

Science in S.F.



Ants: in science fiction—a Zarbie from the new series of *Dr Who* episodes on BBC-1 next month—

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THERE HAS been much debate about the nature of science fiction, both among practitioners of the genre and among the critics. The most satisfactory definition of it that I can propose is that it is fiction distinguished by one feature: that an important element of the story is a general law or set of scientific facts which are known by the author and readers to be untrue. The central word in this definition is 'general'—a general law—for all fiction contains some statements that are untrue; if it did not, it would not be fiction. But in science fiction this untruth is of a wide scope, a degree of generality of a different order from that of normal fiction. Science fiction, then, begins where it is a necessary part of the story that some important feature is quite different from anything in our normal experience. It must be an important feature: much that is published in science-fiction magazines consists of adventure stories that are only distinguished from the conventional western or spy story by their exotic settings or weapons: these are in fact modern versions of the Gothic or Arabian tales of the eighteenth or early nineteenth century. A genuine example of science fiction is Hal Clement's *Mission of Gravity*, where the problem is for Earthmen to co-operate by radio with creatures vastly different from themselves. These creatures are living on a planet whose gravity varies from 10 to 700 times that of the Earth, and on whose surface, as a result, it is almost impossible for a human to land.

Science fiction then is characterized by the alteration of one major feature of the conditions in which the story is set: and most of these stories make use of a change in circumstances that would be of interest to scientists, a difference in the form of a scientific law or the result of a new scientific or technological discovery. Occasionally the extrapolation of a particular trend in science may lead the writer to describe something which is later achieved in reality; a classic case is the detailed description of an atomic bomb, published as fiction in 1944, which led to a security investigation both of Manhattan Project and of the author. Science fiction normally involves physics and chemistry; stories with a sociological content are much rarer. You might say that my subject is a hitherto unrecognized sub-class of science fiction, which I will call 'sociological fiction'.

The rarity of sociological fiction is due partly to the greater prestige of the established sciences, but also partly

Alien sociology

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to the fact that it involves the creation of a fictional society in all its details—and this is much more difficult than extrapolating just a single aspect. Indeed, most of the stories where the interest is sociological proceed by imagining a society like our own, except for one feature. For example, there are those which envisage life on this Earth when the population has expanded to many times its present size, but without any major change in the mode of life or aspirations of the individuals making up that population. (For obvious reasons these aspirations are normally those of Western culture). The writers of such stories are more concerned with issuing warnings of the future dangers of present trends than with trying to sketch out a different form of social organization. And so their stories are more revealing of the problems of the twentieth century. Often the authors have made little effort to think seriously about the plausibility, on sociological grounds, of the organization they suggest.

There is a similar lack of plausibility when the story features a society of creatures genuinely different from human beings. Too little attention is paid to the differences in social organization that would inevitably result from differences in biological form. Space-travellers encounter cultures of cold-blooded, egg-laying animals, but the main outlines of their society differ from our own only in trivial respects. But it is clear that such a society would differ in the whole method of rearing its young, and the structure of its family life; and it is improbable that it would have developed in a way similar to Western civilization. After all, many societies of *homo sapiens* have developed very differently without any biological differentiation. It is a curious, though not necessarily wrong, assumption of many tales that technologically advanced civilizations will be similar to ours in many respects. I will return to this point.

The interest of sociological fiction, however, does not always lie in presenting a plausible picture of a society. More often the authors seem to be aiming at producing a sense of horror in their readers, either by relying on instinctive feelings of revulsion at insects raised to many times their Earth size, or by making the social organization of humanoid creatures into an absolute dictatorship with a degree of efficiency unparalleled on Earth. The culmination is reached when peaceful humanoids are ruled by vicious insects or lizards. Whereas the object of much normal science fiction is pleasure in the prospects of science, sociological fiction seems to be written by those more interested in frightening their audience. Aliens are rarely pleasant, and their societies seldom credible. But the problems raised by such writings have an intrinsic interest; given creatures radically different from ourselves, what forms of society could exist among them at levels such that we could communicate with them? Could they attain the technology sufficient for space flight?

