



Humanity in School Science

**Resource guides and discussion materials
created by the Education Section of the British
Society for the History of Science**

Why history matters: a discussion piece	2
Suppliers of teaching materials	3
Women in science.....	4
Why bother about scientists and religion?	8
Using videos to explore the humanity of science	10
Using drama to bring out the human qualities in scientific reasoning.....	12
Useful web resources	14
Key reference books	15

IMPORTANT: this resource was created in 2001. It is provided as an archived resource, and should not be assumed to be current; some weblinks and listed sources are known to be out of date.

The role of the former Education Section has been taken on by the BSHS Outreach and Education Committee, which is dedicated to producing new materials aimed at schools and other audiences. For the latest information, visit www.bsbs.org.uk/outreach or contact outreach@bsbs.org.uk.

Why history matters: a discussion piece

Science-in-action is always characterised by intense discussion of *ideas* and *evidence*. Someone has proposed an explanation of such-and-such – but what would make a good test of that explanation? What is all the evidence available? What other possibilities are there? ... and so on. It is essentially *idea-driven* and when a teacher succeeds in re-creating that atmosphere of debate with evidence, important aspects of the nature of science are communicated.

Interfering with that communication, we have the mass of 'ready made' textbook science which pupils encounter. It has lost the tentativeness and uncertainty it once had as 'science-in-the-making'. The doubt has gone, and so have the personal voices of the scientists thinking things out, proposing ideas and weighing up evidence. The poor learner meets what is now fully accepted knowledge as just information to be learned – a set of facts, rather than a set of ideas.

A strong emphasis on 'experiment' in school also draws attention away from the scientists' creative and imaginative work and from their role as thinkers, talkers, proposers and model-builders. It suggests that the facts have just been read off from Nature directly, with the scientists being only 'recorders' of them. Pupils end up thinking of science as 'doing experiments and seeing what happens' rather than as thinking, talking, devising and then doing experiments with that talk in mind. By concentrating too much on the evidence-checking part of science we have unintentionally given a wrong impression of science as a whole.

This is why history matters. For pupils to gain a real scientific literacy, they must learn to discuss ideas, and to think of scientific knowledge more in terms of the major big ideas which scientists have contributed and less in terms of an accumulation of discoveries. They must be able to enter into science-as-conversation, and therefore they should hear science-as-conversation in their lessons. It can't be done without retracing some of our cultural history, to unpack knowledge which we now take for granted, and help the learners to understand the human effort that went into establishing it.

What about teaching materials and methods? For future studies of science in school, we suggest:

- more accounts of the big ideas of science which place them in a human context. Why was a particular idea pursued at all? How did it come to be accepted? What evidence was important? What arguments occurred?
- more studies of times when ideas changed and new knowledge was contested before it became widely accepted.
- lesson designs which are less dominated by practical work and therefore less misleading about where scientific ideas come from.

Approaches to making practical work less misleading are discussed in J Wellington, ed (1998) *Practical Work in School Science: Which way now?* published by Routledge.

Suppliers of teaching materials

The names of some suppliers in the UK are listed below, with links to relevant websites or other information on how to order. These are mainly for charts, videos, CDROMs etc to use in the classroom.

- **Shell Education Service** supplies charts, booklets, videotapes etc for schools, including an excellent range of biographical leaflets on scientists, with one series on women in science. Postal address: P.O. Box 46, Newbury, Berks RG14 2YX
- [Nuffield Curriculum Projects Centre](#) has lesson materials for teaching ABOUT science, prepared at the University of Leeds
- [The Vega Science Trust](#) supplies videotapes which help to show science in action, e.g the story of the fullerenes. It is easy to order these via the website
- [The Royal Society of Chemistry](#) The RSC sells useful historical charts on the history of chemistry. They also have biographical articles in 'Chemists through the years, Parts 1 and 2'. Their website is difficult to navigate, but look under PRODUCTS and you can search the publications catalogue. Purchase enquiries can also be directed by E-mail to: turpin@rsc.org
- [BBC Videos for Education and Training](#) This organisation sells BBC videotapes, including many from the *Horizon* series such as the story of penicillin. Their website is complex and it may be quicker to obtain their catalogue by phone 0181 576 2541.
- [PREtext Publishing and Resource Purchase Agency](#). This is run by Peter Ellis at Wantage in Oxfordshire. See his list of books at discount prices, and/or order his termly resource pack on history of science for schools (called 'Breakthrough').

Women in science

Why study women in science?

