

THE CHARIS PROJECT

The aim of the Charis Project is to promote the spiritual and moral development of pupils through the teaching of a range of subjects across the curriculum.

Beginning with resources for 14-16 year olds, the initial phase of the project produced curriculum resources for English, Mathematics and Modern Languages. In the second phase, further resources have been produced for these subject-areas together with a Science resource. Future development of the project will include resources for other subject-areas and age-groups.

The Charis Project Team:

Project Director:	John Shortt	Director of Stapleford House Education Centre
Deputy Director:	Alison Farnell	Departmental Manager of CARE for Education
Management Group:	Bridget Cass	Jerusalem Trust Education Consultant
	Ann Holt	Director of CARE for Education
	Robert Haigh	Headteacher of The Bishops' Blue Coat CE High School, Chester
	Tom Kempton	Head of Science at Didcot Girls' School
	Richard Wilkins	General Secretary of the Association of Christian Teachers

The Charis Project is funded by the Jerusalem Trust. Joanna Lunn, Trust Administrator, has made a particular contribution to the Project.

The Charis Science Writing Team:

Steve Bishop	formerly Oak Hill School, Bristol, now engaged in postgraduate studies
John Constable	Watford Grammar School for Boys, Watford
Penny Harris	formerly Farlington School, Horsham
Tom Kempton	Didcot Girls' School, Didcot
Sally Stokes	Emmanuel School, Oxford
Robin Walker	Ilkeston School, Ilkeston

Editors: John Shortt and Tom Kempton

The Charis Science Team gratefully acknowledge the help of the following schools which took part in trials of these materials:

Birkdale School, Sheffield	Emmanuel College, Gateshead
Christian Fellowship School, Liverpool	Trinity School, Stalybridge

The Team also wish to thank the following who gave encouragement, advice and/or comments on early drafts of some of these materials: John Bausor, Julie Fleetwood, John Holman, John Jordan, John Kirkman, John Martin, Kevin McCarthy, Peter Nelson, John Nixon, Michael Poole, Michael Reiss, Wendy Sharp, Vernon Smith, Dave Thomas and Brian Woolnough.

CHARIS
SCIENCE

UNITS 1 - 11

AGE RANGE 14 - 16+

PHOTOCOPIABLE

Project Director: John Shortt
Deputy Director: Alison Farnell

First published 1997 by:
The Stapleford Centre,
Stapleford House,
Wesley Place,
Stapleford
Nottingham, NG9 8DP
Tel: 0115 939 6270
Fax: 0115 939 2076
E-mail: charis@stapleford-centre.org

© The Stapleford Centre 1997

The Student Sheets which follow may be reproduced without infringing copyright provided reproduction is for student use within the purchasing institution only. The permission of the publishers must be obtained before reproducing this material for any other purpose. No other part of this publication may be reproduced, stored in a retrieval system, or transmitted, in any form or by any means, mechanical, electronic, photocopying, recording or otherwise without the prior permission of the publishers.

ISBN 1 902234 00 6

The Charis Project is a curriculum development initiative based at The Stapleford Centre, Nottingham. Details of training courses and other publications are available from the Centre at the address given above.

The publishers are grateful to the following for permission to use the extracts and illustrations indicated:

BBC Enterprises Ltd for extract quoted in Unit 1 from *Life Story: Horizon Special 1987*, producer N. Jackson.

Headway National Head Injuries Association Ltd. for extract quoted in Unit 1 from review by T. J. Powell of *Christopher's Story* by Myrtle Yeoman, published in *Headway News*, Spring 1996, p. 14.

The Office for National Statistics for statistics on numbers of abortions used in Unit 1, consumption of alcohol, consumption of foods, death rates for people under 65, new users of illegal drugs, and cigarette smoking, all used in Unit 2. These were published in *Social Trends 26*, Crown Copyright 1996, Office for National Statistics.

