1980

# Understanding and Attitudes Derived from the Use of Animals in Schools

Peter J. Kelly
*Southampton University*

of Animal Problems in Washington September, 1979. Not one response has been forthcoming from the academic community. Surprisingly, two responses have come from secondary school students, both excerpted here.

> *. . . I think that biologists should be the only ones to experiment with animals. I think if the high schools want preserved animals to dissect fine. Probably over half of the science teachers aren't sure how to care for the animals. My science teacher did an experiment with gerbils. After the experiment was over, the animals just sat there in their cages. Most of the cages were filthy. They kept breeding and finally he had to give them away. (Richard Harland, Louisville, KY.)*

> *I am a science research student at Beach Channel High School, who recently undertook a project involving the effect of extremely low dosages of caffeine on a mouse's ability to run through a maze, and to adapt to light. Out of the 15 mice I used in my experiment, there were no deaths; and after the end of the experiment, there were over 22 births. Because of an outdated rule, my project is banned from the Westinghouse Fair, one of the most prestigious fairs in the country. I do not feel my project should be banned, when other projects involving extreme cruelty to invertebrates are allowed. (R. Schroeder, New York, NY.)*

## *Conclusion*

Surely the use of some live animals in the classroom is not unreasonable. Today, youngsters need to become actively involved in the learning/discovery process. Use of live material sustains greater interest, provides greater motivation, and probably assures more permanent retention.

Regulation of activities will continue to be important. Attitudes displayed by the teacher do create a learning experience intentionally or not, negative or positive towards the advance of humane attitudes.

I would like to see an orderly progression of limitations, disseminated through teaching journals, workshops, etc., and avoiding extremist positions. This could be accomplished by enlisting cooperation of teacher training institutes and industrial sponsors, Westinghouse and others, in establishing a uniform set of standards for live animal use.

## *References*

Gibbs, L., Nace, W., and Emmons, M.B. (1971) The live frog is dead, *BioScience 21 (20)*, October 15.

*Modern Medicine* (1973) Where have all the frogs gone? November 12, pp. 20-24.



# Understanding and Attitudes Derived from the Use of Animals in Schools*

Peter J. Kelly

## *Abstract*

*A general review of the variety of activities involving the direct use of animals which are undertaken in secondary schools. An assessment is made of their value (positive and negative) in terms of knowledge and attitudes (including ethics) which are, or might be, derived from them. Alternative methods also are reviewed with an assessment of their value in relation to live animal studies.*

## *The British Context*

British schools have a long tradition of keeping and of using animals. This has its roots in the nineteenth century attitude portrayed, for example, by Robert Patterson in his book *An Introduction to Zoology* published in 1848 where he says: "The great object should be to bring natural history knowledge home to the personal experience of the pupil . . . Small collections of objects made by the pupils themselves would, under the guidance of a judicious teacher, be of great value in this species of mental culture and would form the much-prized ornaments of the school room." No biology room or laboratory since seems to have been without its geranium plant, skeleton, aquarium and the inevitable pet mouse, rat, rabbit or guinea pig. The type system of teaching zoology initiated by Thomas Henry Huxley reinforced the tradition. In this a limited set of species representing the major phyla is studied and a display in the laboratory of living animals, dead specimens and their parts, and pictures of the species is a frequent accompaniment.

This Victorian legacy still hangs on to some extent but in recent years it has been modified by several influences, including the curriculum development projects of the nineteen sixties, which have broadened the scope of biology teaching beyond taxonomy, morphology and physiology to include behaviour, ecology, genetics and other aspects of the subject. In particular, the human species has become an increasingly important focus of interest.

These projects have tended to enhance the status of practical work, especially

*This paper is an edited version of "Organisms in Schools: Retrospect and Prospect", published in *The Educational Use of Living Organisms: A Source Book*. P.J. Kelly and J.D. Wray, eds., 1975, English Universities Press, London, U.K.

that which involves experiments and encourages pupils to explore, observe and be creative. The development of attitudes toward living organisms has also become an increasingly prominent educational objective expressed in such phrases as "To encourage a respect and feeling for all living things" which is one of the aspirations of the Nuffield O-level biology project.