(i) Sometimes as role models for girl pupils. Note, however, that women have been involved in science in many different ways, not just as laboratory or field scientists, but also in other roles such as translators and writers whose influence was very significant at a particular time. A study of their lives and their different roles is a good way to gain insights into wider aspects of 'doing science' and into the social contexts in which it has been pursued.

(ii) It is a good way to show all pupils the value of understanding the context and the impact of new ideas on people's lives. One way is to set pupils a project in which they choose to find out about one woman of science and one man of science. There are many suitable resources on the web and elsewhere, and these pages are designed as an initial list to print out and keep for reference. Items are grouped as follows:

1. People to consider for projects on the roles of women in science
2. Website information for projects
3. Videos, posters and books for the classroom
4. Books for the science library shelves
5. Items for teachers, including strategies for involving girls in science
6. Celebrating Women Scientists (travelling exhibition)
7. Beliefs about science - the feminist critique

1. People to consider for projects on the roles of women in science

A list for students, with names, dates and themes only. The challenge then is to find information for your personal project, using the sources listed in later sections.

- Hypatia of Alexandria 370-415 A.D.
- Emilie du Chatelet 1706-49 - Translator of Newton into French
Caroline Herschel 1750-1848 - Comet hunter, star cataloguer, brother of Astronomer Royal
Mary Somerville 1780-1872 - Major writer on the physical sciences.
- Marie Curie - Discoverer of Radium, Polonium
- Irene Joliot-Curie 1897-1956 - The development of artificial radio-isotopes
- Kathleen Lonsdale 1903-71 - X-ray crystallography. She was one of the first women FRSs and also one of the founders of *Society for Social Responsibility in Science*
- Dorothy Hodgkin 1910-94 - X-ray crystallography of B12, penicillin, insulin
- Rosalind Franklin 1920-1958 - X-ray crystallography of DNA

- Rachel Carson (1907-1964) author of 'The Silent Spring'
- Lise Meitner (1878-1968) - who clarified the concept of nuclear fission
- Jocelyn Bell Burnell (born 1943) - Astronomer
- Barbara McClintock (1902-92) - 'Jumping genes'
- Clara Haber - Wife of Fritz Haber, first woman to earn a PhD in chemistry
- Mileva Einstein - First wife of Albert Einstein
- Emma Darwin (1808-96) - Wife of Charles Darwin. (Science in a domestic context)
- Sister Maria Celeste, Galileo's daughter - the subject of a recent book by Dava Sobel (1999). Her letters to her father are now available on a website: [Sister Maria Celeste](#)

2. Websites with information for projects

Further information for projects on individuals can be found in books listed below and on the web:

- [The SHiPS network](#), which includes material on women in science.
- [Women in Science - as surveyed at the VL-HSTM](#) (Melbourne Australia)
- [The Galileo Project](#) at Rice University has notes on 600 seventeenth century scientists.
- [St Andrews University History of Maths archive](#) a very popular site with a lot of lively information about mathematicians and scientists from the more mathematical sciences.
- [Women in mathematics](#) an indexed list of essays from Agnes Scott College, Atlanta, Georgia.

3. Women in science: posters, videos and books for the classroom

- *Women in Science* (Shell). Charts and leaflets about women scientists, including Kathleen Lonsdale, Jocelyn Bell Burnell and others; from Shell Education Service, P.O. Box 46, Newbury, Berkshire, RG14 2YX
- *Local Heroines* (film/video in Adam Hart-Davis' 1998 series of Local Heroes, broadcast on BBC2). The website associated with the series includes biographies of the women featured in this programme. They are written in his characteristic lively style. See the Local Heroes Website
- *Life Story* (BBC) Video 105 mins. A dramatic re-creation and exploration of the events leading up to the publication of the 'double helix' structure for DNA in 1953, and the personalities of the scientists: Francis Crick, Jim Watson, Rosalind Franklin and Maurice Wilkins.