I think it is very likely that any society composed of creatures similar to ourselves, and possessing a comparable level of culture, will have a form of social organization rather like our own. With the number of different types of society which have existed on the face of the earth, this might seem a vague statement. Nevertheless, there are important limitations on forms of human society. All have had some form of family structure. There is considerable agreement among sociologists and anthropologists that it is the method of sexual selection, reproduction and rearing of the young which is an important constant in all human societies. A long period of childhood seems to be an essential feature of *homo sapiens*, and this implies a family structure

for the nurture and education of the young. Any alien society whose parents reared their young in the same way as us would be humanoid in an important sense, even if they were unlike men in physical appearance; for the structure of a society depends on the relationship of the generations that compose it, not upon the physical shape of its members.

There is clearly room for wide variation within the basic pattern, but it is worth noting that there has seldom been any doubt as to whether a group of creatures on this Earth were sufficiently like other human beings to earn the name. What is more, European anthropologists have been able to understand and communicate with a large number of more primitive cultures, and even to describe them in terms appropriate to their own societies. I can see no reason why we should not ultimately be able to understand the social organization of those alien societies which are dependent on similar biological characteristics. By 'understand' in this context I mean that we should be able to communicate with them and follow their motivation; in fact the two things seem to me almost synonymous, or at least necessarily connected. For genuine two-way communication depends not only on the possibility of decoding the symbols used, but also on being able to see the point of using them: the connection with the whole way of life of the people concerned.

In this context, I suspect that Dr Mercer* is rather optimistic about the ease of communicating with aliens. In a recent story, *The Cage*, Bertram Chandler tells of a group of Earthmen imprisoned in a zoo by intelligent aliens. The men try to lay out Pythagoras's theorem in straw on the floor; the warders think that they are nest-building for the mating season, and put the women in with them. Only when they catch a mouse-like creature and put it in a cage is their intelligence recognized, for 'Only rational beings put other beings in cages'.

To learn a language is to learn a way of life. Anthropologists find that they have to understand many details of the social organization of the tribe they are studying in order to be able to understand their language. But, and this is the main point, they normally expect to be able to do this with any society they may discover, even though some of its features may appear at first sight bizarre.

But perhaps the most popular form of alien society in sociological fiction is that based on the 'social insects', ants and bees. Ever since Aristotle so described them, they have popularly served as examples, or more recently as horrid warnings, of possible human society. For science fiction, ants and bees have seemed to be candidates for full and independent civilization, reaching a technology equivalent to our own. It is certainly easy to imagine that these insects work in ways not unlike human beings; there is some form of communication between them; there is co-operation, or apparent co-operation, in a wide variety of tasks; and there is a degree of specialization only found elsewhere in advanced human societies. These facts make it appear possible that a society of ant- or bee-like creatures might achieve civilization.

But if one looks closer one will see that the differences are more important than the similarities. Consider two central features of the ant nest, though much the same also applies to the bees. First there is the fact that the basis of the whole organization is biological differentiation: individuals are adapted to their tasks by their physical characteristics and instinctive drives, not by education and training. Second, the system of communication between individual ants is comparatively simple: it is un-

likely that it could be developed into anything as complex as even a very elementary human language.

Let us take these points in more detail. First, there is the extreme degree of specialization of sex: a few individuals are responsible for all reproduction, and the majority of those produced are sexless. One consequence of this is the difficulty of any technological advance in an ant nest; new specializations can only develop as a result of mutations which lead to greater success for the nest, as a whole. An individual ant can contribute nothing to the 'pool' of knowledge, which is genetic in character. In fact, the only object of the individual worker is the survival of the nest in its traditional form; this seems to take precedence even over individual survival. For this reason some entomologists have wanted to talk of the nest as more like a single organism than a true society; each insect functions more as a cell in an animal body than as a free individual. The obvious example of this is the extreme specialization that has occurred in some varieties of ants, for example the tree-living species where some individuals are living doors, with heads that fit precisely the entrance holes of the nests; or the honey-pot ants where some become living storage jars. On the other hand the success of human societies seems to have been due to the lack of biological specialization, which has enabled different tasks to be performed when necessary by anyone. Ants would need to develop new forms by mutation and selection before they could alter the form of their society.

