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THE ROLE OF PHILOSOPHY IN A SCIENCE CURRICULUM

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ABSTRACT

This paper argues that almost all science curricula are counter-educative in al least one important sense - in their making no provision for discussing the truly fundamental questions and the broad issues entailed in science. All too often, students' interests in such questions and issues are stifled. There is an urgent need for curriculum planners and teachers to recognize this and to allot a formal place in the science curriculum to cater properly for this need.

Mention is made of two universities where this is being done with considerable success - The Open University of Great Britain, and Universiti Malaya. A number of fundamental pedagogic points are also made in this paper, neglect of which must negate any effort to open out and render more truly educative a science curriculum.

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In this paper I shall be arguing that, contrary to a general and quite understandable scepticism about philosophy having any value whatsoever, philosophy can be a 'useful' thing and can even deserve a place in formal education. I shall not be arguing that philosophy has more educational value than any other area of enquiry because I do not believe that any subject possesses greater educational merit than any other subject. And I do not believe that any subject possesses greater educational merit than any other subject. And I do not believe this simply because, as a teacher, I have come to realize that what is of value and permanence in education is not so much what is taught but how one teaches. So, my claim for philosophy having a place in the curriculum is a fairly modest one. I shall, however, be saying that philosophy can play a unique (but not a uniquely valuable) role in the curriculum, and particularly in the natural science curriculum.

Before going any further, we should be clear about what philosophy is and what it is not. The term derives from two Greek words, and as such it originally meant 'love of wisdom'. I don't think it means that any longer, partly because it has changed as human society has changed and partly because wisdom is rather too high a goal even for professional philosophers. Indeed, philosophers turn out to be as foolish and nasty as any other type of person. What I mean by philosophy is simply and solely: The asking of fundamental questions. There is no special area within which one has to ask such questions; they could be asked within metaphysics, or theology, or the social or natural sciences, or domestic science, or politics, or farming - in fact, in any area of human discourse and activity. What makes a question a philosophical question, and what makes all such questions when taken together 'philosophy' is its fundamentalism. A person starts to ask fundamental questions when he/she has learned to strip away the superficial, non-essential aspects of a phenomenon and to enquire about the heart of the matter. These two tasks namely, stripping away the superficial, and enquiry - are the business that I call 'philosophy' and it is in this very unpretentious from that I shall use the word 'philosophy' in this paper.

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I say 'unpretentious' because, it seems to me, everyone is capable of doing this. You don't have to be a 'philosopher' to do it. All you need is a certain way of looking at things, a certain critical spirit, a commitment to the belief that most things are not what they seem to be and that it is always worthwhile asking questions. Ideally, this spirit or attitude should be inculcated into every student during the formal educational process. However, we all know that in most cases it is not. Even at the tertiary level where one might assume that students are most able to handle knowledge critically this is not the case. And, even more tragically, this is not the case in that area of human endeavour which itself has been so indebted to this spirit-of-enquiry-and-criticism. I mean the natural sciences.

II. Some pedagogic points on the role of philosophy in a natural science curriculum.

My own introduction to the use of philosophy (and of history) in a natural science curriculum came when I was at Secondary School as a student. One of our science teachers decided, as an experiment, to take our class through a course in history and philosophy of science. He followed a syllabus, the Oxford and Cambridge Board O/A Level syllabus in History and Philosophy of Science (the only such syllabus in existence in Britain, and at a level intermediate between O level and A level), but he did not intend us to take the exam because he wanted the course to be a means for us to have an opportunity to ask the type of question that the usual school curriculum makes no time for and to see things - in this case, the big thing we call 'science' - from a broad perspective. As we got into the course, however, he realized that we were enjoying it and were proving to be competent at it; so he registered us for the exam but told us not to take it too seriously and not to worry if we failed. We all passed, and we passed so well that our teacher won a prestigious teaching prize for the results. Since, to my knowledge, our teacher's name is virtually unknown outside of his own immediate circle I wish to record it here for he was, and still is, a very great teacher indeed - the sort of teacher that every educational establishment ought to have but so seldom does have. He is the Rev. Fr. Pearon, and he was one of the natural science teachers at Ratcliffe College, Leicestershire, England.

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It was because of his commitment to two things - to education as a process of developing skills and values rather than as a mechanism for instilling knowledge, and to what I have described as 'philosophy' - and to his ability as a teacher to communicate that commitment to his students that I, for one, acquired two interests - an interest in teaching, and an interest in philosophy. It therefore seemed quite natural to me that whilst reading for my science degree (biochemistry at Oxford) I should do a special course and project in the history of biochemistry and that afterwards I should do some studies in history and philosophy of science. In hindsight, it also seems to have been natural that my first job was in an educational establishment where the task of teaching is taken much more seriously than in most other places, namely The Open University.