The Office for National Statistics for statistics on death rates for lung cancer used in Unit 2. These were published in *Social Trends 25*, Crown Copyright 1995, Office for National Statistics.

Department of Health Publications for statistics on malignant melanoma of the skin by gender used in Unit 2. These were published in *Health and Personal Social Services Statistics for England*, Crown Copyright 1996, Department of Health Publications.

The Institute for Study of Drug Dependence for statistics on drug use by 14-16 year-olds used in Unit 2. These were published in *Drugs Futures: changing patterns of drug use among English Youth* by Howard Parker et al, ISDD, 1995.

Reed Consumer Books Ltd for extracts quoted in Unit 4 from *The Organic Garden* by Sue Stickland, Hamlyn, 1992.

Marinus Dirk Stafleu for extract quoted in Unit 5 from his book *Time and Again*, Toronto: Wedge, 1980.

Random House UK Ltd for extract from *Dulce et Decorum Est* by Wilfred Owen quoted in Unit 7, published in *Collected Poems*, Chatto and Windus, 1963.

Mining Journal Books for maps in Unit 8 showing movement of the continents, published in *Concise World Atlas of Geology and Mineral Deposits* by D. Derry, Mining Journal Books, 1980.

Faber & Faber Ltd for quotation by Russell Stannard in Unit 9, published in *Science and Wonders* by Russell Stannard, Faber & Faber, 1996.

Icon Books Ltd for quotation by Felix Pirani in Unit 9, published in *The Universe for Beginners* by Felix Pirani and Christine Roche, Icon Books, 1993.

SPCK for quotation by John Polkinghorne in Unit 9, published in *Quarks, Chaos and Christianity* by John Polkinghorne, Triangle, 1994.

David Higham Associates for quotation by Arthur C. Clarke in Unit 9, published in *The Lost Worlds of 2001* by Arthur C. Clarke, Sidgwick & Jackson.

Victor Gollancz Limited for extract quoted in Unit 10 from *Lords and Ladies: A Discworld Novel* by Terry Pratchett, first published by Victor Gollancz, 1992.

Quotations on p. 120 reprinted by permission of Open Court Publishing Company, a division of Carus Publishing Company, Peru, Illinois, from *Cosmos, Bios, Theos*, edited by Henry Margeneau and R A Varghese, Open Court Publishing Company, first printing 1992.

Scientific American for quotation by Geoffrey Burbidge in Unit 10, from his article 'Why only one Big Bang?' published in *Scientific American*, February 1992, p. 96.

Transworld Publishers Ltd for quotation by Stephen Hawking in Unit 10, published in *Black Holes and Baby Universe* by Stephen Hawking, Bantam Press, 1993.

Harper Collins Publishers Ltd for quotation by Steven Weinberg in Unit 10, published in *The First Three Minutes* by Steven Weinberg, Flamingo, 1977.

The Association of Science Education for map showing fuel consumption of the world published in *SATIS Atlas, Science and Technology in Society*, 1992.

Scripture taken from the HOLY BIBLE, NEW INTERNATIONAL VERSION. Copyright © 1973, 1978, 1984 by International Bible Society. Used by permission of Hodder and Stoughton Limited.

The publishers have made every effort to trace copyright holders and obtain permission for copyright material. If any acknowledgement has been omitted, the publishers would be grateful for notification and corrections will be made as soon as possible.

Photographs, apart from those in Unit 1 © 1997 PhotoDisc. Inc.