In 1974 a Working Party of the Schools Council (an institution concerned with developing new curricula and examinations and governed by representatives of teachers' professional organizations, local education authorities and the national Department of Education and Science) drew up a list of aims for the educational use of living organisms (Schools Council, 1974). It was approved by an extensive body of opinion and depicts clearly the broad perspectives that provide the framework for present-day thinking:

*To provide a source of inherently interesting material which can be used to arouse and encourage an attitude of controlled curiosity and inquiry.*

*To provide the opportunity for personal experience in observing and investigating living organisms, their diversity, their variation, their inter-relationships and life processes.*

*To inspire and encourage creative work in a variety of disciplines.*

*To promote an understanding of some of the concepts of biology and of the processes associated with life.*

*To identify and to examine those factors in the immediate environment of living organisms which affect them and to develop an understanding of the relationships between living organisms and their environment.*

*To promote an understanding of the relationship between man and other living organisms; of his dependence on many living organisms; of the reason for his exploitation of certain living organisms for food and for other needs; and of his competition with pests and predators.*

*To develop sensitivity to and consideration for the needs of living organisms.*

*To emphasise that man as a living organism has certain needs and to encourage an attitude of thoughtfulness and consideration when dealing with other human beings.*

*To encourage an attitude of concern about the conservation of natural environments in which living organisms may thrive and an awareness of the problems associated with conservation.*

*To develop an aesthetic appreciation of the colour, form and movement associated with living organisms and of the enjoyment of them.*

*To give information about and experience in the necessary skills involved in the techniques of care and management of living organisms.*

*To impress by showing that, when it is necessary to kill animals, for whatever reason, the most humane methods are always used.*





A survey by the Schools Council's Educational Use of Living Organisms (EULO) project in 1970 found a range of over 100 species (or groups) being used in secondary schools (Kelly and Wray, 1971). Thirty-one of these were vertebrates. In order of the percentage of schools using them the most prevalent vertebrate species were the common frog (81%), mouse (68%), newt (63%), goldfish (54%), gerbil (54%), guppy (50%), common toad (45%), rat (44%), guinea pig (41%) and rabbit (41%). Thirty-three percent were using the Nuffield O-level biology materials, at least in part. Smaller proportions were using courses from other curriculum development projects initiated in the nineteen sixties. Thirty-three percent of the schools had Natural History or Biological Societies, 12% had Pet Clubs and 63% used organisms in informal, extra-curricular activities with pupils. Predominantly organisms were used for scientific-work, rarely as foci of interest in other subjects or for therapeutic purposes.

Although scientific studies were cited as the main context in which organisms are used, this tended to be chiefly concerned with descriptive studies rather than experiments. It is in the Nuffield biology courses that the latter occur most but, as Table 1

**Table 1: Use of living (or freshly killed) material in the Nuffield biology courses†**

| | % of exercises involving living material | Relative use of the main groups of living organisms expressed as a percentage | |
|---|---|---|---|
| | | Invertebrates | Vertebrates‡ |
| **Nuffield 0-Level** | | | |
| Year 1 Introducing Living Things | 85 | 44 | 42 (H = 4) |
| Year 2 Life and Living Processes | 60 | 5 | 10 (H = 2) |
| Year 3 The Maintenance of Life | 73 | 15 | 17 (H = 14) |
| Year 4 Living Things in Action | 73 | 25 | 25 (H = 14) |
| Year 5 The Perpetuation of Life | 72 | 26 | 28 (H = 11) |
| Average use overall | 72 | 23 | 24 (H = 10) |
| **Nuffield A-Level** | | | |
| Maintenance of the Organism | 61 | 28 | 13 (H = 5) |
| Organisms and Populations | 89 | 34 | 8 (H = 3) |
| The Developing Organism | 71 | 6 | 22 (H = 3) |
| Control and Co-ordination | 82 | 18 | 32 (H = 6) |
| Average use overall | 75 | 22 | 18 H = 4) |

†Excludes communities where individual species were not noted, and all blood except human blood.
‡H = Use of the human species.

(Dowdeswell, 1975) indicates, the number of activities using vertebrates is, in fact, small, and among the vertebrate species used the pupils themselves figure prominently.

