The editorial team welcomes a steady flow of material for wider dissemination, rumination and even disagreement. Please keep up the steady flow of your articles, opinions, comments, news and ideas.

Saturday 10th January is the deadline for copy to be with Kate Buss for the next issue of Education Forum. cwbuss@aol.com

Article

The history of science in science classes: engaging with electrostatics

Patrick Gavin

The history of electrostatics illustrates many points, but is complicated and would be unduly confusing to teach in detail. However, it might be useful for teachers, and students doing coursework, to appreciate how, by tortuous paths, our present understanding of charge gradually emerged. Every physics teacher is well aware that experiments and demonstrations in electrostatics are bedevilled by humidity: the equipment must be kept in a warm dry cupboard. This simple fact may have delayed the development of the subject.

Terminology and magnitudes

Gilbert (1544-1603), an Englishman, coined the word *electricity* from the Greek word for amber. About 1750, the then American colonist, Franklin, proposed calling the two types of charge *positive* and *negative*. In the late 19th century there was evidence, e.g. from electrolysis, that there was some basic unit, or particle of electricity. In 1891 the Irishman Johnstone-Stoney proposed the word *electron*. In 1897, J.J.Thomson, working at the Cavendish laboratory in

Cambridge showed experimentally that electricity is associated with particles, electrons, and he calculated their ratio of charge to mass (e/m). In 1909, the American Millikan found experimentally the magnitude of e in Coulombs – $e=1.6x10^{-19}C$. About 1965 it was proposed on theoretical grounds that this fundamental unit of charge might be further sub-divided into quarks: charges in units of $+2/3e$ and $-1/3e$. In 1983 experimental evidence for quarks was produced.

Chronology

The history of electrostatics might conveniently divided into four periods:

1. up to 1700 simple observations using amber or other non-metals and frictional charging;
2. 1700 – 1740 established as a subject;
3. qualitative information increased;
4. quantitative measurements.

The principal steps in the development of electrostatics were:

1600 Gilbert (1544-1603) physician to Queen Elizabeth, published De Magnete in which he distinguished between magnetism and electricity.

1727 Gray distinguished between metals and insulators, noting that metals cannot have electricity induced in them, but they can conduct.

1733 Dufay, "There are two distinct electricities, very different from one another, one of which I call *vitreous* and the other *resinous*, and the law between them like charges repel and unlike charges attract."

1745 The first capacitor, the leiden jar, was invented independently by van Musschenbroek and by von Kleist.

1747 Benjamin Franklin (1706-1790), American diplomat living in London and Paris, proposed calling the two types of electricity *positive* and *negative*. He replaced Dufay's two fluid theory, by a theory of his own in which a charged body has an excess or a defect of one of the charges from the average. This is basically how we teach it nowadays.

1752 Franklin invented the lightening conductor. He also invented bi-focal lenses and an improved stove.

1753 Dr.Richman, in St. Petersberg, was killed while performing an experiment to collect the energy from a lightening strike. Flying kites in thunderstorms was another precarious activity in which some indulged at that time.

1754 Canton (1718-1772) enunciated the principle of electrostatic induction and invented the electroscope.

1767 Joseph Priestly (1733-1772) published, *The History and Present State of Electricity*.
1787 Coulomb (1736-1806) showed that the inverse square law applies between electrostatic charges as it does between masses, as given by Netwon's law of gravitation.
1787 Bennet (1750-1799) invented the gold-leaf electroscope.
1851 Rhumkorff (1803-1877) invented the induction coil.
1929 Van der Graaf constructed a high voltage generator.

Further notes

It was in 1928 that Dirac predicted, from a mathematical model, that the electron could have an anti-particle. The positron was found by experiment in 1932.

