COMMENTARY ON "ON THE NATURE OF EMOTION"

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One of the least satisfactorily explored fields of psychology is that of motivation, and a major part of that field, social motivation, is perhaps the least understood of all. An ever present component of motivation is emotion, acting as a source of internal stimulation. Consequently, Salzen's paper, on the nature of social emotions, deals with a very important phenomenon. His paper not only presents his TASS theory in detail, but includes an extensive review of the literature on emotion from Darwin's paper up to the present.

The central part of the paper deals with a general theory of emotion which Salzen calls "Thwarted Action State Signalling" which he shortens to TASS. I shall comment on this theory in the light of my own research in two relevant areas: that of the emotional basis of attachment (Scott, 1987) and the role of emotion in agonistic behavior (Scott, 1975).

Salzen, whose primary training and research background is in ethology, which began as a descriptive science, centers his attention on observed social signals and explains these as a result of thwarted action states. This raises two immediate questions: 1) Do all emotions result in signals, i.e., are they always expressed externally; and 2) do all action states result from thwarting?

Applying the theory to the phenomena of attachment and separation, one of the principal emotions observed in infant dogs is separation distress, taking the form of vocalizations emitted at very high rates, sometimes more than 100 per minute. These can be first elicited at approximately four weeks of age, rise to peak rates at about 8–9 weeks and gradually die out as the animal grows older.

Applying Salzen's theory, the isolated puppy is thwarted in any attempt to rejoin its mother and litter mates, becomes highly aroused, and emits social signals that have the effect of attracting the attention of the animal's caretakers, either the mother or human caretakers. The observed behavior is, therefore, consistent with TASS theory.

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Once the puppy is beyond the age when, in a purely canine society it would normally not require caretakers, the symptoms of separation change. A dog separated at six months of age or older shows two types of responses. The most common is a fear response to anything strange, either living or nonliving, combined with efforts to escape and run away. This behavior in a free situation would result in a lost animal's wandering around until it found its home. The fear response would prevent it from staying in any new situation long enough to become attached there. Once taken back to its home kennel, an experimentally separated dog immediately becomes nonfearful and shortly begins to emit social signals such as tail wagging that indicate a friendly approach and a subordinate attitude.

If we analyze this behavior, the separated dog is certainly thwarted in its attempts to return home and is highly aroused or activated. To illustrate the strength of arousal I can cite the case of a six month old dog that was separated from its familiar kennel and caretakers and brought to a home. It responded by complete inactivity. The new owners reported that it would not move, eat, urinate or defecate for 24 hours, remaining totally quiet the whole time, at which point they brought it back. This dog, as well as those whose response took the form of fearful behavior, did not emit social signals but rather behavior that was adaptive to the situation: the fearful dog's attempt to run away from the situation, or in the case of the inactive dog, to escape notice. Incidentally, after a long and partially successful attempt to get it attached in a new home situation, the inactive dog eventually ran away.

The conclusion is that thwarting the attempt to return to the site to which the individual is attached will result in strong emotion in dogs of any age but will only result in social signalling if signalling will result in relief. Therefore, the theory needs some modification to account for the above behavior. Under some conditions, thwarting results in emotional arousal followed by adaptive behavior rather than social signalling. Social signalling results only if there is some possibility that it will result in some relief from thwarting.

A second kind of behavior following separation in mature dogs is somewhat closer to the Salzen model. A six-months old basenji (a breed that has a reputation of being aggressive) was adopted by a family of experienced dog owners. A few weeks later they reported that the dog had severely bitten various family members on at least three occasions, and without warning. Some of the bites were severe enough to draw blood. I and my associates verified this behavior, which most dog owners would call fear biting because it results when a person approaches a strange dog. Before we attempted to approach this dog, we carefully observed it and concluded that it was not a "happy" dog. It showed no positive interest in any person, familiar or strange, and did not wag its tail. Sure enough, when closely approached, it attempted to bite but only got hold

of loose clothing. We therefore returned it to its home kennel where it again became friendly toward people and subsequently never bit anyone. The significant fact is that while dogs have a full repertory of warning signals such as barking, growling and snarling, this dog gave none of these before it attacked. While the bite itself might be called a signal, I would be inclined to call it the behavior itself.