CONTENTS

	Foreword	iv
	Introduction: The Charis Project	v
	Introduction: Charis Science	vii
Unit 1	The value of life (Sc2) Some ethical and social issues raised by a mechanistic approach to the human body and by some medical practice	1
Unit 2	Body matters (Sc2) Current health statistics and data are used to identify a healthy lifestyle and to provide an opportunity to assess personal behaviour in the light of this	9
Unit 3	It's all in the balance (Sc2) The natural balance which occurs in living communities and how it can be disrupted by human activities	25
Unit 4	Watch your waste! (Sc2) A holistic look at waste products and the interdependence of the whole natural system - leads to reflection on the role of humankind on Earth and our mortality	43
Unit 5	A brief history of atoms (Sc3) An (all too) brief look at the history of the theory of atoms which shows how scientific knowledge of reality is limited and can be flawed	61
Unit 6	Metals (Sc3) A look at the extraction of some metals and how science can be used for good or ill	73
Unit 7	Most noble Nobel (Sc3) Four important scientists and their discoveries in the field of Chemistry, each of which had the potential of being used for good or ill	85
Unit 8	Continental drift (Sc3) A look at how the theory of Continental Drift was developed and reflection on the limitations of science	101
Unit 9	There's no place like home (Sc4) Some special physical properties of the Earth that make it habitable	109
Unit 10	The Big Bang (Sc4) A look at current theories of how the Universe may have started	117
Unit 11	Fuel consumption (Sc4) Comparing fuel consumption in different countries and looking at the need for conservation	127

FOREWORD TO THE FIRST CHARIS PUBLICATIONS

BY PROFESSOR SIR STEWART SUTHERLAND

The OFSTED discussion paper of February 1994, in which I took a particular interest, *Spiritual, Moral, Social and Cultural Development*, pointed out that the development of pupils in these areas, could not be restricted to one or two periods per week and related school assemblies. The focus in question is rather a whole school and whole curriculum activity.

Schools declare and commend values under all four of these headings in a whole variety of ways - as much by what schools do as by what they teach in formal context. Equally however, there is hardly an area of the curriculum which does not, both explicitly as well as implicitly, raise questions of fundamental beliefs and values. It is this latter aspect of spiritual, moral, social and cultural development which is the concern of The Charis Project. The Stapleford Centre is to be commended for its contribution to both the debate and to classroom activity.

The Charis Project materials have the great merit of raising specific questions of beliefs and values which arise out of particular cases of subject content. This is by no means as easy as some would imply, nor would we expect the specific examples given to be uncontentious. The most important contribution of this material is to show that questions of beliefs and values do arise across the curriculum, and that to ignore that is to diminish the impact and the potential of education. There may well be differences of opinion about precisely which questions will most stimulate young minds, and which potential answers most approach adequate answers. The challenge is to enter the debate and to do so in a way that is most likely to promote spiritual, moral, social and cultural development of pupils of diverse ages and diverse backgrounds.

Stewart Sutherland

Principal and Vice-Chancellor of the University of Edinburgh
and formerly Her Majesty's Chief Inspector for Schools
May 1996

INTRODUCTION: THE CHARIS PROJECT

Teaching in the schools of the nineties

Teaching in our schools today is rather different from in previous decades. Teachers, pupils, communities and society have changed and developed, and technology has made a huge impact.

We talk of accountability and appraisal, SAT's scores and measurable outcomes, league tables and competition between schools. Somewhere, the pupil as a whole person is in danger of getting lost beneath the demands of all these outside constraints.

At the same time, the wider concerns are still there - both for legislators and for teachers. The 1988 Education Reform Act in England and Wales required schools to "promote the spiritual, moral, cultural, mental and physical development of pupils". This was further formalised by the Education (Schools) Act 1992, which saw the birth of OFSTED (the Office for Standards in Education), and of regular schools' inspections. Amongst other things, Registered Inspectors have to report on "the spiritual, moral, social and cultural development of pupils". These are not new considerations, they have always been there, but teachers are now giving more thought to this more fundamental dimension of education - the personal development of their pupils.

The development of the whole person

This renewed emphasis has spawned a mass of literature, seminars, consultations and conferences. A whole new language began to appear with much talk of the "four adjectives" or of "SMSC" (spiritual, moral, social and cultural). If that suggests that the person consists of four separate and unrelated 'bits', more recent talk of 'personal development' has re-affirmed the wholeness of the person.