In 1754 a village priest in Bohemia, Prokop Divish, fixed a lightening conductor to the roof of his house. The villagers, fearing it would be dangerous, pulled it down. Similarly, at St. Omer, in the Pas de Calais, Monsieur de Visseri erected a lightening conductor; the neighbours being alarmed brought a legal case against him. The case dragged on from 1780 to 1784. A young lawer, Maximillian Robespierre appeared for the defence. One of the experts called by the prosecution was Jean Paul Marat. De Visseri won the case.

References

Whittaker, E. (1951/3) A history of theories of Aether and Electricity. Volumes 1 and 2. Reprinted by Dover in 1989.

Report

Reflections on York'03: The BSHS 2003 Conference

Peter Fowler

There is no doubt, in my mind at least, that York'03 was a good conference. Plenty of contributors, a broad range of interesting talks, a venue in an attractive city and a large interested audience ensured that the conference was a success, particularly after an absence of some years. I think that it is important for the BSHS to build on this 'initial' success to make future annual conferences as successful (and hopefully more so), but at the same time be

flexible enough to meet new needs, tastes and trends, and to allow some sort of overall direction.

But, as I have said above, I think that the conference was a success. However, even though the above paragraph does admit that the conference was 'good', this is a value judgement based solely on a description of what actually happened. If conferences are to be a regular event they must have sort of long-term value, we need to go deeper to find aims and objectives for conferences and ways of assessing outcomes arising from them. And for this to happen, there needs to be an analysis of what annual conferences are for and can do for the BSHS in the future. In effect the BSHS has to justify to itself and others why annual conferences are a good thing.

There are a lot of answers to the question, "Why have an annual conference?". Answers can be pragmatic, sociological, psychological, developmental, philosophical, etc. For instance, conferences are great places for networking – developing links with other people with similar interests in other institutions, even in other countries, for future mutual benefits. Also, annual conferences of institutions can help create, maintain and develop a group identity and style. This is achieved by the way papers are presented and the way arguments and ideas in those papers are structured. Conferences can also provide useful feedback for the presenters about their research and directions for the future. And they can provide a summary of the present stage or state of an area of research, such as the History of Science (HoS).

In particular, the justification I would like to focus on is one of definition. Annual BSHS conferences, perhaps unconsciously, can be seen as part of the process of defining what the History of Science (and Mathematics and Technology) *is* and *means*. If, for instance, if one looks at the totality of the papers given at the York'03 conference, it is very obvious that there was a very broad range of content: from Science and Religion in the C19th, to Sam Alberti on Guy's hospital Museum, to Katja Huumo on the Politics of Language in Finland. The message is that HoS is a 'broad church'. The way that each session was 'themed' provides convenient 'hooks' or 'pigeon holes' to hang or place different areas of HoS and defines how HoS can be classified. Similarly, what was left out or rejected from the list of papers submitted can also contribute to the process of definition. Also, the types of research methods used, the sources, both primary and secondary, etc. etc. all contribute to this ongoing process of definition, but only in front of a large audience made up, on the whole of the body of the BSHS, many of whom are involved in research into HoS and are therefore contributors to that process of defining the meaning of the History of Science.

On the Friday of the conference, another part of the defining process was being carried out in Phoenix 15 as the Education Section part of the conference. Peter Ellis showed the dozen or so people who attended this part of the day a series of CD-Roms for secondary school use on HoS. In particular these resources enable pupils to interact with characters from the History of Science, created by the programmers of the discs and, literally, put words into their mouths by making dialogues between characters from different periods. Graeme Gooday, in his paper, talked about the skills that non-historian science graduates could gain from learning about HoS. Andrew Hunt, from the Nuffield Foundation's Curriculum Centre showed a resource for the new C21st Science GCSE containing HoS material. For my paper on why secondary teachers should teach HoS, I described both what secondary HoS might contain and does contain. Charlotte Sleigh from Kent University presented work on how to use role play. All of the people giving papers in the education section part of the conference, I would argue, were, in their own ways, attempting to define what the History of Science is and means, in the educational context, whereas the main part of the annual conference was taking part in the process of defining the History of Science in the academic context.