There is certainly no reason to suspect that the use of organisms has increased since these studies were made. The economic vicissitudes which have beset the education system over the last five years have allowed little room for expansion.

Overall, then, the position in Britain can be summarized as being one in which there is a tradition of using living things in education; in which the use of living organisms is now limited to a wide range of educational aims; in which most secondary schools use organisms, especially for descriptive work in science (biology) lessons; and in which the use of vertebrates for experimental studies is small.

To complete the picture two other matters should be mentioned. The first is that there are legal and moral constraints on the use of vertebrates in the form of the Cruelty to Animals Act of 1876 and the Protection of Animals Act 1911. The latter is the principal statute and states that it is an offense to "cruelly beat, kick or ill-treat, over-ride, over-drive, over-load, torture, infuriate or terrify any animal" or "by wantonly or unreasonably doing or omitting to do any act . . . cause unnecessary suffering, or being the owner, permit any unnecessary suffering to be so caused to any animal." Other sections of this Act make it an offence to convey any animal in a way that causes unnecessary suffering, or to "wilfully, without any reasonable cause or excuse, administer, or cause . . . such administration of any poisonous or injurious drug or substance to any animal . . . ", or to subject "any animal to any operation which is performed without due care and humanity" (O'Donoghue, 1975). Because of these constraints vivisection and cruelty to animals in schools is "officially" non-existent. Unofficially it is still rare, occurring mainly as a result of negligence or accident. Providing a non-legal framework for the use of animals in schools is a detailed code of practice produced by the Schools Council (1974) and a variety of publications produced by the Department of Education and Science.

Finally, it is important to mention a backlash effect inhibiting the use of living organisms which has occurred in recent years. Following the curriculum developments in the sixties which inspired a greater use of animals in schools, projects, such as the EULO project, were established to provide advice on the value of using organisms, on their maintenance, and on the health, legal and other implications of using them. This work was intended to facilitate and encourage the use of organisms in an educationally and ethically valid manner. However, in some quarters it has been seen in quite the opposite way. The need for increased resources and the realisation of potential health hazards, for example, have been perceived in an exaggerated fashion and used as arguments for preventing organisms being used in schools. Such contortions of intention into practice indicate the sensitivity of the balance of attitudes of teachers, administrators, politicians, parents and others which decide whether or not, and how, animals are used in schools.

## *A Framework for Discussion*

The problem of determining the understanding and attitudes which may be derived from the use of animals in schools is an educational issue. It needs to be distinguished from the contexts of ideological and political issues in which it is inevitably found and with which it is inevitably confused. For example, discussion based on propositions such as "Animal life is sacred to each species; confining animals is wrong,





therefore young people should not deal with animals in a captive state," or "the preservation of human life is the paramount virtue; this inevitably is harmful to other animals, therefore, young people should be educated to accept this" consider the ideological (moral, if you like) determinants of whether or not you *place* animals in schools. This is an important cultural discussion but not, *per se*, an educational one. The educational issue *presupposes* animals are in schools, or some other educational context, and asks questions about the teaching and learning methods and about the effects pupils *derive* from the *education* they undertake with the animals.

Another distinction to make is between the very specific case of using animals for investigations in which there is a high probability that they experience pain or harmful discomfort, the case of killing animals (*e.g.* for dissection), and the case of other forms of using animals which have no intentional consequence of cruelty or death. The understanding and attitudes and, of course, moral perspectives involved in each of these three cases are of quite a different order.

Yet further distinctions, which it is important to bear in mind, are those between different types of pupils and different types of school and cultural setting. Age and sex differences in pupils' attitudes to animals have been detected by research and are known through experience by teachers and parents.* The influence of social background and peer group pressures on the attitudes and behaviour of young people are well known and, again, will produce a variable effect.

Any judgements on the value of animals in education will have to take these considerations into account. They suggest that it will be unlikely that we are able to make any grand generalizations.

Generalization is also difficult because, at least in Britain, there is insufficient variety of experience of using animals in schools and, certainly, grossly insufficient research.