This brings up the question of whether Salzen's theory can be applied to aggressive behavior and if so, how. Most of my early work was done with fighting in house mice, and one of our first problems was to find out why mice fight. House mice are much less social than dogs, and one of the reasons is that fighting produces spatial separation. We found that the most reliable method of inducing fighting in a male mouse was to expose it to an attack by another male; the attacked male invariably fought back. We concluded that pain was probably the effective stimulus, as even very young mice will bite in a reflex fashion if a tail is pinched.

A common method of inducing an attack is that of isolation. An inexperienced male mouse is put into a strange cage and left 24 hours. At this point an inexperienced stranger is placed in the cage and usually starts investigating its new surroundings. The first male, which apparently has become attached to or at least habituated to the strange case, attacks in most cases. Ebert (1983) later showed that female wild mice would attack other females when placed in an isolation cage, but in a smaller proportion of cases. That is, both sexes have the same behavioral capacities, but express them in different frequency. It will also be noted that mice do not show the obvious fear responses that occur in separated dogs.

With respect to social signals, mice have some that are not directly apparent to humans, such as odorous signals and ultrasonic vocalizations. Two that are easily visible to any human observer are hair fluffing and tail rattling. These are given while a male in an isolation cage is apparently hesitating before making an attack on a stranger. These can be interpreted as warning signals. Another set of signals is given by a defeated mouse. The attacked mouse, after being severely beaten, will often assume an upright posture, hold out its forelegs stiffly, and squeak audibly when approached by the attacker. This defense posture can be interpreted as a signal that the mouse accepts defeat. It also has an inhibitory effect on the attacker, as it exposes the vulnerable parts of the body that are not usually bitten or hurt in fighting. An attacking mouse usually attempts to bite the posterior lumbar region where vital organs are well protected and where the result of a bite is a superficial wound rather than a disabling one. Applying TASS theory, one could say that a strange mouse thwarts the resident's action state (some emotion that is not obvious but is presumably related to anger), and the result is a warning signal followed by the behavior itself. In a free situation the strange

mouse would or could run away without being attacked. In this case the TASS theory applies without difficulty.

Furthermore, in some highly social and group living animals such as chickens and dogs, prolonged agonistic interaction will result in its reduction to threat by the winning animal and avoidance by the loser. Such a dominance-subordination relationship is agonistic behavior reduced to a symbolic (or signalling) form.

Unlike chickens and dogs, house mice are unable to develop good dominance orders. If they are held in contact, mice have two available relationships: 1) complete peacefulness or 2) a situation in which there is constant attacking by a male that has won fights over all the others. The losers attempt to escape but do not become subordinate nor fight with each other. The peaceful relationship can be achieved by rearing a litter of male mice together from birth to adulthood. This phenomenon is explained by the principle of passive inhibition.

Incidentally, mice do not seem to be highly disturbed by being isolated in a strange situation. Their responses are to investigate thoroughly the new area and quickly resume their normal activities of feeding and nest building. Thus, there are importance species differences in the phenomena associated with attachment.

From these examples, I conclude that thwarting (or frustration, which may be an emotion itself) does produce emotion in most if not all cases, but thwarting may either lead to social signalling on the one hand or to directly adaptive behavior on the other. Social signalling is likely to occur in highly social species and in situations in which a social signal can result in the relief of whatever produces the thwarting in the first place. The TASS theory is important, but it does have some limitations.

Another question, dating back to the James-Lange theory of emotion, is whether either a behavior or a social signal can occur in the absence of emotion. We found that agonistic behavior in highly trained fighting mice could appear in a fraction of a second, *before* the slow physiological changes that are associated with emotional states can occur. I also suspect that in a highly trained subordinate animal in a species that is capable of developing good dominance orders, signals indicating a subordinate status could eventually appear with little if any internal emotional response preceding them.

What is the relationship of TASS theory to other theories of emotion? Salzen reviews these other theories in a somewhat cursory fashion, but since this has been done very thoroughly in the volumes written by Plutchik (1980) and edited by Plutchik and Kellerman (1980) this is not a serious omission. But it is clear that Salzen intended his TASS theory to replace rather than supplement others. My own viewpoint is that because the phenomena of emotion are so complex and because they can be approached from so many directions, it is valuable to have a variety of theories.

