

# **WorkBooks in Science**

## **Science as a Creative Adventure of the Mind**

A Programme for Science on the Internet

### A Presentation of the Series

At the root of all human progress is education: the elimination of ignorance, superstition and prejudice; and the promotion of understanding and awareness, both of others, and their needs, and of the world around us. Learning about Science and its methodology is especially important; for Science, along with all that has grown out of it (present-day medicine, technology, industry and all the rest), has changed the lives of all of us within the last century and continues to do so.

Yet, in many parts of the world, science development is in crisis. In the Developing Nations this may be largely due to a severe shortage both of material facilities (schools, laboratories, equipment) and of well qualified science teachers. But even the ‘scientifically advanced’ societies are not without their problems: in the UK, for example, there seems to be a widespread disenchantment with science. The ‘hard sciences’, such as Physics and Chemistry, which depend heavily on Mathematics, have been hardest hit as more and more students turn towards disciplines which depend mainly on verbal expression and virtually exclude mathematical argument. One reason is surely that the symbolic languages used so widely nowadays in science are not learnt at an early age, as more conventional languages are. But a more important reason is probably the public image of Science, which is no longer seen, by many, as a creative and cultural activity – but rather as the product of dull and tedious experimentation in the laboratory, quite remote from other – more ‘human’ – pursuits.

In a world where the progress of humanity is increasingly dependent on the peaceful exploitation of science, this situation is no longer acceptable. We should try to bring an understanding of science and its symbolism within the reach of everybody; and that is a primary aim of the Series “WorkBooks in Science”. Without such an understanding, and a critical appreciation of what science can do, members of society are denied their democratic right to full participation in shaping their destinies – destinies that will depend increasingly on the progress of science and our awareness of where it is taking us.

Every book in the Series will start ‘from the very beginning’, assuming no previous knowledge of the subject, so as to be accessible to anyone, anywhere

in the world, who wants to know about Science and is prepared to start from nothing and work hard. Readers will normally be of pre-university age, but may also include adults whose knowledge of science is either completely lacking or half-forgotten – a politician perhaps, who needs to argue on a subject such as environmental pollution or nuclear energy: all will start from ground zero.

Each WorkBook will be a small ‘module’ of Science, typically containing around 100 pages on a compact and well defined theme: the themes may be trans-disciplinary, cutting across traditional boundaries, but will be carefully chosen to ensure maximum coherence within the Series. Examples are WorkBook 1 “Number and symbols – from counting to abstract algebras” and WorkBook 2 “Space – from Euclid to Einstein”. Taken together, the books of the Series will provide a rudimentary science library leading up to university entrance level (and sometimes beyond).

When organized on the Web, all modules will be interrelated so that by ‘clicking’ on a word or topic in one it will be possible to access an explanation in another. Each WorkBook will contain material for study, either privately or with help, over a period of 4-5 years, graded according to growing experience of the reader. In short, each will be usable as a ‘teach-yourself’ book.

Besides being ‘thematic’, the treatment is innovative, *not* following the traditional (schoolroom) pattern with its emphasis on science as a predominantly experimental discipline. It can be argued instead that the required ‘input’ from the laboratory is often very small and that many hours of practical work, using costly equipment, are not essential to gaining an understanding of science and scientific method. A first aim of the Series is to show that large parts of Mathematics and Physics (dreaded by so many students) can be built up from nothing more than a few notions about *counting* and *measuring* (distance, with a metre rule, and time with a clock) and a few very primitive observations, such as Galileo’s experiments with falling bodies. The rest is very largely **a creative adventure of the mind**, in which more and more is discovered just by *thinking* about what we know already. Even if Science has its roots in observation and experiments (and the validity of any theory rests on the agreement of its predictions with observed ‘reality’) we have chosen to stress the theoretical aspect of so much of science because we find it appealing, beautiful and exciting and hope to share that excitement with others.

On the platform constructed in the first few WorkBooks, the Series expands into Chemistry, the Life Sciences, the Earth Sciences, and other disciplines that utilize similar concepts and methodologies. An overall aim is to stress

the essential *unity* of Science. Every module is referred to again and again and so has a part to play in revealing the ‘big picture’.

The WorkBooks will all be published on the Internet and will be available for downloading – *free of charge* – from either of two web sites:

<<http://www.paricenter.com>> (check out ‘WorkBooks in Science’) or  
<<http://www.learndev.org>> (check out ‘For the Love of Science’)

The WorkBooks are to be published in their original form at the ‘paricenter’ site. The same versions will also be available from the ‘learndev’ site, where additional attention will be given to specific modalities of use (individually, in groups, with peer-to-peer and/or tutorial support, in either face-to-face settings or in a ‘distance education’ context) and to the formative evaluation of the modules, along with research concerning their various uses.

Key email addresses for further information are <[info@paricenter.com](mailto:info@paricenter.com)> (David Peat – for publication matters), <[jvisser@learndev.org](mailto:jvisser@learndev.org)> (Jan Visser – for issues relating to modalities of use, the building of learning communities, formative evaluation and research), and <[mcweeny@dcci.unipi.it](mailto:mcweeny@dcci.unipi.it)> (Roy McWeeny – for scientific content and editorial issues).