Mention of The Open University makes this an appropriate moment to discuss some of the basic teaching principles that I believe to be crucial in teaching generally and particularly in the teaching of something as potentially esoteric as philosophy to non-philosophers. Firstly, one must carefully identify one's students. By this I mean that one must try, before all else, to weigh up the intellectual capabilities of one's students one must try to understand their perceptions, their command of vocabulary, their thought-patterns, how well they can follow a sophisticated argument even if such an argument is couched in completely non-technical terms, and the degree of interest they are likely to have in the subject being taught. In other words, find out about your students first, and only after having done that should you design your curricular in detail. This is a fundamental principle in the teaching philosophy of The Open University, and it is my primary principle in the teaching of philosophy to science students.

Secondly, a course should never fall into the trap of being too systematic for its students. Teaching a highly systematic and rigorous course to students who are not ready for such a level of discourse must always to more-or-less counterproductive. Of course, it is often very tempting for a teacher and especially for someone who is truly an academic to present his subject as thoroughly and fully as possible. But that is not the job of any teacher. It is a job best left to textbooks. Many teachers, and especially many teachers of philosophy, seem not to realize this and in their efforts to be thorough and to teach everything they simply destroy all interest and creativity in their students.

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Thirdly, the teacher's main aim in presenting a course and the curriculum planner's main aim in designing any course should be to equip a student with the fundamental tools in that discipline for he himself to do something creative in it. In the case of a philosophy course for science students, this entails giving one's students enough understanding and sufficient confidence for they themselves to start asking fundamental questions.

These three principles, in my opinion, are absolute requirements for good teaching at all levels - primary, secondary and tertiary.

III. Why philosophy in a science curriculum?

There are a number of reasons for discussing issues within a philosophical framework in a science curriculum. The main ones seem to me to be as follows:-

i) At bottom, many of the most interesting and intricate questions and ideas in the natural sciences are actually so fundamental that they may be said to be philosophical. There is a certain stage at which the natural scientist and the philosopher find a common ground, where they find that they are working on the same problem although from different angles. In twentieth-century science, this has been most conspicuous in physics, particularly in the development of Quantum Mechanics in which the principal participants - Niels Bohr, Albert Einstein, Werner Heisenberg Wolfgang Pauli and Erwin Schrodinger (mentioning only a few) - were acutely aware of the fundamental and philosophical nature of their science and of its implications for the world outside of science. A measure of the philosophical nature of what they were doing is that Einstein's name has been cited more often than any other within twentieth-century Western philosophy. If a visitor were to come from outer space in a thousand years from now, knowing nothing of the history of mankind, and were to browse through the philosophical writings of the twentieth century he would get the impression that there was one truly great philosopher in that period, namely Albert Einstein. But we all know that Einstein was actually a mathematician and physicist, not a philosopher. Or was he?

If so much of the intellectual history of science has been a philosophical enterprise (and there is abundant evidence for this), there should surely be a place for revealing this is our science curricula. The history of science has not been a mere sequence of more-or-less mechanical answers to straightforward, purely technical questions-in-science; nor is this what modern science is like. Science always has been, and always will be, a creative, fallible venture into the unknown; and one might venture the generalization that its most enduring achievements have come from the asking of the most risky and fundamental questions - questions which have gone beyond the realm of empirical evidence and safe method. How few science teachers impart this realization to their students. It is, in my opinion, an urgent task for historians and philosophers of science to put the record straight and, if possible, to get science students themselves to share the sense of exhilaration and of confusion which comes with the breaking of new ground. This is something that I and my colleagues in the history and philosophy of science try to do with the science students in Universiti Malaya. We have some 1500 students taking our courses in history and philosophy of science at any one time; and it is our dream that just a small percentage of of them leave the university with food for thought about science and particularly about the 'big', the fundamental, issues that scientists themselves have raised and, more often than not, have left unanswered.

ii) Many people, and certainly many students, are naturally interested in asking questions about Nature which go beyond any method and make light of mere evidence. Questions which begin with 'Why?' or 'How can we be so sure that...?' are often just such. In the final analysis, these questions are actually challenges to what we take to be 'proper scientific method' and 'good science'. The question then arises of what to do with these questions. Should the science teacher wave them aside as being, at best, distracting and, at worst, stupid? Many science teachers do exactly this, or (quite understanding) they feel they don't have time to deal with them even if they feel inclined to do so. The curriculum and the pressure of examinations prevent them.