## *Use of Animals in Experiments*

In terms of the understanding and attitudes reputedly derived from the practice, the advantages and disadvantages of using animals for experiments in schools tend to be described as follows:

**Advantages**
- *(i) It provides an understanding of an important form of scientific work.*
- *(ii) It engenders balanced attitudes towards operating on, or with, a living body.*
- *(iii) It provides a quality of perception of the working of an animal which cannot be obtained in other ways.*
- *(iv) It can be used to develop caring attitudes with respect to limiting pain and discomfort.*

**Disadvantages**
- *(i) As an experiment in school it will not be original and it is not, therefore, needed scientifically; thus it leads to a false understanding of the ethics of research.*

*My conclusions about research have been helped considerably by surveys conducted by J.D. Wray and M.J. Barrowman. Details of the former's work are found in the publication of the Educational Use of Living Organisms (EULO) project. Mrs. Barrowman's work is reported in her Master's of Education (1977) thesis of the University of London.

(ii) *School pupils (and sometimes teachers) do not have adequate technical expertise to ensure an appropriate standard of performance.*
(iii) *It reinforces attitudes of distaste and fear related to the functioning of a pupil's own body.*
(iv) *It engenders nervous amusement rather than a serious attitude toward such experiments.*

The results of research—for example with pupils taking the Nuffield Biology courses—are limited and ambivalent on the issue. Whether or not beneficial understanding and attitudes are developed by experimental work is not proven either way. What, however, appears to be clear is that an important influence is the level of commitment and control exerted by a teacher and, flowing from this, that there is a necessary set of preconditions needed to ensure the possibility of benefit. The students must approach the work seriously, there must be a serious and controlled context, e.g. small groups, and an adequate level of technical expertise demonstrated by those performing the experiment. In other words, the value of the work depends fundamentally on the preparation for the work and its context.

As has been mentioned previously, experiments with vertebrates in school are limited in Britain. Nevertheless, in part at least, much of what has been said can be applied to work with invertebrates and, I suggest it is ethically appropriate to do so. Given the broader view I believe there is a case, on educational as well as ethical grounds, for requiring appropriate training and possibly obligatory credentials for our teachers who wish to undertake this type of activity.

### *Necrology*

For Britain at least it is probably true to say that there is far less danger of developing inadequate understanding and attitudes from experimental studies with live animals than there is from the use of dead specimens. One of the public reactions voiced against practical work in biology courses is over the number of organisms killed for educational use. The reaction is partly ethical—protesting against what is considered to be mass slaughter—partly on grounds of conservation. However, such views tend to be peripheral to the schools themselves. What is more influential in the schools is the kind of learning environment produced when practical work in a biology course predominantly involves dead material.

Again this has not been studied with any thoroughness but there is logic, if nothing else, in the view that this practice does little to enhance pupils' understanding of living phenomena nor develop their attitudes to live animals. A pupil once wrote of an instance of this necrological approach in this way—

*The bell rang for the end of break:*
*It was Biology next.*
*As soon as we came in he told us the bad news.*
*We were going to dissect rats.*
*As he opened the fridge the smell engulfed us.*
*He took out the rats, packed neatly in polythene bags,*
*And swimming in yellow preservative.*
*When we opened the bags the room smelt of biology.*





The use of dead specimens helps to develop some skills of observation and dissection. It possibly helps understanding of morphology and anatomy and provides some insights into functions. But it is debatable as to whether it does much more.

Most dead material is obtained by schools from commercial or local authority suppliers. In some schools, however, animals are killed, usually by the teachers or technicians, rarely by senior pupils. Again, this is possibly a peripheral influence on the attitudes of most pupils. In some schools, however, where killing is performed in an obvious and unconcerned way, it appears to lead to an atmosphere of oblivious disregard for the idea of living. Conversely, where killing is performed discreetly and, most importantly, in a concerned manner, a quite different and respectful atmosphere is engendered.

### *Alternative Methods*

The main alternatives (other than plants or tissue cultures) to the use of animals in experiments and studies involving dead animals are three-fold; the use of illustrated texts, still and moving film, and models. What evidence there is suggests that in terms of factual knowledge gained and scientific principles understood these methods, if applied efficiently, are certainly not inferior. And that is about as much as we really know. Views on the extent to which such methods contribute to an understanding of the more holistic properties of living organisms and to the development of attitudes of concern for life vary and, no doubt, are influenced by the quality of teaching materials encountered and personal experience and predilections. It is a field in which, again, there is a need for much research.