Therefore, to summarise thus far, the majority of the participants were involved in part of an internal process of defining the meaning of the History of Science at the annual BSHS conference (HoS for the historians of science), while the remaining minority were involved in a similar external process (HoS for non-historians of science - the 'rest', which includes those in education at the moment, and who will eventually become ordinary members of the public). I argue that there are two points of concern about these two 'sub-processes'.

The first is that there was very little formal dialogue between the academic and the educational parts of the process of defining HoS, and yet how one sector of the BSHS defines HoS should have an influence on the other. Besides this, as members of the same organisation, should not both sectors be 'singing from the same hymn sheet' or at least be aware of what each other sector is doing? I would argue that this is a necessary condition for a successful organisation, and therefore a successful annual conference.

Secondly, whilst all the participants who took part in the education section day were all highly capable and experienced professionals, I would argue that the task of defining HoS for the non-historians, albeit in the educational context, is too big and too important a task for so few people. Not only do

many people outside the BSHS need to be involved (primary and secondary teachers; lecturers in further and higher education; professionals in the media and publishing, etc.), but also the professionals within the BSHS need to have an involvement. The achievement, or even the start of the latter would truly be a long-lasting success of an annual conference.

How could the concerns I have just expressed be addressed? This brings me to one possible improvement to the conference that could easily be made. Even though the conference was well organised and well run, it started with the participants reading the papers they had come to York to give. There was no real formal start to the conference. As it had been the first BSHS annual conference for some years, it would have been a good idea to have an event at the very start of the conference to at least give an overall identity to the whole conference: the hopes and the aims of the organising committee, for instance. However, an opening event for all participants organised by the Education Section committee, may be an idea for a future conference.

The event would have to be constructed to allow both formal and informal dialogue, after an initial paper from somebody on the Education Section committee, perhaps. The paper could give an overall view of HoS at the moment, and look at the ideas and initiatives that are taking place in educational institutions. Content could include: the limitations on how HoS can be taught within the National Curriculum (NC) framework, bearing in mind that the function of science lessons is to teach science; what the limitations are due to pupils' and students' ages, abilities and motivations; the bottom line in education (e.g. 9.7 on a cold, wet Friday afternoon in January); the possibilities that HoS can provide for education, and the losses that may occur if it is discouraged in teaching, etc. dialogue can be set up by having immediate responses to the paper; a comment board could be set up for written responses; etc.

This would allow a lot more people who should be involved in the process of defining HoS in the educational context, and perhaps even give the annual BSHS conference a direction. Direction can then provide the impetus to keep the annual conference as an ongoing concern, and further enhance the identity of the BSHS as a national institution.

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Forthcoming events

ASE 2004

The Annual Meeting of the *Association for Science Education* is taking place at Reading University from Thursday 8th to Saturday 10th January 2004. As usual the BSHS Education Section will be taking part. This year we are putting on two sessions.

The first, at 11.30 on the Thursday 8th is a talk by Dr John Oversby called "The Origin of Chemical Equations". John is Chemistry Education coordinator at the Reading University Education Dept and is a long time member of the Education Section. His talk promises to be an authoritative and highly entertaining examination of why we write chemical formulae and equations the way we do.

At 9.30 in the morning of Friday 9th the Education Section is holding a session on "The Assessment of Ideas and Evidence at GCSE". Readers of Education Forum will be familiar with the articles in the previous edition examining the Ideas and Evidence questions in the specimen papers provided by the three GCSE awarding bodies. Now that candidates have actually sat GCSE papers containing I&E questions the Section will be reporting on its survey of all the science papers set in June. The session will be lead by James Williams, committee member and Science Education lecturer at Brighton University.

The BSHS will be displaying in the exhibition hall and visitors will be very welcome to stand D13/14 (very close to the Philip Harris display). We would like to hear from members of the Section who would be willing to do a period helping on the stand during the conference.