This dilemma can be resolved by making a place for the handling of such questions in the science curriculum, by providing a breathing space where, under minimal curriculum and examination pressure, students and teachers can play with them. I use the word 'play' deliberately. We all know how important play is for the intellectual development of the very young. I believe it is still important for intellectual development at the secondary and tertiary levels of education, and beyond. To play with an idea, to have the leisure to turn it around and upside down, to see what makes it tick - this is something that all students should be given opportunities to do. It is something that I try to do, as a philosopher with my science students. For example, every year I ask my class to tell me what topic(s) more-or-less within their natural science they are really interested in and would like to discuss. Last year, at the top of their list was 'The Quality of Life'. We therefore spent two lectures looking at this topic, asking such questions as: What does the phrase mean? How can we measure it? Can we, as scientists, say anything especially worthwhile about it? And what about its social and political dimensions? My students themselves contributed enormously to the discussions. Some of their contributions were flippant, but a skillful teacher can always turn a flippant comment to useful account. But in the end, they all agreed that the discussion had been worthwhile as well as just refreshing and they requested a question on it in their Finals Examinations. Which they got, and on which some of them did brilliantly.

iii. A third reason for providing a philosophical breathing space in a science curriculum is that a number of issues in natural science inevitably touch upon our deepest beliefs and values. What we learn in science sooner or later comes into contact with our world-view, with our religion, even with our conception of a good society. Evolution theory comes particularly to mind. Often, the science teacher does not have the time or the background to deal with this; and consequently many students develop a sort of schizophrenia with regard to their education, treating one area as the realm of 'facts' and 'knowledge'

and another, intrinsically more interesting area as the extra-curricular realm of values and beliefs and 'what-life-is-all-about'. This is a tragedy. It undermines so many of our pretensions to providing education. And unless science curriculum planners and teachers make a deliberate effort to allow for such discussions, this absurdity will grow.

iv) A final reason is that the thoughtful man and woman eventually realizes that reason and belief each possess their own legitimate areas of operation and their own limitations. Eventually, one has to ask questions like: Where does science end and belief take over? How far can we go with our science, or with our rationality? Is the world of science a separate one from the world of belief and values? Do these two worlds conflict? Or are they complementary, like the two sides of one coin neither of which could exist without the other? And out of all this, how does Man emerge? These questions are amongst the most profound that can be asked, and many of our students do ask them - only to be greeted with a wall of silence from their 'educators'.

IV. Conclusion

If we are to be serious about education, and if science teachers are to do something about the commonly acknowledged social sterility and intellectual confinement of science curricula, a place must be made for genuine enquiry and freedom. This is not to say that science curricula should have a couple of hours of anarchy per week, under the pretentious label of 'philosophy'. Rather, students and their teachers should have a properly acknowledged opportunity to explore some of the fundamental and often somewhat indefinite issues that are entailed in this thing we call 'science'. Whether we call this opportunity 'philosophy' or something else like 'complementary science' (which is the term used in Universiti Malaya') does not really matter. Made proper use of, it will be an exercise of fundamental importance, intellectually and educationally. Its success, of course, will depend upon the seriousness with which teachers and educators, and in the long run politicians too, take this intricate and delicate ideal called 'education'.

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Selected Bibiegraphy

There is a wealth of literature in, and on, the history and philosophy of science, on the teaching of philosophy, and in criticism of science curricula. I find it impossible to recommend any works in particular for a recommendation should have some sort of reader in mind as well as some fairly specific intention. And given the nature of this conference, I am hesitant about both. However, mention has been made of two universities where philosophy (of science) and history of science are taught to science students; so mention of some of their material might be in order. The latest course available in The Open University is called: Science and Belief: from Darwin to Einstein. There is a set of Open University texts for this, as well as two anthologies - Coley N.G. & Hall V.M.D., Darwin to Einstein: Primary sources on Science and Belief, and Chant C & Fauvel J, Darwin to Einstein: Historical studies on Science and Belief, London, Longman, 1980.

In Universiti Malaya there are currently four courses in History and Philosophy of Science for science students. For a concise statement of the philosophy behind this programme, see the anthology of reading: SF 403 Falsafah Sains, Sesi 1983/84, ed. Vance Hall, available from the Dean's Office, Science Faculty, Universiti Malaya, Lembah Pantai, Kuala Lumpur.