The second important point I mentioned was that the type of communication between ants was unlikely to lead to any adequate scientific language, or indeed, anything that could be called a language. Recent studies suggest that almost all communication in ant nests takes place by means of the sense of smell; certain chemical substances induce ants to behave in certain ways. For example, an ant finding a source of food will leave a trail back to the nest, which will then be followed by other ants. They, on returning, will leave similar trails, so that the stimulus for more ants to visit the place is strengthened. When the food source has been exhausted trail-laying will cease, and the substance evaporates, so that no trace is left to confuse other ants. In a similar way ants can release an 'excitement' substance, which will cause other ants to run to the spot.

It is probable that all the complex behaviour we can see among the ants is a result of such chemical releasers, or 'pheromones'. One recent author writes that: 'Our observation of ant colonies over long periods has led us to believe that as few as ten pheromones, transmitted singly or in combination, might suffice for the total organization of ant society'. This would reinforce the notion that the ant nest is more like an individual body than a society; the odours serve as 'chemical messengers', spread indiscriminately among neighbouring 'cells', rather than as a means of communication in the sense we normally understand. It is difficult to see how such a system could be elaborated.

Human space-travellers may well encounter worlds where the ant-type of organization flourishes, but it seems highly unlikely that such creatures will have reached a stage of development where there will be any need to communicate with them; and it is unlikely that Earth will be invaded by hordes of ants in spaceships. And so my general conclusion is that writers who have modelled their fictional societies on those of the social insects have not paid sufficient attention to the facts.

In the corpus of science fiction, many kinds of creatures have



—and in fact: a honey-pot ant whose body is a living storage jar

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* Dr Mercer's talk on 'Alien communication' was printed in THE LISTENER of January 7. † Yet more Penguin Science Fiction, 1964 (Penguin, 3s. 6d.).

been described as having a high degree of culture; in fact all the Earthly species have probably been candidates for some kind of culture somewhere in the galaxy. But in most cases the forms of their societies have not been considered in any detail; the writer has merely assumed that any intelligent creature would have a way of life not unlike our own, and that we could communicate with them. Given the nature of science fiction, this is not very surprising; a really alien society would be so difficult to comprehend that it would be hard to write a good story about it.

The Amoeboid

As an example of the difficulties, let us consider briefly a kind of creature which sometimes crops up, the amoeboid. It is even suggested that their mode of life is advantageous, in that each individual is 'born' fully adult, so there is no need for an elaborate programme of education. There are obvious biological difficulties in imagining such creatures to be intelligent, but, if we neglect these, there still remains the problem of how they could develop a society. For there are no obvious reasons for individuals to associate with one another. Human relationships rest on the need for a family life, even though some of these relationships are outside the family. This need for the family is partially sexual, partially for the rearing of children; and amoeboids would need neither. Also it follows from their method of reproduction that they would not be true individuals. Human children differ genetically from their parents; but apart from errors in the reproductive process new amoebae are identical in every respect with the 'parent'. What individual identity would mean in such circumstances is hard to imagine, and so it is difficult to envisage a 'society' of such creatures.

So far my examples have been based on an extrapolation from existing creatures. But in science fiction all rules can be broken: there is often no such analogy. The first of these entirely new creatures are the telepathic aliens; those who have no need to speak or to use other sensory means of communication for the transfer of ideas from one to another. Unfortunately, the notion of telepathic communication is by no means clear; most authors seem to write as if it were a process exactly like speech except for the fact that no movement of the vocal organs takes place, and that there are no detectable signals between the individuals communicating. Even in scientific work on telepathy, such as that of Rhine and his colleagues, it is hard to see what is meant to be happening. The common experiments consist of one person looking at a card in a room and another elsewhere indicating what card it was. Even if we agree that such a process can occur, and with an adequate degree of reliability, it is still hard to call the result 'communication'. For what we communicate is generally something beyond the simple fact that a certain object is before our eyes. No doubt there are circumstances where this would constitute useful information, but something more is required before this type of process could become a substitute for our normal language. For what we say, even when we are merely reporting our own experience, is only a small fragment of that total experience; language is one of the means of 'filtering out' the mass of useless data that there would be no point in communicating. If ever there were 'communication' direct between two minds, the result would either be confusion or a situation where we would be inclined to say that a single individual possessed two bodies.

