The Rigidification of Behaviour

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Phil. Trans. R. Soc. Lond. B 1966 **251**, 327-330
doi: 10.1098/rstb.1966.0017

C. ABNORMAL RITUALS IN STRESS SITUATIONS

The rigidification of behaviour

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Behaviour sequences commonly consist of highly variable appetitive phases leading to rather fixed consummatory acts. Action-pattern rigidity is typical of the terminal moments of a reaction chain.

This basic fact is all too often obscured by the artificial conditions of behaviour studies. Observations on laboratory or captive animals tend to conceal the degree of variability of the earlier phases of each sequence. The simplicity and sterility of the unnatural environment offered to the animal causes differential damage to its motoric performance, attacking the early stages more and the later stages less. A caged animal will feed, drink, nest and copulate, but it cannot set off on lengthy quests for food, water, nest material or a mate. Notorious laboratory devices such as the Skinner-box have served to eliminate totally any possibility for motoric variability. The emphasis in laboratory studies of this kind has been steadfastly concentrated on the variability in the relationship between simple stimuli and an artificially rigidified response. Although the study of this (*SR*) relationship is an important aspect of animal psychology, it is extremely misleading to overstress its importance as has been done so often in the past. To equate it with the whole topic of animal behaviour is like claiming that the gaming rooms of Las Vegas reflect the whole of human endeavour.

Animals placed in an artificially restricted environment—domestic animals, zoo animals, laboratory animals—react to the situation in a number of ways (Morris 1964). They do not always capitulate by becoming appropriately inactive. Behaviour output-demands may be low, but the nervous system frequently refuses to accept the 'easy life'. Complexity may be put back into the environment by the animal itself. It may invent new motor patterns, as happens with some of the great apes; it may create stimulus situations to which it can then react, as with some cats that throw dead food into the air and then catch and 'kill' it; it may give super-normal responses to normal stimuli, as with certain bears and ungulates that go on feeding until they become grossly over-weight.

These and other such behaviour devices assist the animals to carry on a complicated life in a simple environment. They either devise ways of making more variable appetitive behaviour available to themselves, or they abnormally increase the amount of fixed consummatory activity.

Successful attempts to convert a sterile environment into a more acceptably complex one are, however, little more than minor gestures of defiance on the part of the nervous system. There appears to be a contradiction here. If, on the one hand, the system cannot accept inactivity, and yet, on the other hand, it cannot bring about a major replacement of variability, how does the animal manage to survive? The answer is that its appetitive performances do not cease, but instead become rigidified. Behaviour stereotypes develop. These permit a reasonably high level of motoric output even in the absence of environmental variability. What occurs is that the environment *releases* behaviour patterns, but does not *guide* them. The animal is stimulated to patrol its territory, hunt for food or search for a mate, but beyond this initial triggering of the activity it is on its own. There are no clues to follow up, no unknowns to investigate, no obstacles to by-pass. The performer has appetitive behaviour to spare, but nothing to spend it on. It starts to wander round and round. When it comes to the end of its restricted territory it makes intention movements of going further, but to no avail. After a period of time either its erratic wanderings or its thwarted intention movements, or both, become more and more formalized. Eventually they arrive at a rhythmic condition in which they are performed as rigid, repetitive stereotypes. The pacing animal wears a track in the sand. A dark patch appears on a wall where the patrolling animal presses with its feet as it turns at the end of each run. The corner of the wire-netting is worn smooth by a thousand rhythmic intention movements.

Although the captive animal has not capitulated by becoming inactive, it has given up in one important respect. The very essence of its natural appetitive behaviour was that it comprised a basic locomotory pattern combined with a strong neophilic urge. That is, it was stimulated (1) to move about its home range and (2) to respond strongly to any novel stimuli. As no natural environment is ever completely static, there is always something new to catch its attention and break up any fixed patrolling rhythm. But in captivity, the novelties are gone. Everything is familiar. The rhythm is not broken up. It is to be expected under such conditions that the patterns of behaviour would become rigidified, for any formalization of motor output must simplify the work of the central nervous system.

The existence of a rigid stereotype in a captive animal therefore reveals three things about its condition: (1) Its environment is too simple and too static. (2) It has abandoned its natural investigative curiosity, at least temporarily. (3) It has come to terms with its situation and has arrived at the most comfortable way of giving expression to its appetitive urges.

Rigidification of this kind is not confined exclusively to appetitive behaviour. It also occurs with patterns that are close to the consummatory end of a sequence, but it is naturally less conspicuous there, as these actions are already more fixed in character. Subtle differences can be detected, however, even with such patterns as copulation.

How are these stereotyped patterns of appetitive and consummatory behaviour related to animal rituals? There is no doubt that superficially they often look very much alike. The turning to-and-fro of the caged animal is very similar to the pivoting dance of the courting animal. The repetitive leaping of the captive is very reminiscent of the rhythmic jumping of the ritual combat. There is stereotyped nodding and ritual nodding, stereotyped bowing and ritual bowing, stereotyped swaying and ritual swaying. Almost all the rhythmically repeated actions of the behaviourally rigidified zoo animal are to be found in the performances of the naturally displaying wild animal. But is this merely a superficial resemblance, or does it have some deeper significance?