The development of the whole person is clearly a whole school issue. It cannot be restricted to RE and assemblies and so become the responsibility only of those involved in these aspects of school life, of central importance though they may be. Also important to personal development, taking place as it does through personal relationships, especially those between teacher and pupil, is the ethos of the school. This pervades all aspects of the life of the school - in the classroom, in the playground, in the assembly-hall or at the bus queue. The QCA (Qualifications and Curriculum Authority) Forum on Values in Education and the Community (1997) has emphasised the importance of considering values in all subjects of the curriculum. The QCA's school pilot guidance materials will contribute to the revision of the National Curriculum for the year 2000. It is envisaged that consideration of values should then be given much greater prominence in classroom teaching.

Promoting personal development throughout the curriculum

The OFSTED discussion paper *Spiritual, Moral, Social and Cultural Development* (February 1994) claims that the promotion of spiritual and moral development in all schools should be a whole-curriculum matter. It goes on to say that "to move to such a place where subjects see themselves in this way might seem to require a sea-change in attitudes and approaches, but certainly the potential is there".

The school, and here this means all teachers in every subject across the curriculum, is encouraged to create opportunities which:

- provide pupils with knowledge and insight into values and beliefs;
- enable them to reflect on and develop their own beliefs and values, aspects of life and experiences so that they develop spiritual awareness and self knowledge;
- encourage pupils to consider life's fundamental questions, and relate religious teaching to those questions;
- encourage pupils to explore meaning and purpose, values and beliefs;
- teach the principles which help pupils to make moral decisions and to distinguish right from wrong;
- foster values such as honesty, fairness, respect for truth, justice and property;
- encourage pupils to express moral values across issues affecting their school community;
- encourage pupils to respect other people and relate to them positively;
- encourage pupils to take responsibility, exercise initiative, participate in community and develop an understanding of citizenship;

- create opportunities to work cooperatively, and to participate cooperatively in the school community;
- teach pupils to appreciate their own cultural traditions, and the diversity and richness of others, to gain understanding of societies, families, school and communities; and
- provide opportunities to enrich pupils' cultural learning experiences.

For some teachers, the responsibility that they are now given for the personal development of their pupils could be an added burden. For others it is a welcome return to educating pupils in a more holistic manner, re-focussed away from the exam success mentality. For all teachers in every part of the curriculum, it is an opportunity to enhance their teaching styles and resources.

The Charis Project

The Charis Project was set up to produce classroom resources for teachers who are beginning to effect the sea-change in attitudes and approaches to the curriculum called for by OFSTED. The first three subject-areas tackled are English, Mathematics and Modern Foreign Languages (French and German) with Science being added subsequently. The resources have been designed with the needs of pupils aged 14 - 16 years in mind.

The teachers in the writing teams have sought to produce materials which will help their colleagues to create the opportunities set out above. In particular, they are concerned to:

- enable teachers to respond to the challenge of educating the whole person;
- help teachers to focus on the spiritual and moral dimensions inherent in their subject;
- encourage pupils towards a clearer understanding of Christian perspectives on the fundamental questions that arise in all areas of knowledge; and
- contribute to the breadth, balance and harmony of pupils' knowledge and understanding.

It is recognised that there is much that is held in common among people of various faith perspectives and of no particular religious outlook. Values are often very widely shared and there can be quite general agreement on what is true, beautiful or good. The Charis resources seek to promote these common values. At the same time, the reasons why they are held and the basic beliefs about reality in which they are grounded differ from one perspective to another. These fundamental differences lead to different total outlooks and to detailed differences on what qualities, attitudes and actions are truly moral and/or spiritual. The Charis Project is based on the belief that these differences and the distinctives of the Christian perspective are significant and that understanding this is an important element in a pupil's education and personal development and a positive preparation for life in our contemporary plural society.