## *More Valid Uses for Animals in Education*

I have briefly surveyed the issues of using live animals for experiments and dead animals for scientific studies. They are clearly matters of current concern. We can conclude that there is uncertainty about their educational value and that there is an imperative need for research to elucidate the issues and for a fuller consideration of the educational use of living organisms in teacher education.

However, at the same time, I feel that these issues are a distraction from a more important concern: the need to study animals as part of human psychological and cultural experience. This would involve four educational objectives which are rarely considered at the moment: the cultivation of empathy; creating beneficial psychological relationships between people and organisms; developing an appreciation of the place of organisms in human culture; and establishing an alert consciousness concerning life and the environment.

### *Empathy*

By empathy I refer to the understanding of an organism from that organism's point of view. Ideally this can be considered as entering the "mind" of the organism, which clearly is impossible. Practically it is manifested in the attempt to do this by interpreting one's human-biased knowledge of living things as relevantly as possible and being guided by attitudes of respect which ameliorate our anthropocentric tendencies and the recognition of each species' unique perceptual behaviour and ecological world. Empathy is something that requires continuous and close contact with organisms and involves using the full range of one's senses. It produces as much a sensuous as a cognitive portrayal of an organism and its milieu. At the same time it makes

it possible for a person not only to answer the question "What does an organism do?" but also, "What might an organism do under particular circumstances?" Both questions are important but the first requires a purely descriptive answer, the second requires one with a depth of understanding that anticipates the reactions of the organism. Possibly the best sense of this concept of empathy can be gained by reading the books of naturalists like Jean Henri Fabre and some of our contemporary ethologists—Tinbergen, Lorenz and Goodall, for example. Through their studies they have acquired a perspective of life—part knowledge, part feeling—that combines realism with respect. It is neither over-emotional nor cold-bloodedly scientific. It is a perspective that educationally is surely as worthy of a pupil's experience as others—those, for example, of the biochemist and physiologist based on physical studies of life—which tend to dominate today. Possibly it is one that gets nearer to acceptable truth than most.

The cultivation of empathy is also important for the understanding of ourselves and human relationships and it may well be of value to provide links between empathetic activities with other organisms and those involving fellow humans. The aim of these links would not be to provide a metaphorical imagery of people within other species. They would be concerned with defining each species' way of life so as to give greater reality to the qualities and limitations of our own.

### *Human-Organism Reactions*

The use of organisms in the newer courses has not always been welcomed wholeheartedly. Reservations about dissection, the aversion of youngsters to some organisms (sometimes said to be "innate"), and the possibility of cruelty, neglect or wanton destruction by unsupervised children are among those voiced. In essence these are reservations about the ethical and aesthetic attitudes which pupils have, or may develop, toward organisms, and their relations with other living things in a very personal sense. Our knowledge of the psychology of these human-organism reactions is limited but one can see quite clearly their broader implications in, for example, discussions about significant environmental matters. With some people, the topic literally loses its significance or a silent subconscious barrier of abhorrence descends when the role of toads or snakes in a food web is mentioned: as long as it was elephants and geese that were being considered it had significance. They are sometimes the same folk—young or old—who are horrified if harm comes to a chick or hamster, yet do not move an eyelid when it is a wild partridge or a rabbit and will, with little compunction, squash a frog or leave tadpoles to suffocate in a jam-jar. There are similar ambivalent attitudes to different members of the human species and one wonders if, in fact, there are parallels here that might be more fully explored. To be aware of one's ambivalence of attitudes toward organisms is certainly salutary. It is educationally valuable to understand that human survival depends on our living in accord with other species and yet antagonistically with some, and that there is a need to seek a humane balance between rationality and emotion in our attitudes toward living things.