And when telepathy is generalized to include a large number of beings, I think it would make no sense to talk of 'individuals'; there would merely be a single mind possessing a number of 'bodies'. If there were a successful set of creatures with a single mind in this sense, it would appear to be more like one of the insect 'societies' I mentioned earlier. (Indeed, it has even been argued that there is something that can be called the 'mind' of a nest of termites.) In such a case, there would be no need of anything that could be described as a social organization, in the sense of relations between individuals.

Some writers may have realized these difficulties, for some

form of partial telepathy, under the control of the individual, is a more popular theme. Partial telepathy still raises the difficulty of the nature of the communication, but, leaving that on one side, there are other problems. The situation would not be unlike the attempt of a number of people to communicate through unco-ordinated radio transmissions, all on the same frequency; you would have to monitor all the communications to discover your own, and there would be the constant danger of eavesdropping. One advantage of communication by sound waves is the limitation of range, and the possibility of locating the speaker; when we supplement this by such devices as the telephone I can see little advantage, and many disadvantages, in the possession of telepathy, even if it could be turned off at will.

A problem that does not seem to have struck those who have used telepathy in fiction is how creatures possessing such a talent came to develop a society like our own. For if we imagine telepathy developing at a primitive level, it might well inhibit any further advance by making the creature too successful. A telepathic carnivore might be so efficient that it destroyed its own food supply. The final and overwhelming argument against telepathic societies seems to lie in the nature of communication itself. For it is only by increasing the precision of symbols that any society evolves to a more complex culture; science as we know it is impossible without mathematics, and this in turn depends on its symbolism, which provides, as it were, an external discipline. Indeed, the constant effort to communicate exactly is one of the means of such advance. With telepathy, this stimulus would be lacking.

There is just one more problem, that of communication between telepaths and non-telepaths—who in science fiction are normally ourselves. It is unlikely that a telepathic society would also have developed a language of a different kind—an aural language—so they would not be able to communicate in the conventional way. If they tried to communicate by transmitting their thoughts direct to our minds, it is hard to see how we would recognize these as alien thoughts. Most writers slide round this problem by expressing the substance of the message in words of our own language. But if they occurred in the recipient's head in this form, how would he distinguish them from his own thoughts? The fact that they are new is no indication; most of us from time to time think of things that we have not thought of before. And if their alien origin were marked by their complete originality, it is difficult to see how they could be understood by the recipient, for they would be incapable of formulation in his ordinary language.

Implausible societies

I am forced to conclude that these bizarre societies are implausible. And this is not really surprising. After all, it is an important fact about the forms of social organization that have existed on the Earth that only a few among them, and those basically similar, have developed to a high technological level. (This level may have been imitated later by other forms of society, but it was the discovery of what can be loosely termed 'Western civilization'.) It is, of course, a difficult and much debated question as to what were the dominant reasons for such developments in one society. Clearly the competitive element has been an important one, and this has obviously been connected with the whole social structure of the West; and so it seems to me highly likely that any alien society of a comparable or higher level of technology will be similar in important respects to our own, will be composed of beings whose basic pattern of life, though not perhaps their physical shape, is much like ours.

Most forms of society different from our own that have been envisaged in science fiction contain fatal flaws, are not sociologically plausible. Nevertheless, I do not think that the consideration of the subject has been in vain. One of the advantages of reading science fiction is that it can, if we consider it critically, make us more aware of the nature of our own social organization.

—From a talk in the Third Programme