We are often asked why Charis was chosen as the name of the project. We tried without success to invent a catchy acronym. The modern foreign languages teachers said we could not have an English word in the title of a French or German book so we went to Greek and Hebrew. Somebody said "charis" and we all realised how well its idea of grace and giving fitted in with one of our concerns - to provide an antidote to the consumerist "me-first" assumptions of some curriculum resources. So it became the Charis Project!

The Charis resources are offered as a starting point with ideas to help teachers to promote the personal development of their pupils while still teaching to their examination syllabus. It is also our intention that, in using these materials, teachers will be encouraged to develop their own resources and their own methodologies for the promotion of spiritual and moral development through their subject-area. In preparing them, we have experienced something of a sea-change in our own attitudes and approaches. We hope that they may stimulate our colleagues to produce more and better resources.

John Shortt and Alison Farnell

Project Directors

INTRODUCTION: CHARIS SCIENCE

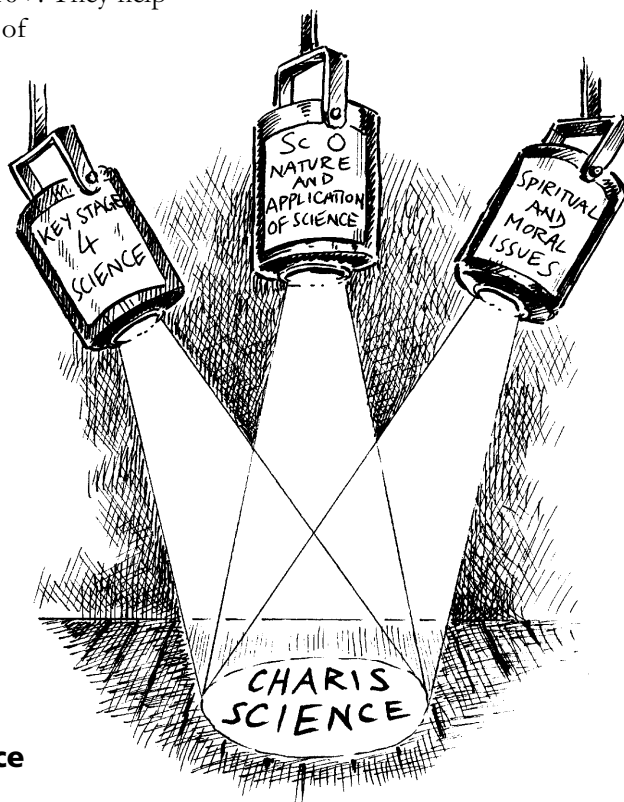
1. What are the aims of the science materials?

Our aim in writing this book is to provide material that addresses the Sc0 requirements of the National Curriculum for Science. In other words, elements of 'application of science' and 'the nature of scientific ideas' are considered.

These units are intended for use with students aged 14 - 16+. They help to develop the moral, spiritual, social and cultural aspects of the National Curriculum (KS4 in England and Wales) and to encourage the consideration of science within such parameters.

These units of work seek to:

- promote a sense of the meaning and the wholeness of life;
- challenge materialism and self-interest as a basis for life;
- explore moral aspects of relationships, both person to person and humankind to creation;
- encourage students to reflect on the role and development of science;
- develop an awareness of the limits of science;
- highlight the need to consider the moral, spiritual and social implications of scientific activity;
- give students a view of science 'with a human face'; and
- acknowledge that science is not value-free.



2. What are the implications for the Science teacher?

a) What am I aiming at when I use these units?

These are first and foremost science learning units with thought-provoking content.

In-depth discussion of the moral and spiritual issues is not the aim nor can it be a realistic goal of science at this stage of the students' learning. However, these materials should prompt students to reflect, and they are intended to stimulate their thinking and promote opportunities for their spiritual and moral development.

b) Won't this be too much for a disaffected class?

Don't under-estimate the effect of novelty.