Human-organism reactions can also be of a more positive nature. Youngsters can benefit from the responsibilities and the satisfaction of purposeful activity derived from keeping animals. Children's affection for animals can satisfy certain of their psychological needs and afford a means of working out the developing appreciation of their personal and social roles away from the public scrutiny of their peers and adults. In this context animals become for children partial and understanding mirrors of themselves and the people they have to contend with. Given that this involves the development of sympathetic respect and does not involve aggression, it can be of immense





value.

Under this heading comes also the vexed issue of dissection. Should pupils see animals dissected? Should they undertake dissection themselves? For some, of course, dissection is required as part of their training as future biologists, nurses, doctors and the like. Even so, if it involves extensive killing, or brutality through neglect or callousness we surely must have reservations about saying yes to such questions. But is it sufficient to argue the case against dissection on grounds such that "children are squeamish" or that "dissection treats organisms with disrespect?" There are many people who have acquired attitudes of responsible respect for the bodies of organisms and their own; who treat accidents and operations with relative equanimity; who see beauty and fascination in the bodies of organisms; and who have a first-hand understanding of the workings of the bodies of living things of personal, practical value. They have acquired these qualities from studies involving dissection and acknowledge the benefits derived from them. Is there not an argument that pupils should *not* be deprived of this experience and of acquiring these qualities?

If we bear this in mind and link dissection with studies that portray the life of the same animals that are dissected . . . , If, as teachers, we practice those attitudes we wish to encourage and discuss with pupils the moral implications of dissection . . . , If we emphasize quality and enquiry in dissection and there is no question of forcing children to dissect . . . , If these conditions are fulfilled, might then dissection have a positive educational value? The point is that, apart from its use in training for specific occupations, the value of dissection, like that of other activities involving organisms (field work is another example), can only be judged in the fuller context of experience, feeling and morality; and in terms of creating beneficial psychological relationships between people and organisms.

### *Organisms and Human Culture*

Many species are part of human culture. They play a role as objects to be studied. In this respect they feature in our scientific sub-culture and, in this context, they occur predominantly in education today. They are also physical and psychological components of our broader cultural environment. They provide food and materials. They can, through disease and predation, provide misery and destruction. Some domesticated species, have lost, or were never sought for, their utilitarian values but live with people as pets providing possessive, aesthetic and other satisfactions for them. Animals have for long been in human mythology (ancient and modern) and frequently are cited in metaphors. They are a part of a great deal of our normal behaviour from zoos and international horse trials, as the focal point of so much of rural life, in nature conservation, in science, sport, in art, with implications that reach out into religion, law and government. In philosophy, organisms feature in discussions of man's place in the natural world, be it in terms of, for example, his dominion over nature—seen particularly in Marxism; as part of the evolution of life—ideas that stem from Darwin; or, as those such as Albert Schweitzer and Teilhard de Chardin would conceive it, in terms of a mystical kinship between man and the natural world: a notion expressed years before by Alexander Pope in his Essay on Man:

> *All are but parts of one stupendous whole,*
> *Whose body Nature is, and God the soul;*

To have an appreciation of the place of organisms in human culture is surely of educational value. It is part of getting to know ourselves, and of acquiring a further perspective of life which, in individual and social terms, will allow us to appraise the significance of what we do to ourselves and to our environment.

### *Life and Environmental Consciousness*

Behind these ideas of the role of empathy in understanding organisms, of the importance of stimulating an awareness of the balance of rationality, emotion and values which prescribe our attitudes toward living things, and of the recognition of the part played by other species in human culture lies an implicit, central inference: that for people today it is imperative that they be continually conscious of the concepts of life and of the natural environment. This does not just mean that they should know about living processes or ecology in the same way as they may know a mathematical formula, the history of the Roman invasion of Britain, or the action of enzymes on foods. They need to be aware of the concepts sufficiently that they rise automatically and immediately in a person's consciousness whenever relevant issues occur. The concepts should be understood sufficiently that they can be applied with appropriate selection and due consideration for the limits of knowledge. We are concerned with a level of consciousness where knowledge is intimately linked with motivation, feeling and activity and possesses a moral dimension involving not only scientific neutrality but also the antagonisms of good and bad, and beauty and ugliness.