Reviews

“Charles Darwin - The Power of Place.” by Janet Browne,
Pimlico, 2003. ISBN 0-7126-6837-3 £12.99
Reviewed by Clive Sutton

What is it that justifies TWO volumes about Charles Darwin, each of nearly 600 pages, when there are already so many biographies available? Janet Browne's first volume: '*Charles Darwin - Voyaging*' was so helpful in developing an appreciation of Darwin the man himself and Darwin in the context of his times that I looked forward eagerly to the second volume, *'Charles Darwin, the Power of Place*'. Yet at first I was taken aback by the second volume’s length and the amount of careful reading it would evidently require.

I need not have worried, because for one's own enlightenment it doesn't have to be read all at once. Almost any few pages can be a delight and a self-contained education about people-and-ideas-in-context.

Take for example the pages I read yesterday about preparations in the autumn of 1859 for publishing *'On the Origin ..'* . What else was John Murray publishing at the same time? What other books hit the bookshops that winter? How did Murray calculate how many copies to print? In getting a bulk order from a circulating library, what difference did it make to his hopes? What was the role of those libraries at the time? What readers did Murray employ for comment on Darwin's outline, and what note did he take of them and why? How did T.H. Huxley manage to get a review of the book into *The Times* at a good moment just after Christmas? What light does all this throw on the role of newspapers, review journals and book publishers in Victorian science?

... Victorian England ... the changing place of science in society, Darwin and his family, Darwin and his personal concerns ... Darwin's way with personal letters ... there is a great deal here to entertain, to amuse and to inform anyone who wants to understand science in context then, and by implication now. And the two big volumes *are* necessary. If we are to appreciate the science itself *and* its social context, we *do* need the detail, *and* the depth of reflection that Janet Browne is able to bring to its presentation.

"The Man Who Knew Too Much: the strange and inventive life of Robert Hooke 1635-1703." by Stephen Inwood.

Macmillan, 2002. ISBN 0-333-78286-0. £18.99. There is a paperback version now available.

Reviewed by Martin Monk

About six months ago I went with a biology teacher from South Africa to see a copy of Robert Hooke's book "Micrographia" then being displayed in the King's College London library, in Chancery Lane, the old Public Records Office building. The book was much larger than I had imagined it would be: both larger pages and thicker. We were the only people in the room at that time. Of course it was open at the illustration of the flea, so often reproduced. Then, at the Royal Observatory at Greenwich, in the buildings adjacent to Flamsteed House, there has been a small exhibition of Hooke's microscopes and telescopes. On my recent visits, as yet I have not stopped to look at the exhibition. I have a well-trod path around the observatory and the small section given over to Hooke's work is not on it! My hurrying my study fellows onto the other exhibits – the wall quadrant and successively larger telescopes – is symptomatic of how science students are generally hurried on, in their science studies, past the work of Robert Hooke. The biography of Robert Hooke by Stephen Inwood is unlikely to change this situation.

In teaching science we only give time to the occasional aside on the life of scientists who lived the construction of our current, or past, knowledge. What most science teachers know about Robert Hooke's life can be written on a postage stamp and comprises his dispute with Newton. Such one-off events come to characterise the scientist's life. So if Hooke is presented in this way he is disputatious, interfering and petty. I have seen two quite different interpretations of Newton's written comments in a letter to Hooke about standing on the shoulders of giants. The first is that Newton meant what he wrote. The second is that Newton was making a snide attack on Hooke who suffered from a distorted spine that caused him to stoop more and more in later life. Stephen Inwood, in his biography of Robert Hooke, "The man who knew too much." Eventually gets to this story and shows that Newton was writing in good faith to heal a breach between the two men.