From BBC Videos for Education and Training, 80 Wood Lane, London W12 0TT. Price on application 0181 576 254

- *Science Changes* A book by Peter Ellis, PREtext Publishing, Brecon Cottage, 33 Newbury St, Wantage, Oxon OX12 8BU. Pbk £3.95. Intended for Key Stage 4, this book underscores change in science: changing methods, changing views (including how different races, governments, religions and societies have viewed science and scientists), and changing values. It includes sections on ancient science in China and on women in science.
- *Women Life Scientists: Past, Present and Future: Connecting Role Models to the Classroom Curriculum*. A resource edited by Marsha L. Matyas and Ann E. Haley-Oliphant. It contains twenty modules, each with a biography of a female scientist along with a related activity, teachers' notes etc. Historical and contemporary scientists are included. From the American Physiological Society (Bethesda, MD), or from booksellers quoting ISBN 1-890251-00-3.
- *The Human Element: 1, Gift from Heaven*. (BBC) The first episode in a series aiming to show the cultural dimensions of chemistry. It tells the story of Lise Meitner

4. Women in Science: books for the science library shelf:

- *Hypatia's Heritage: the History of Women in Science from Antiquity to the End of the 19th Century* by M. Alic, published by The Women's Press. Readable by most high attainers in KS4 and beyond.
- *The Cambridge Dictionary of Scientists* edited by David, Ian, John and Margaret Millar, Cambridge University Press, 1996. Pbk £10.95. As well as entries for 1300 scientists (including a number of women) this dictionary contains 33 'panels' outlining themes in the history of science. Four of these deal with the entry of women into astronomy, medicine, chemistry and biological sciences.
- *The Usborne Book of Scientists: From Archimedes to Einstein*. Struan Reid and Patricia Fara. Usborne Publishing Ltd, 1992. Pbk £4.50. Aimed at KS2/3, each double page of this book addresses a theme in the history of science. One of these is 'Women in Science', beginning with Hypatia of Alexandria and women are well represented in the other chapters also.

5. Women in science: articles for teachers:

- *Topical Essays for Teachers: Race, Gender and Science*. Written especially for teachers by outstanding historians, each essay includes a general thematic overview, biographical information, discussion of social and cultural contexts, and teaching plans for 1 to 3 days, with suggested reading and audiovisuals. Available from the History of Science Society, University of Washington, DR-05, Seattle WA98185, USA. \$8.00

- *Breaking the Mould: An assessment of successful strategies for attracting girls into science, engineering and technology* (1997) from the Department of Trade and Industry Tel 0171-215-0051 or from booksellers quoting ISBN 0 7115 0347 8. This slim volume is a survey of findings from the GASAT (Gender and Science and Technology) international conferences from 1981 onwards.

6. Celebrating Women Scientists (travelling exhibition)

Celebrating Women Scientists is an exhibition on historical women in science prepared by Madeleine Shepherd for display as part of the Edinburgh International Science Festival (March-April 2003.) The exhibition will be available for cost of transport only to schools, libraries, community centres and science festivals from mid-June 2003. [More details of the exhibition and related events](#)

7. Beliefs about science - the feminist critique

Teachers studying women in science will also want to look at the feminist critique of beliefs about science. For a short overview explaining what the issues are, see:

- Christie J.R.R. (1990) 'Feminism and the history of science' in Olby R.C. et al *Companion to the History of Modern Science*, Routledge.

Other books include the following:

- Sharon Traweek (1988) *Beamtimes and Lifetimes*, Harvard University Press. (An anthropologist tries to observe and understand the peculiarly masculine world of the atom-smashing laboratories)
- Donna Haraway (1989) *Primate Visions*, Routledge, Chapman and Hall
- Caroline Merchant (1980) *The death of nature: Women, Ecology and the Scientific Revolution*
- Sandra Harding (1986) *The Science Question in Feminism*, Open University Press
- Evelyn Fox-Keller (1983) *A feeling for the organism; The life and work of Barbara McClintock*
- Londa Schiebinger (1993) *Nature's Body: Gender in the making of modern science* Beacon Press, Boston.
- Londa Schiebinger (1999) *Has Feminism Changed Science?* Harvard University Press.

Why bother about scientists and religion?

Discussion notes by Clive Sutton, 1999

1. Because it is relevant to an understanding of what 'doing science' involves. It is difficult to understand what science as an activity really 'is' without having some feeling for what it has meant to the people concerned - how it fitted in with their overall understanding of human life. For example:

- What did Newton think he was doing in revealing the laws of celestial and earthly motion?
- What did Robert Boyle think he was doing when he urged people to study Nature *by experiment* rather than by 'mere argumentation'?
- How did Michael Faraday as a devout member of the Sandemanian sect think his scientific work connected with the rest of his life and thought?

Modern history of science offers insights into what they felt they were trying to do in this larger sense. It illuminates the kinds of basic metaphysical commitment which have been important to different people in a scientific quest for understanding. Amongst theistic, atheistic and 'agnostic' scientists alike there has always been a commitment to the idea that the natural world is orderly and therefore open to a study of how it works. For at least a couple of centuries, this idea of orderliness occurred within a framework of 'natural theology' as understood in European Christianity. 'Natural philosophy' was seen as a means towards understanding the works of God.