The reason why this is necessary is simple. We are living phenomena and we *depend* on our natural environment. The influences of biological alienation present in the urban environment, in the deprivations of some of the underprivileged and in the sophisticated social and intellectual life of some of the privileged, make this dictum a particularly necessary caution. We need to be aware continually of the implications of our nature.

## *Courses and Resources*

If the propositions I have outlined are valid it follows that the methods by which we study life in schools may well require revision. Three questions can act as the framework for reviewing what is needed.

1) How relevant are our present biological courses?
2) What significance do the propositions have for areas of the curriculum other than biology?
3) What type of facilities are required?

The emphasis of biology courses has moved from anatomy and physiology to one which gives more equal weightings to genetics, ecology and other areas of the subject. This provides a fuller portrayal of the living processes but tends to fall short on two counts. The dynamics of the life of organisms tend to be underemphasised and, because usually a purely analytical approach is employed, the parts of organisms and, to some extent, ecological systems tend to be emphasised rather than the synthetic whole which is the essence of any living being or system. To provide the fuller perspective that the propositions suggest will require the whole organism to be the focus of activity with greater emphasis on its ecology, behaviour, development and reproduction. It will require also that exercises in synthesis, not just analysis, be employed. Students could be asked to design and possibly build a pond or some other ecological system, not just to study its components. They could be involved more extensively than at present in studies focused on the interrelations between the parts of organisms and those between organisms and the environment. They should be encouraged to think about and develop empathy toward living things through studies of behavior and ecology based on intensive observations of a limited number of species.





Room will be needed also for topics dealing with the role of organisms in human culture and for students to engage in activities dealing with issues related to them. They might, for example, consider what fish mean to people and deal with the fishing industry, fishing for leisure, the aquarists, fish in our folk tales, the symbolism of fish in religion, the fisherman's and the zoologist's knowledge of fish and so on. They would, no doubt, soon come to realise that fish have much greater significance in human culture than being the associate of chips in the Englishman's diet. In the same way as words such as "application" and "conservation" have gradually acquired sufficient respectability to be included in syllabuses so might "mythology", "ethics," "economics," "legal" and others that reflect the range of human implications flowing from the study of living things. It will have to be accepted also that there is educational value in tackling the more obvious social problems such as those about agricultural production and at the same time discussing deceptively simple, more philosophical questions such as "What is a weed?", "What sort of world does a rabbit perceive?" or "Is the survival of the fittest good?"

The study of organisms in this context spills over boundaries of biology into many other subjects. It can be included in historical and social studies. Art can contribute to our aesthetic appreciation of the living world. Understanding an organism's way of life can be played out in role-playing, the drama of environmental issues in theatrical productions. Beyond the normal subject limitations pupils could engage in studies in which "life" or "organisms" serve as a central theme for coordinated activities cutting right across the curriculum. Activities which are now relegated to an extra-curricular place—pet keeping, gardening and conservation in the school or local environment, for example—could be utilised as for foci for more extensive study within the curriculum.

To meet demands such as these requires much from the school curriculum. It first has to be acknowledged that it implies a considerable time allocation. If we are to include the range of study of organisms as outlined here and, at the same time, include also human and social biology (including topics such as health and sex education) and aspects of environmental study which are equally important, and still include some of the values of classical biology, more time will be needed. It is possible to conceive of a new form of biology course in schools but more important it is to be hoped that a more receptive and flexible attitude will permit a *variety* of courses so that for different ages the study of life has different emphases and that cooperation between subjects will add to this variety.

Allied to this is the need for flexible timetabling and for what might be called "biological deschooling." The forty to eighty minute blocks so typical of secondary school timetables but becoming rare in the primary schools are, no doubt, appropriate for some subjects such as language and mathematics. You can fit into them the type of science (not usually scientific) experiments which demonstrate well-regulated phenomena (usually not physical or chemical). But for activities concerned with the local environment, with observations of organisms or habitats which are changing or difficult to predict, with visits to field study centres, zoological and botanical gardens and the like, or with those activities, such as conservation work or the care of plants and ani-

mals which require regular commitments from pupils, there is the need to be able to exchange or combine time between subjects and to have more extensive time allocations for interdisciplinary studies and activities out of the school. Many of these activities are relegated to the position of extracurricular activities. What is needed is the removal of the distinction between timetabled and extracurricular work and the opening up of the timetable to include a much greater variety of endeavours.