Students become used to having a certain range of expectations placed on them in science lessons. Until now, it has rarely included consideration of spiritual and moral issues. These units may challenge your students' expectations of what they can think about in a science lesson by addressing important issues of the utmost relevance.

3. How do I fit in the time for these units on top of everything else?

Plan for integration into your existing course. Use them for revision, consolidation or as material presenting a new perspective on the nature of science. Much of the material can be used for homework.

All units can be used at any stage with 14 - 16+ students. They do not attempt to cover an entire GCSE module. Each unit has links with KS4 modules and is designed to enrich rather than replace existing work. They are intended to supplement your normal course. It is not necessary to use the whole of a unit: a number of them are specifically designed to allow the teacher to use them in a variety of ways. Many of the units may best be employed towards the end of a module. We expect them to take between one and two periods of 40 - 50 minutes, or equivalent time in homework.

The content of some of the units may, initially, appear more difficult than that of some of the texts in regular use. However, it seeks to touch areas of students' lives that remain otherwise untouched in science lessons. We can expect our students to be interested in more than the material, superficial requirements of life.

4. How do I use the materials?

We have tried to make them as flexible as possible. The material can be used unit by unit as the topic is taught; they can be used as revision material before module tests or examinations; or parts can be extracted and integrated into a scheme of work.

If the sheets are used in class, it should not be necessary to provide a copy for each and every student - they can share sheets. If the material is to be used for homework, it will, usually, only be necessary to copy one or two A4 sheets per student. The sheets are designed to be recyclable!

5. Won't this all be too difficult?

Whilst some of the material is targeted at those students preparing for the Higher paper, there is much that is accessible to Foundation Level students and it may be that the novelty of the content will encourage students to attempt material which might have been considered difficult for them.

There may be a need for additional guidance from the teacher initially since teaching strategies are being used which are not familiar in the context of science lessons - discussion, debate etc. The science teacher may wish to call on the experience of non-science colleagues who make more frequent use of these strategies.

6. How do I judge success?

- Students enjoy the lessons.
- Students start to make critical judgements of the role of science in other areas of the course.
- Students ask follow-up questions and want to discuss the ideas beyond the end of the lesson.

Summary

How do I get the most out of these units?

- Be prepared for the effect of novelty.
- Plan for integration of this material into your existing course. Use for revision and extension.
- See this as a vital part of your work as a science teacher.

How do my classes get the most out of these units?

- by enjoying the science they meet in a fresh context;
- by having time to reflect on the challenging issues raised;
- by learning about science as well as learning science!

The Charis Science Team

November 1997

Additional Resources

KEY : * introductory; ** intermediate; *** advanced

Bibliographies

Steve Bishop 'Introductory resources for the interaction of science and Christianity' *Themelios* January 1994 vol. 19 No. 2 (a five page annotated bibliography listing over 150 items)

Christians in Science Education (CISE) *List of Resources for Teachers on the Relationship between Science and Faith* (London: CISE, 1991) (split into 8 categories, including Miracles, Evolution and Environmental Issues)

General books

*** John Hedley Brooke *Science and Religion: Some Historical Perspectives* (Cambridge University Press, 1991) (an historical commentary on the relationship between science and religion)

** Rodney D. Holder *Nothing But Atoms and Molecules?* (Tunbridge Wells: Monarch, 1993) (provides a useful survey of the problems of reductionism written from a Christian perspective)

John Polkinghorne ** *Serious Talk* (London: SCM, 1996) and * *Quarks, Chaos and Christianity* (London: Triangle, 1994) (the second is more accessible than the first but both provide a useful overview of how dialogue between science and religion can proceed)

** Colin Russell *Cross-currents: Interactions Between Science and Faith* (London: Christian Impact, 1996) (a historical survey of the way science has developed and its interaction with Christianity)

* Russell Stannard *Doing Away with God? Creation and the Big Bang* (London: Marshall Pickering, 1993) (examines the resonances between Genesis and the Big Bang theory)