2. Because widespread misunderstandings exist, e.g. (i) Many people see science as quite separate from religious thinking, but the history of individual scientists denies this. (ii) Stereotypes of conflict, in the sense of new truth against old superstition, are still powerful, but historical analysis shows a more complex set of relationships. When conflict did occur it was often primarily political and institutional e.g. in the last century, Huxley and others were struggling for the recognition of professional scientists in places where established churchmen had a monopoly of power and influence. (See Further reading, below)

3. Because science cannot avoid touching pupils' sense of their own personal identity. Today, science – almost more than religion – affects learners' ideas of how they fit into the scheme of things and of what they can do and become in their lives. Within any youngster's half-conscious search for meaning and personal purpose, science may contribute positively, or it may fail to do so. An educative experience in school will be one that recognises this aspect of their maturing. If they can see that such questions were also important to other people inside and outside the world of science, it may help them with their own developing sense of identity.

Further reading

- "Science and Religion: Lessons from History?" An essay by John Brooke (1998) published in *Science*. (vol 228 pp 1985-6.)

- John Brooke and Geoffrey Cantor (1998) *Reconstructing Nature: The Engagement of Science and Religion*, Edinburgh; T Clark.
- R. Hooykaas (1972) *Religion and the rise of science*, Scottish Academic Press
- Geoffrey Cantor (1991) *Michael Faraday, Sandemanian and Scientist* MacMillan.

For a brief account see also: Cantor G (1998) 'Michael Faraday's religion and its relation to his science' in *Endeavour* vol 22 no 3 pages 121-124.

- Another individual scientist to study (inventor of the word 'agnostic') is T.H.Huxley. See Adrian Desmond's book (1997) *Huxley: From Devil's Disciple to Evolution's High Priest*. The collected works of T.H. Huxley are available on the web at: [Huxley](#). His ideas were a part of wider debates over agnosticism and materialism in the late nineteenth century which involved, amongst others, John Tyndall (his Belfast address of 1874) and also the theism of James Clerk Maxwell.
- *Science and Belief from Copernicus to Darwin* (1974) Open University course materials prepared by Colin A. Russell, R. Hooykaas, David C. Goodman, Open University Press.
- *Darwin to Einstein : historical studies on science and belief* (1980) edited by Colin Chant and John Fauvel, Longman in association with the Open University Press.
- In the 1990s there has been a growing literature which is not about established religions as such but about the question of the omniscience of science. Amongst people who are critical of the idea of science as the answer to all our questions, read Mary Midgeley (1994) on '**Science as Salvation: A modern myth and its meaning**', published by Routledge.
- Mike Poole (1995) *Beliefs and values in science education*, Open University Press.

Using videos to explore the humanity of science

The following are examples of videos useful for exploring the nature of science in context:

Title and notes	Source
<p>Life Story: a double helix (BBC Horizon drama, 1987, 105 minutes). A reconstruction of the events of 1952-3 which led up to the publication of the double helix structure for DNA. Very good for provoking discussion about many issues, e.g. the role of experiment and of theory in science, the ethics of scientific co-operation and competition, the role of individuals - Francis Crick, James Watson, Rosalind Franklin, Maurice Wilkins.</p>	<p>BBC (see below)</p>
<p>Crater of Death? (BBC Horizon 1997, 50 mins) Arguments about interpretation of the 'KT boundary' in the geological record. Is it a record of a meteor impact 65 million years ago? Could the extinction of ammonites and dinosaurs be explained this way? A very good portrait of science in action at a point where the conclusion is not yet cut and dried.</p>	<p>BBC (see below)</p>
<p>Molecules with sunglasses (BBC Horizon 1992 and 1996, 50 mins) Featuring the story of the 'fullerenes' and the scientists who were involved in wondering whether they had really identified a new allotropic form of carbon. High in human interest and very good for discussion of the international aspects of science, and of the tussles in working with new ideas: doubt, experimental evidence, what will count as certainty?</p>	<p>BBC (see below)</p>
<p>The mould, the myth and the microbe (BBC Horizon 1991, 50 mins) The penicillin story retold, with the work of Florey and others to show what was involved in extracting and purifying the antibiotic, and the context in which that work was done in the early part of World War II.</p>	<p>BBC (see below)</p>
<p>Local Heroes A set of six-minute vignettes. In each one, Adam Hart-Davis tells the story of an individual who was an innovator in science or technology. He takes us to the places where they lived and worked and shows us their original equipment and/or a reproduction of its essential features.</p>	<p>Off-air from the BBC, but see Heroes below.</p>
<p>Mind Works A set of ten-minute dramatisations to re-create moments from the past and to interest modern American pupils in the people of those times and their scientific ideas. In one of the dramatisations, Count Rumford is portrayed with his daughter in a scene which starts with how to eat hot soup and develops into a discussion of how to consider heat as essentially a kind of motion.</p>	<p>Publisher</p>