What most of Inwood's text documents is that science was only a small part of Robert Hooke's life. And if Hooke is to be remembered for anything, it is his work on the re-building of the city of London, after the great 1666 fire, that was his greatest achievement and his most lucrative activity. The Monument, by London Bridge, is undoubtedly the work of Hooke and not Wren. As are many 'Wren' churches. Hooke was a skilled draughtsman and had been

trained in the studio of Peter Lely, the artist who painted Charles II's mistresses. Stephen Inwood shows us Robert Hooke as a renaissance polymath, who was most successful as an architect and surveyor. In this he probably surpassed Christopher Wren, his more famous life-long friend and supporter. Yes, Hooke did serve the young Royal Society as its most inventive research officer. Yes, he did serve the Royal Society as its most incompetent secretary. Yes, he was voted on and off the council at regular intervals. He resented his ambigious relationship with the members of the Society as an intellectual engine but at the same time a servant. But this did not stop him spending virtually every evening in the coffee houses of late seventeenth century London with other Royal Society big-wigs. He drank with lords and worked alongside labourers. His relationship with Thomas Tompion, the master watchmaker, helped in the rise of Clerkenwell as the instrument centre of eighteenth century Britain. Hooke slept with his housekeepers and even his niece. Science was his passion but it was not the sum total of his life.

In the course of that busy life, with such varied interests, Robert Hooke fell out with others. Sir John Cutler FRS, refused to pay Hooke his fee for giving the Cutler lectures at Gresham College. Hooke went to litigation, won the case, but still did not get his fees. He fell out with Flamsteed, a younger man, who borrowed quadrants and telescopes from Hooke to use in the newly built Royal observatory, complained that they did not work and then complained when the Royal Society asked for them back. He fell out with Oldenburg, the Royal Societies first secretary, who he later succeeded, and was blamed by Hooke for conspiring with Newton. And, of course, he fell out with Newton over who had first thought of the nature of the forces that keep a planet in orbit.

Stephen shows, to my satisfaction, that Hooke had the mental model of a central centripetal force diverting a planet from its straight-line motion before Newton. On the inverse square law, my reading of Inwood's text is that there was not much to choose between Newton and Hooke. On the issue of the mathematical proof that such a central gravitational force produces elliptical orbits, Newton has priority. Hookes' scientific reputation problem was that he had so many irons in the fire that he never really devoted enough time for his genius to be published. Having thought of things, he moved on. And then complained that other had forgotten what he had thought first. Gravity was not the only topic on which Newton and Hooke came into conflict. Netwon's ideas on the propagation, refraction and dispersion of light was criticised by the older Hooke. Newton won out, temporarily, by delaying the publication of text on Optics until after Hooke's death in 1703. Newton lived on till 1727. In

the following quarter of a century Newton was able to work on enhancing his own reputation to the detriment of his dead adversary and fellow scientist.

Stephen Inwood's book is certainly illuminating. One can see how it is a natural successor to his very popular book *A History of London*. There were chapters where, in telling the tale of Hooke's busy daily life, as recorded in his diary, I found it a bit tedious. This is a literary way of showing how one of Britain's greatest scientists was more than that, for he was indeed an architectural, social and intellectual giant.

"Newton: the making of genius" by Patricia Fara.
Published by Picador 2003. ISBN 0-330-37588-1. £8.99
Reviewed by Martin Monk

Having just read Stephen Inwood's biography of Robert Hooke and re-visited the Hooke-Newton controversies, I decided to get the other side of the story. So before setting off to a late August conference I went to a branch of Waterstones. What I left with was not another biography of Newton: far from it. Settled on the train, I started to read Patricia Fara's book. Then realised just what I had bought.

Patricia Fara gives an account of how the scholar, Issac Newton, who produced an abstruse theory with mathematical proof, that Newton himself admitted he made difficult so no petty mathematicians would dare contradict him, was turned into an icon of scientific endeavour. How did this happen? How was such a genius made?

Patricia Takes us through chapters that deal with the sanctifying of Newton's reputation as the archetypal scientist, the iconography of Newton-mania, his disciples and enemies, the impact Newton's ideas had on French intellectual life, the varied and changing notion of genius, some myths about Newton, the way places associated with Netwon's life have taken on a shrine like character, and lastly the inheritors of the making of Newton as *the* singular scientific genius.