** Russell Stannard *Science and Wonders: Conversations about science and belief* (London: Faber and Faber 1996) (Professor Stannard interviews a number of scientists and theologians about the questions raised by science and religion)

*** Howard J. Van Til, Robert E. Snow, John H. Stek and Davis A. Young *Portraits of Creation: Biblical and Scientific Perspectives on the World's Formation* (Grand Rapids: Eerdmans, 1990) (a useful book on the origins of the physical world)

** David A. Wilkinson *God, the Big Bang and Stephen Hawking* (Tunbridge Wells: Monarch, 1996)

* David A. Wilkinson and Rob Frost *Thinking Clearly about God and Science* (Tunbridge Wells: Monarch, 1995)

* John Wright *Designer Universe: Is Christianity Compatible with Modern Science?* (Tunbridge Wells: Monarch, 1994)

** Richard T. Wright *Biology through the Eyes of Faith* (Leicester: Apollos, 1991)

For teachers

** *ASA Teaching Science in a Climate of Controversy* (rev edn) (Ipswich: American Scientific Affiliation, 1993) (available in the UK from CiS, Atholl Centre, Atholl Road, Pitlochry, Perthshire PH16 5BX; price £4.00)

** Steve Bishop 'Science and faith: boa constrictors and warthogs?' *Themelios* 19 (1) (October 1993) pp. 4-9 (a summary of some issues relating to science and faith; including the myth of neutrality, the philosophy of science and miracles)

* Adrian Brown 'Science and religion at the chalkface; where it all goes wrong in schools' *Spectrum* 28 (2) (Summer 1996) pp. 119-130

* Adrian Brown, Sue Hookway & Michael Poole *God Talk: Science Talk, A Teacher's Guide to Science & Belief* (Oxford: Lion, 1997)

** Reijer Hooykaas 'The Christian approach in teaching science' *Science and Christian Belief* vol 6 (2) (Oct 1994) pp. 113-28 (a stimulating article first published in 1960)

** Michael Poole *Beliefs and Values in Science Education* (Buckingham: Open University Press, 1996) (an examination of how beliefs and values interact with science education and includes chapters on Galileo and Creation/ Evolution)

** Michael Poole "The Galileo affair" *School Science Review* vol 90 Sept 1990 (258) pp. 39-48 (a useful resource to allay the myth of Galileo as the science martyr against the ignorance of the Church)

** Michael J. Reiss *Science Education for a Pluralist Society* (Buckingham: Open University Press, 1993 (a mine of useful information and ideas for those who want to break out of the materialistic reductionism that may characterise school science)

* Mark Roques *Curriculum Unmasked: Towards a Christian Understanding of Education* (Eastbourne: Monarch, 1989) (a critique of school textbooks and the worldviews that lie behind them, it also presents a Christian response and contains two chapters on science education)

For Pupils

* Michael Poole *A Guide to Science and Christian Belief* (Oxford: Lion, 1994) (suitable for bright students at KS4 and above)

* Russell Stannard *Here I am!* (London: Faber and Faber, 1992) (a story aimed at KS2-3 students, written by a professor of physics, that examines the role of God in creation)

Russell Stannard *The Question Is ...?* (a video published by the Christian Education Movement for the John Templeton Foundation, 1995)

Useful addresses

CISE (Christians in Science Education) (Sponsored by the Association of Christian Teachers and Christians in Science) 5 Longcroft Road, Edgware, Middx HA8 6RR (produces a newsletter twice a year, annual subscription is £5.00)

Christian Schools Trust Science Curriculum Team c/o 108 Ratcliffe Drive, Stoke Gifford Bristol BS12 6UB (produced a number of papers dealing with a Christian approach to the teaching of Science)