For more information about videos and where to get them see:

- *The Magic Lantern* – a guide to nearly 2500 audiovisual resources. Available from the History of Science Society office DR-05, Seattle, Washington 98185, USA. It is indexed by topic, by series, and by name and includes a list of over 150 suppliers, nearly all in the USA.
- BBC Videos can be purchased. To order a catalogue, phone (UK) (0)181 576 2541. Some information is also available on the (rather complex) website: [BBC Videos for Education and Training](#)
- *Local Heroes* is the title of a series of BBC programmes, produced for the BBC by Screenhouse in Leeds, UK. They are not yet available for purchase, but see below about [short videos](#).

- *Mindworks - Making science concepts come alive* – This curriculum project has eight teaching units associated with the eight video dramatisations produced by KCET in Los Angeles. Publication (by Kendall-Hunt Publishing Co, Dubuque, Iowa 52002) is scheduled for April 2000. For further details contact the Project Director Barbara Becker.
- Vega Trust videos – These are videotapes which help to show science in action. It is easy to order them via the website: Vega Science Trust

Discussion notes for teachers

Whether it be Harry Kroto talking about the struggle to understand the substances which became 'the fullerenes', or a portrait of the early microbe hunters, video or film usually presents scientists in a much more rounded way than the average textbook. However, teachers have to consider how long to devote to showing the video, and how long to spend on other activities which help the learners to understand and appreciate what it shows.

Long videos. Sometimes a semi-fictionalised re-creation is best for showing the excitement of science and its uncertainty. The best known example is the Horizon film "Life Story" about the events of 1952-3 which led up to the publication of the double helix structure for DNA. Skilled actors help us to think a good deal more about Francis Crick, James Watson, Maurice Wilkins and Rosalind Franklin than we would after reading a textbook account. On the other hand films are long - longer than a school lesson. Without time to work over what they have seen, pupils may be thrown into too passive a role when viewing them.

Short videos. Adam Hart-Davis, in his television programmes called *Local Heroes* offers six minute vignettes of individuals and their ideas. These include ideas for follow-up activities and leave plenty of time for such activities. The materials are not yet available on videotape, but may eventually be accessible on DVD discs, which would allow easy access to the portrait of a particular person. Meanwhile, consult the Local Heroes Website.

Still pictures can be even more useful than videos for stimulating discussion in class. Here are some sources:

- The library of images from the history of medicine in Washington, USA, at: <http://www.wihm.nlm.nih.gov/>
- Still images available at the Oxford Museum of the History of Science: <http://www.mhs.ox.ac.uk/images/index.htm>
- Scientists on postage stamps and banknotes Scientists on stamps and notes

Using drama to bring out the human qualities in scientific reasoning

Textbook science as received in school has often lost the intense discussion of ideas and evidence that is characteristic of real science-in-the-making. Some teachers use role-play and drama to revive that aspect of its humanity - the vitality of proposing an idea, weighing up evidence, engaging in debate.

Others use it for exploring the social context and the social implications of new knowledge or developments in technology. Perhaps you have used some of the role plays suggested in the SATIS collection - for example "The Re-trial of Galileo" or the one about Jenner's 'vaccination' of the young boy, James Phipps, or the one about the consequences of extending a limestone quarry?

For those who have little confidence in organising role play or other sorts of drama in the classroom, it is a common experience that once you have tried it, it becomes much less daunting. There are very substantial gains in involvement for the pupils, but nevertheless there are cautions to add - see below. We start this page as a place to share experience of what works well.

Role cards: aids to identification with characters

Guidance on two role-plays ('The Committee on Uranium' and 'The Trial of Galileo') can be found on [The SHiPS network homepage](#). Guidance on organising 'The Re-trial of Galileo' can also be found as Unit 1 in the SATIS 16-19 resources available from the ASE at Hatfield, Herts AL10 9AA. 'The Limestone Enquiry' (its chemistry, its uses, the users, the environmental impact of quarrying etc) can be found in 14-16 SATIS unit no 602, from the same address. Guidance on how to explore the vaccination story is available as 'Jabs for James Phipps' in 'Exploring the Nature of Science at Key Stage 3' by Joan Solomon, published by Blackie.