Readers of Education Forum will doubtlessly already be alert to the fact that "Newton: the making of genius" is a study in the sociology of science. But it is not the usual sociology of science that is to be found in KS3 of Science in the National Curriculum for England. There is nothing of the learning "about the ways in which scientists work today and how they worked in the past, including the roles of experimentation, evidence and creative thought in the development of scientific ideas." No. This is not a study of the sociology of

Newton doing his science. There is a great deal of "how scientific ideas are presented, evaluated and disseminated." That is found at the start of the Programme of Study for KS4. Admittedly the authors of the KS4 PoS go on to specify [for example. By publication and review by other scientists]. It is highly unlikely that they were thinking of Newton's own self-promotion, the political and anti-religious use to which his theories were put, the nationalism his work was used to support, the market in prints, wooden apples and National Trust heritage away-days. Patricia offers us a sociological understanding how the trick was worked, how Newton came to be the iconic figure he now is.

I found the chapter on the changing nature of genius rather boring. I found the three chapters entitled Myths, Enemies and France the most interesting.

"Experimenting with Humans and Animals: from Galen to Animal Rights"
by Anita Guerrini. Published by The John Hopkins University Press 2003.
ISBN 0-8018-7197-2. £13.50.
Reviewed by Martin Monk

I wanted a book that would balance some biology against all the physics that appears to get into popular science, the history of science, and our reviews in Education Forum. Anita Guerrini's book certainly does this. It takes us through the history of experimentation with animals – and humans – in medical research. Some of this is not easy reading. In fact descriptions of vivisection procedures made me feel distinctly unhappy. However, Anita does not exploit this and bang a drum for Animal Liberation Front. Instead, she tries to locate the investigations within the historical times they occurred so we are not led to anachronistic righteous indignation. I think this is quite an achievement given the material she has to deal with. From Anita's text one can recognise how some abhorrent procedures actually settled disputes that could not be resolved in any other way. The historical location of those procedures in the social attitudes and prejudices of the time allows one to understand how what would be unthinkable to a modern researcher was mundane in an earlier period. Towards the end of the text, when one might slip into thinking the present is so much better than the past, Anita reports how in 2001 some 2,400 human medical experiments at John Hopkins University were suspended following the death of a healthy subject when a medical protocol had been changed without approval from the university medical school IRB – this book is published by John Hopkins University Press.

I found the chapter on Polio and Primates very interesting. I had seen snippets in newspapers and magazines before that had linked research into polio to the

advent of AIDS. Here Anita takes us through the work that led to the research on polio and the way in which a possible transfer across from research animals to humans may have occurred. I also found it interesting that she comes out against Galen having ever vivisected gladiators. I always thought there was some uncertainty between historians of science. Anita comments how the Romans did not even look favourably on those who practised 'primitive' cures using human body parts. The corrosiveness of the philosophy of Descartes is discussed in terms of providing a justification for vivisection. So it is not surprising that much of the middle of the text is taken up with describing work done in the 16th to 19th centuries and the recurrent debates about where to draw the shifting line between acceptable pain and unacceptable suffering and cruelty.

Anita's book could provide an invaluable useful resource for those wanting to take part in and lead discussions on ethics in biology and medicine.

Resources

Mrs. Marcet's Conversations on Chemistry.
Selections from the 5th edition (1817) edited and abridged,
with introduction and commentary by Nick Selley.

It was difficult to decide where to put this in Education Forum. For it could be treated as a text in its own right and placed under reviews, or, it could be treated as a resource. I have chosen to treat it as a resource. I would welcome others reviewing the text for a future issue of Education Forum.

Nick Selley has reproduced an edited version of Jane Marcet's Conversations on Chemistry. The first seven pages comprise Section One and set the historical background both in terms of Jane Marcet's own life and also in terms of the chemistry that she sets out in her Conversations. The Conversations, that form Section Two, are just that: a discussion between several characters named Caroline, Emily and Mrs.B. In the course of those scripted conversations they touch on the topics of:

- the general principles of chemistry;
- light and caloric;
- the chemical agencies of electricity;
- oxygen and nitrogen;
- hydrogen;
- sulphur phosphorous and carbon;
- metals;
- the alkalis and earths;

- acids
- organic chemistry.