The study of life will also need to be conceived as more than just biological science. Although it is important that science has a central role, greatest value will come from accepting life studies as a field of interest served by many disciplines and involving a wide range of activities. It will have to be granted a comprehensive status, suitable for all pupils and uninfluenced by attitudes which set up the dichotomy prescribing nature study and topics to do with human beings and society for the young child and the less able older pupil, and restricting biological science to the more able.

To provide the facilities for life studies of the sort described will require an economic attitude which sees it as worthwhile to spend money on a room or part of one which contains suitable habitat enclosures and containers in which a variety of organisms live in simulated natural environments, well serviced and with arrangements for the safety of both pupils and organisms, as it is to line the walls of the room with cupboards and apparatus. Given this attitude it is possible that, in a relative sense, the costs need not be excessive for what is envisaged is that instead of having a laboratory, greenhouse and animal house isolated from one another they should be built into an integrated area for Life Study which would contain also the equipment and other materials needed for the variety of activities that have been mentioned earlier. Instead of the greenhouse and animal house being isolated and used merely for maintaining and breeding stocks of plants and animals, equivalent facilities should be available where the pupils normally work. This would give the opportunity to study the lives of the organisms in, as near as can be obtained, their natural setting. Aquaria are obvious and well-known examples of simulated habitats. Terrestrial vivaria serve the purpose equally well and, with the equipment now available for regulating temperature and humidity, a range of habitats from tundra to tropical could be constructed. Multiple habitats, e.g. aquatic-terrestrial-aerial, could also be demonstrated. Others might include open-sided burrows for gerbils and hamsters or colony chambers for mice.

Ideally this internal Life Study Area would also have easy access to one outside, not necessarily large and either urban or rural in character. This could be a natural habitat or a garden that can be used for investigating a range of associations between organisms. If provision was small it could be merely the microenvironments of paving stones and guttering in the school grounds. From this area would commence a series of well-mapped, although not necessarily easily identifiable, "nature" trails providing the guidelines for local studies. Such faciltities might be shared by a number of schools.

In addition, one would hope that parallel with the development of such facilities as these in schools, the developments in recent years of field study centers of Local Education Authorities (LEA) and national bodies and the educational work of national parks, zoos and botanical gardens would continue and be more fully integrated into the educational process. They can do much, and in some respects more than the schools.

Overall such a range of facilities would allow for a balance between planned and casual activities to meet the variety of requirements of students stretching from those intent on scientific studies to those needing the emotional satisfactions of being with plants or animals and, at the same time, provide the means of achieving the objectives





of life studies we have considered. Of course, the objectives can be criticized as being too demanding on the resources of teachers and schools. But, if one looks back on what has been achieved over the last decade or so, and at the same time, recognizes that most of the ideas have already, in fact, been implemented to some extent in some schools such apprehensions can be queried. Like so much in education the real question is "Is it worthwhile?" The answer lies in the acceptance, or otherwise, of a simple proposition: to understand life, other than in an immediate and purely social sense, a person has to encounter the living world, question their relation to it, appreciate the uniqueness of each species, including their own, within it, and to perceive other species as part of the human environment, both physical and cultural. Is this to be the framework of life studies or do we retain the ornamental rabbits and geraniums and our memories of when "the room smelt of biology?"

## *References*

Dowdeswell, W.H. (1975) Use of living material in Nuffield biology. In *The Educational Use of Living Organisms: A Source Book,* P.J. Kelly and Wray, J.D., eds., English Universities Press, London, U.K.

Kelly, P.J. and Wray, J.D. (1971) The educational uses of living organisms. *J Biol Ed 5(5)*:213-218.

O'Donoghue, P.N. (1975) English legal requirements and living organisms. In *The Educational Use of Living Organisms: A Source Book,* P.T. Kelly and J.D. Wray, eds., English Universities Press, London, U.K.

Schools Council (1974) *Recommended Practice for Schools Relating to the Use of Living Organisms and Material of Living Origin.* English Universities Press, London, U.K.