Scripted material

An outstanding example is Tony Harrison's verse drama (1992) *Square Rounds*, available from Faber and Faber, ISBN 0-571-16868-x. It raises issues about science and agriculture, and about science and war, with material to explore the personal involvement of Justus von Liebig, William Crookes, Fritz Haber, his wife Clara Haber, and others. With plenty of teacher support, parts of this are accessible to pupils of 14 years and above.

Michael Frayn's play *Copenhagen* is based on the visit of Werner Heisenberg to Neils Bohr in German-occupied Denmark in 1941. It explores not only the character of these two individuals and their approaches to science, but also the whole question of relationships between scientists in wartime. The script is published by Methuen (1998) at £6.95, ISBN 0 413 72490 5. It offers material suitable for 16 years and above.

Help from professional actors?

Here are some of those who are most experienced at working in schools. You may know of others. Please use the response form (below) to help us expand the list.

Professional actors offering stimulus sessions in UK schools			
Actor/Organisation	Characters	Address	Telephone
Peter Joyce <i>Past Present Science</i>	(i) Newton, (ii) Galileo	P.O. Box 5212 Grantham NG33 5SR Lincolnshire.	Fax: 01 476 860 180
Gary Brooking <i>The Famous People Company</i>	(i) Jenner (ii) a late Victorian doctor (iii) G. Stephenson	56 Ridge Street, Stourbridge, W.Midlands DY8 4QF	Fax: 01384 390985
Philip Reader <i>Science Alive</i>	'Albert E.' (not strictly the historical character)	22 Ashview Gardens Ashford, Middlesex TW15 3RD	01784 889671

Useful web resources

- [The SHiPS network homepage](#) in Minneapolis. This is a site specifically designed for teachers who want to draw on History Philosophy and Sociology of Science. Find regular new discussions, or go directly to [SHiPS biographies & portraits page](#)
- [The Galileo Project](#) at Rice University has notes on 600 seventeenth century scientists.
- The [Virtual Library for the History of Science Technology and Medicine](#) started in Melbourne, Australia, is a long-established site – now moved elsewhere, so follow directions when messages to that effect appear and you will eventually get there. The site is divided into many sections, so you can search in different ways for the information you want.
- [St Andrews University History of Maths archive](#) This very popular site has a lot of lively information about scientists from the more mathematical sciences.
- [Biographies search page](#) This will often give you a person's dates and some basic information, but without references for further study. It is not specific to science.

Other useful sites include:

- [Women in mathematics](#) at Agnes Scott College, Atlanta, Georgia
- [Afro-American Scientists: a source list](#)
- [The Nobel Foundation](#) for an index of Nobel prize winners.
- [Science Odyssey](#) (52 biographies offered by the Public Broadcasting service in Boston)
- [Newton.org.uk](#) a suite of pages about Isaac Newton
- [Physicists on the money](#) A collection of more than 20 pictures of physicists on banknotes from many countries, collected at the University of Maryland.
- [The International History, Philosophy and Science Teaching Group](#).
- [UK Science Personalities - information from the British Council](#).
- [Science Teacher Festival](#) Changes in science teaching over the last 100 years.
- [Albert Einstein Online](#) This connects to many other pages about Einstein.

Key reference books

- *The Cambridge Dictionary of Scientists* by David, Ian, John and Margaret Millar, Cambridge University Press, 1996
- *Macmillan Dictionary of the History of Science* edited W.F.Bynum, E.J.Browne and Roy Porter (1983). (A good place to find short articles on the history of the gene, or the electron, or how ecology began, or the story of ideas about atoms etc. etc.)
- *A Travel Guide to Scientific Sites of the British Isles: a guide to the people, places and landmarks of science* by Charles Tanford and Jacqueline Reynolds, Wiley, 1995. This is the book you'll need if you want to arrange visits or to start your own version of 'Local Heroes'.

These and other books, including many short biographies of scientists for young readers, are available at discounted prices from PREtext Publishing at Wantage, Oxfordshire, UK. To receive a list of books, email your request to Peter Ellis at: PREllis18@aol.com. The same agency will supply a termly resource pack on history of science for schools. It contains portraits of scientists in each issue.