Unit	Title	National Curriculum KS4	Sc0 The Nature of Science	Principle Spiritual and Moral Aims	Activities	Tier
1	<i>The value of life</i>	Sc2 Life processes and living things: 1. Life processes and cell activity: (a) and (e) 4. Variation, inheritance and evolution: (g) and (h)	2. Application of science: (a) and (c)	To promote an appreciation of the wonder of life; to provide real-life contexts for ethical judgements; and to show that some medical judgements involve the devaluing of life.	Case studies. Reading and questions. Data analysis.	F/H & H
2	<i>Body matters</i>	Sc2 Life processes and living things 2. Humans as organisms: (k) and (t)	2. Application of science: (b) 5. Health and safety: (a), (b) and (c)	To help students to assess how they value themselves by examining how responsible they are in caring for their bodies.	Magazine-style quiz. Brainstorming and speculation. Graph and data analysis.	F/H
3	<i>It's all in the balance</i>	Sc2 Life processes and living things 5. Living things in their environment: (a) and (b)	2. Application of science: (c) and (d)	To increase awareness of God's creativity in the variety and uniqueness of living things; to encourage good stewardship of the natural world by reflecting on the effects of individual actions (including a look at suffering).	Card-game for small groups. Brainstorming and speculation exercise.	F/H
4	<i>Watch your waste!</i>	Sc2 Life processes and living things 3. Green plants as organisms: (d) 5. Living things in their environment: (b) and (e)	2. Application of science: (a) and (d)	To help students to re-appraise the value of 'waste' and the importance of natural cycles of replenishment; to show humankind as part of an interdependent system; and to promote reflection on death and personal mortality.	Board-game for small groups. Reading and questions. Case studies.	F/H & H
5	<i>A brief history of atoms</i>	Sc3 Materials and their properties 1. Classifying materials: (a), (b), (c) and (e)	3. The nature of scientific ideas: (a) and (b)	To show that scientific knowledge of reality is limited and can be flawed.	Interpreting diagrams and charts. Model making. Reading and questions.	F/H & H
6	<i>Metals</i>	Sc3 Materials and their properties 2. Changing materials: (j), (k), (l), (m) and (o)	2. Application of science: (a), (b), (c), (d) and (e)	To encourage a value for the ideas and beliefs of people of other cultures; to counter exploitative views of third world peoples and ways of life; and to show that science can be used for good or evil.	Writing to a newspaper/MP. Brainstorming and speculation. Reading and questions.	F/H
7	<i>Most noble Nobel</i>	Sc3 Materials and their properties 2. Changing materials: (p)	2. Application of science: (a) and (b)	To show a need to accept responsibility for one's actions and to think through their likely outcomes including their effects on others; and to show that scientific discovery can be used for good or evil.	Balloon debate. Case studies. Reading and questions.	F/H
8	<i>Continental drift</i>	Sc3 Materials and their properties 2. Changing materials: (z)	3. The nature of scientific ideas: (a)	To show that scientific theory should not be used to explain away or deny a purpose but, rather, to illustrate the grandeur of creation and the intricacies involved.	Interpreting maps and charts. Brainstorming and speculation. Reading and questions.	F/H & H
9	<i>There's no place like home</i>	Sc4 Physical processes 4. The Earth and beyond: (a) and (b)	3. The nature of scientific ideas: (a) and (b)	To promote a sense of awe at the immensity of the Universe and the astonishing degree of balance and 'fine tuning' there is in it.	Brainstorming and speculation.	F/H & H
10	<i>The Big Bang</i>	Sc4 Physical processes 4. The Earth and beyond: (d)	3. The nature of scientific ideas: (a) and (b)	To explore the compatibility of the Big Bang model with some religious views.	Brainstorming and speculation. Reading and questions.	H
11	<i>Fuel consumption</i>	Sc4 Physical processes 5. Energy resources and energy transfer: (c)	2. Application of science: (b) and (d)	To encourage good stewardship of resources; and to show that greed and exploitation of energy resources starves the developing countries.	Interpreting maps. Preparing and giving a talk.	F/H & H