In the case of ritualization, the process is one of communication enhancement. This is not primarily so with zoo stereotypes. (There may be a secondary signal advantage, but this need not concern us here. For example, certain patterns performed by zoo inmates lead to food rewards being given by members of the public. These particular patterns may then be developed as begging signals.) The changes that take place as a ritualized signal develops from an unritualized one are primarily concerned with improving its specificity and its obtrusiveness (Morris 1956). The signal becomes more and more unambiguous. It is vital that it should not be confused with other actions and this is ensured (*a*) by increasing the rigidity of its form, and (*b*) by making this form as outlandish and improbable and therefore as conspicuous as possible. Amongst animals (but not man) this process is essentially phylogenetic and species-typical (rather than ontogenetic and individual-typical like the development of stereotypes) and it is frequently accompanied and supported by the evolution of display colours and structures. (In man, these colours and structures have to be added artificially.)

The changes that occur during the evolution of an animal ritual are as follows:

(1) *Loss or modification of the original orientation.* This means that an action does not have to be aimed directly at a social companion (which may well be shifting its position) and variability of the pattern is therefore potentially reduced.

(2) *Lowering of the threshold of the action.* This will not only render it a more frequent performance, but will also make it more available for rigidification by

(3) *Rhythmic repetition.* In addition to this standardization of the time intervals between successive performances of the action, there is also rigidification of the form of the action itself as a result of the development of a

(4) *Typical intensity.* This process involves the disruption of the normal frequency/intensity relationship; instead of the intensity of the action increasing as its frequency increases, it remains more or less the same regardless of frequency changes. Other changes that appear to have occurred during the evolution of ritual patterns include

(5) *Differential exaggeration of components*, or, in extreme cases,
(6) *Omission of components.*
(7) *'Freezing' of movements.*
(8) *Change in the sequence of components.*
(9) *Changes in component co-ordination.*
(10) *Increase or decrease in the speed of the performance.*
(11) *Change in the vigour of the movements.*

A close examination of the stereotypes of zoo animals reveals that almost all the above-mentioned changes are operating there also. The modifications to the motor patterns in the two contexts differ in so far as the rituals are tending towards greater conspicuousness. Apart from this, both stereotypes and rituals show exactly the same kinds of increased rigidity. Clearly the similarities are too great to be accidental.

If we search for a common factor that could explain the shared properties of these two behaviour trends, we are forced to look again at the 'release without guidance' aspect of the situation. It has already been explained how the sterile environment that creates zoo stereotypes, sets off a behaviour pattern that would normally 'expect' variable stimuli subsequent to its initiation. In the absence of these varying clues, guiding the animal from place to place, the released pattern becomes rigidified. In the case of a zoo animal that makes intention movements of escaping through the wire or glass of its cage, one can observe the way in which the fleeing movements that never get started become more and more rhythmic. The animal has no chance to dart this way and that as it scampers off. All it can do is to make the initial jerks of running away, over and over again. If one compares this with the displaying animal in the ritual situation, it emerges that the pressures are much the same. It is strongly stimulated to move, but it is held in check by some competing tendency. Typically, the animal that displays during a fight or during courtship is in a state of conflict between fear and aggression, or between fear, aggression and sex. There may be no physical obstruction—no wire or bars—but there is a psychological obstruction just as powerful. In both the case of the stereotype and the ritual, the actions of the performer are stimulated and then checked. In both cases thwarted intention movements or ambivalent actions result, with the outcome that in both instances we can observe the same sort of rigidification taking place. If, in either instance, the animal was able to carry through the released action pattern, we would then see the motor output being buffeted this way and that by the special, variable, guiding stimuli with which the environment bombards any appetitive locomotory actions. But this stage is never reached.

This means that the changes which we are seeing in the development of zoo stereotypes are probably extremely similar to the kinds of changes that took place during the evolution of animal rituals. Of course, the actual steps taken during the phylogenetic development of rituals are lost to us forever. We can never hope for the sort of fossil evidence that helps us in tracing, say, the evolution of new skeletal structures. As Konrad Lorenz has pointed out, we can, however, attack the problem indirectly through comparative methods, studying the differences in the more and the less ritualized signals of closely related species. I would like to suggest that, in addition to this, we can learn a great deal about the evolution of animal signals by making a more detailed study of the way in which behaviour patterns become rigidified in captive animals. It is surprising that this has not already been done. Using special filming techniques, it should be possible to analyse minutely the gradual 'rounding off' of the jagged actions of the caged animal and to express more precisely the kinds of motoric transformations that occur. In this way the serious investigation of zoo stereotypes may well assist us in our attempts to understand the evolution of animal communication.

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