Nick has added a Section Three that looks at thermodynamic theories found in the 1817 text and also further ideas on elements, caloric and electrolysis.

As a resource for science teachers this has different possibilities. One is in the teaching of the history of science whilst another is in the actual teaching of science content. Despite the odd, necessary, anachronism w.r.t. modern chemistry, year 11 to undergraduate students could benefit from reading this as part of a reading group exercise.

Copies available from:
e-mail: nickjselley@hotmail.com
post: Birchberrow Cottage, Shelsley Beauchamp, Worcs. WR6 6RL
Tel: 01886 812886

HODDER BOOKS FOR YOUNG READERS

Hodder have a series of books for young readers that are well worth looking at if you work at *KS2, 3 or 4*. For KS2-3 with a *reading age range of 7+* come:
- The Cosmic Professor: the story of Albert Einstein 0-7500-2304 X
- The Explosive Discovery: the story of Alfred Nobel 0-7500-2371-6
- The Bright Idea: the story of Thomas Edison 0-7500-2303-1
- The Silkworm Mystery: the story of Louis Pasteur 0-7500-2558-1

At *KS2-3* for those with a *reading age of 9-11* there are:

- Baird	0-7502-3979-4	- Faraday	0-7502-3977-8
- Bell	0-7502-3820-8	- Fossey	0-7502-4008-3
- Curie	0-7502-3900-X	- Franklin	0-7502-4006-7
- Da Vinci	0-7502-3976-X	- Galileo	0-7502-3821-6
- Darwin	0-7502-3890-9	- Marconi	0-7502-3978-6
- Edison	0-7502-3899-2	- Newton	0-7502-3888-7
- Einstein	0-7502-3887-9	- Pasteur	0-7502-3889-5

At *KS3-4* with a *reading age of 10-12* there are two titles:
- The smallpox slayer 0-3407-8773-2
- The Blue Death 0-3408-0571-4

THE POCKET, UNIVERSAL RING SUN DIAL

Like their larger pedestal and wall-mounted cousins, pocket sun dials were once common place. Versions of such pocket sun-dials occasionally came ready for universal use. These could be double ring shaped to allow for small

adjustments depending upon the latitude and time of year. A universal ring sun dial was the true seaman's watch , the only type that could be used on a long voyage. Michael Kala, an Austrian, has re-created a Universal Ring Sun Dial. Michael's universal dial shows the true time any place on earth: both northern and southern hemispheres. (Michael was a clock repairer and had worked extensively with old timepieces.) Today, these dials can have an educational use as working models and, at the same time, provide pleasure as a highly unusual means of keeping track of time. These dials have a diameter of 61 mm, and fold down to a slim 6 mm circle. They come with a nylon lanyard, which is needed to suspend the dial to catch a ray of sunlight as it passes through a hole and onto the scale.

Pricing

A one-off universal ring sun dial sells for £23.50 for each dial. This includes VAT and postage to anywhere in the UK.

With a purchase of six dials the price drops to £14.50 each+VAT+£3.50 for postage.

e-mail: *l.honey@virgin.net*

Post: Leonard Honey at: 22, Heathview, London N2 OQA

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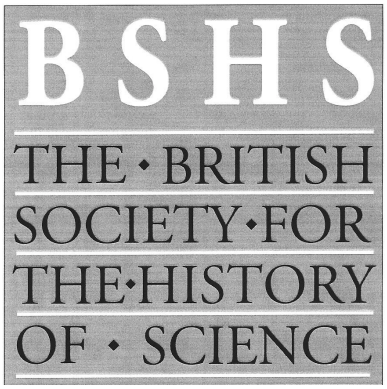

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