Woolverstone Hall School — Governors' Report March 1986

PHYSICS DEPARTMENT

AIMS, PRINCIPLES AND METHODS

In addition to the Science Department Aims:-

1. To stimulate and sustain an interest in and an enjoyment of Physics and its applications.

2. To show that Physics is a coherent framework of knowledge based on fundamental theories of the structure and processes of the physical world.

3. To provide a basic knowledge and understanding of the principles of Physics and a range of applications appropriate to a technologically based society and to show that Physics is relevant to the economic, environmental and social needs of that society.

4. To provide, at each level, an appropriate body of knowledge for those not studying the subject beyond that level, which will also serve as a foundation course for more advanced studies in Physics and to provide the essential background for study in subjects for which Physics is relevant.

5. To develop practical skills and the skills of observation, of experimentation, and of processing and interpretation of data, including the selection and evaluation of evidence.

6. To encourage students to apply, qualitatively and quantitatively, their knowledge and understanding of physical principles to familiar and unfamiliar situations.

7. To ensure students follow instructions and comply with safety procedures.

8. To foster relevant communication skills, and the ability to work with other people.

9. To foster independent thought both on physical principles and, through discussion, on the construction of appropriate models and theories.

The syllabuses followed are all Nuffield orientated and their basic philosophy is to learn by doing, discovering and discussing. The boys respond well to this and seem to enjoy the times when they are actively having success at discovering something.

SYLLABUS

a) 6th. Form: The A Level course followed is the Nuffield "A" Level, set by Cambridge Local for O & C Joint comprising 12 units -

Unit	A	Materials and mechanics.
	B	Currents, circuits and charge.
	C	Digital electronic systems.
	D	Oscillations and waves.
	E	Field and potential.
	F	Radioactivity and the nuclear atom.
	G	Energy sources.
	H	Magnetic fields and a.c.
	I	Linear electronics, feedback and control.
	J	Electromagnetic waves.
	K	Energy and entropy.
	L	Waves, particles and atoms.
	+	All students undertake two independent investigation, each lasting two weeks.

The units are organized as:-

Forces and fields	Matter and atoms	Stability and change	Unit
	Solids: deformation and structure Gases	Statics: equilibrium Dynamics: collisions	A
Current: potential difference; capacitors; charge	Conduction Electrons	Decay of charge	B
		Digital electronics: gates; memory	C
		Waves; oscillations; resonance; standing waves	D
Electric and gravitational field Inverse-square law Potential		Circular motion	E
	Radioactivity Rutherford atom Ionization	Exponential decay; randomness	F
Nuclear forces	Nuclear binding energy	Fission; fusion	
		Energy supply and demand Thermal conduction Energy conversion	G
Magnetic field; electromagnetic induction			H
		Linear electronics: amplification; oscillation; feedback and control	I
Electromagnetic spectrum Electromagnetic waves		Optics: diffraction and interference	J
		Entropy Boltzmann factor Absolute temperature	K
	Photoelectric effect Spectra; energy levels Wave/particle duality for photons, electrons		L

The One Year Sixth are following an electronics course based on "A Practical Approach to Systems Electronics" by Gregory, Hackett and Vincent-Smith. The main topics covered are -

Combinational logic.
Sequential logic.
Analogue systems.
Diodes and transistors.
Basic radio reception.
More advanced digital circuits and analogue systems.

b) 3rd. - 5th. Forms:

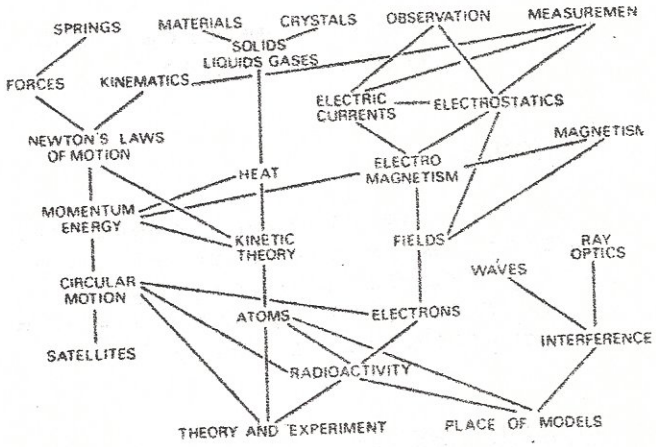
All pupils are following the "Nuffield style" EAEB/London 16+ exam.

<u>The syllabus "map" and the year syllabuses:</u>

A particular feature of the Physics (Nuffield) course is that it provides a connected scheme. Topics discussed in one part of the course are shown to be relevant to other parts, so that in the end a fabric of experience and knowledge becomes established.

The structure of the course was built up back-wards. End-points were agreed and it was then decided what earlier topics were needed to reach these end-points as well as provide the ground work for understanding later teaching. The General Introduction and the Teacher's Guides put this clearly. They explain that one end-point might be some 'atomic physics' (including some radioactivity and something about models). If this were to make any sense it should be preceded by some teaching of electron streams and ions, and their deflection by electric and magnetic fields. A good knowledge of energy would also be necessary. These topics would in turn need some experience of electric currents, magnetism, kinetic theory of gases and Newtonian dynamics. The latter would require some initial study of forces and of motion.

This syllabus in Physics (Nuffield) has deliberately preserved this sense of structure. This is illustrated in the adjacent diagram.



RESOURCES

The department is well provided with standard laboratory equipment, several computer programmes are available and the main books used by the pupils are:-

6th. Form

Nuffield Advanced Physics	Students Guide.
Nuffield Advanced Physics	Resource books.
Duncan Advanced Physics	Materials and Mechanics.
Duncan Advanced Physics	Fields, Waves and Atoms.

3rd. - 5th. Forms

Duncan Exploring Physics	Books III - V.
Fuller & Coates Light on Physics.	
Hall Simply Physics.	

Other resource and text books are available for use as, and when, required.

FINANCE

The present resources are adequate to run the Department, but are not sufficient to allow any real curriculum advances in the world of microelectronics, or the replacement of aging equipment. We have been fortunate to obtain a special grant to allow the revised Nuffield A Level Course to be followed.

FUTURE TRENDS

The present trend in science education, backed strongly by the ILEA inspectorate and various HMI initiatives puts the future of the 3rd. to 5th. year courses very much open to debate and we are, together with the rest of the Department, looking at the new initiatives and the courses arising from them. We will welcome the end of the "once and for all" fifth year exams, as they are replaced by annual assessments and think that present developments seem very exciting.

We have appreciated the very supportive and encouraging remarks from HM Inspectorate and our own Inspectorate in the follow up to the Quinquennial. The point was made that there could have been more electronics teaching and, though very limited by resources, we have introduced two microelectronic courses (in the third and 6/1) and look to expand this in future years.

As mentioned in the quinquennial review, and at the follow up Governors' meeting, we are still concerned that the crowded shelves in the laboratories constitute something of a Health and Safety risk and also prevent the display of pupils' work or allow work on long term projects. The previous request, repeated at the Governors' meeting,

for the unused cloaks area between the laboratories to be converted to a store has as yet received no positive answer.

The Inspectorate's possible offer of a Nimbus has been followed up with alacrity and we still have some hope of providing real computing in the Department.

H.J.Ramsay
Head of Physics