I would also like to point out that there is a resemblance between the TASS theory and the three factor theory of maladaptive behavior that I proposed (Scott, 1988). The three factors are: 1) a prolonged state of strong motivation, usually accompanied by or including a strong emotional component; 2) inability to adapt to or respond to the motivation; and 3) inability to escape from the stimulus situation that produces the motivation. The combination of these three factors over a long period produces disorganized or maladaptive behavior. This has been demonstrated by numerous investigators in various animal species in the field of experimental neurosis. Factor one is equivalent to Salzen's "action state," and factors two and three are conditions that produce thwarting. Only the end result, maladaptive behavior, is different from Salzen's formulation. Salzen's theory assumes that the animal should signal, receive help and so escape from the situation. I see no contradiction between these two theories except that signalling behavior is not an essential part of the three factor theory.

A perennial problem is the classification of emotions. If one starts with human subjective reports of emotion, the result is several hundred different names, a situation of unmanageable complexity. Most authors have reduced these to less than a dozen groups, most of which overlap to some extent but are not identical. Salzen has reduced his list to eight, based on human facial expressions. My own preference is to classify according to the association of emotions with the ten major categories of adaptive behavioral function. Some of these such as sexual and agonistic behavior are purely social, and others such as ingestive and defensive behavior may or may not involve social interactions. Some emotions, such as hunger and anger, are associated with specific categories of behavior; others such as fear may occur in more than one category.

Comparing my list with his, Salzen has grouped the emotions related to sexual behavior into two categories, one associated with eating (he does not mention hunger as an emotion) and one with acceptance and relief. He apparently does not consider hunger as an emotion or action state. Likewise, he separates the two emotions associated with agonistic behavior, anger and fear, into separate categories.

Part of these difficulties with classification arise from the fact that, as B. E. Rosenberg (private communication) once remarked, we know a great deal about the unpleasant emotions such as fear, anger and pain, but almost nothing about the pleasant ones such as joy, love and ecstacy. Salzen proposes that the joyful, ecstatic and happy emotions are the end result of the TASS process; i.e., joy is the end result when thwarting is relieved. While this undoubtedly occurs (one has only to look at the faces of persons emerging from a public restroom), joy, satisfaction and love may also be associated with an ongoing behavior, particularly caring behavior defined as any sort of helping another, including parental care, and allelomimetic behavior, the joy of working with a group or team.

I conclude that there may be many valid classification schemes for emotion, depending on the basis for categorization and the particular aspect of emotionality which is being investigated.

Salzen's paper also illustrates one of the difficulties that psychologists have when they try to investigate phenomena that are first described in popular terms. They are forced to redefine such terms, which always leads to confusion, as the reader has to refer back continually to the new definition in order to be sure of what the author means. Emotion itself is one of these popular terms, and so are most of the descriptive terms referring to specific emotions. Salzen, in the light of his theory, has redefined the terms of affect, feelings, moods, emotion and sentiments. I regret that he chose to redefine affect, which originated as a coined term for emotion that did not carry the surplus meaning of the original. Salzen thinks of affect as an inclusive term embracing all the rest of the above and hence of little value as a tool for theory.

Finally, the importance of any theory is that it gets other scientists to raise questions that can be answered by observation and experimental tests. Reading this paper has certainly caused me to rethink many of my former ideas and to formulate the questions that I have raised above. At the same time, the phenomena associated with emotion are so complex that a great variety of theories should be useful, each attacking different aspects of the phenomena. One striking omission from Salzen's paper is a theory of individual variation, both in emotional expression and activation states. The explanation of such variation must reside in a combination of genetic, experiential and environmental factors. Salzen mentions evolutionary theory, but does not go into the genetic theory which is its basis. It takes little observation to see that humans vary a great deal in expression of their emotions and little more observation to see the variation in emotional expression among different animal species. In our experiments with the social behavior of dogs, we (Scott & Fuller, 1965) found that the highest degree of heritability among breeds was associated with physiological differences which are of course the basis of the internal phenomena of emotion. Likewise, we found important breed differences in the rate of expression of distress vocalization in isolated puppies, although all breeds and all individuals showed this reaction to some degree.

In conclusion, TASS is an important new theory of emotion dealing specifically with social signalling, which is a new way of looking at the phenomenon that Darwin called the expression of emotions.

REFERENCES

Ebert, P. D. (1983). Selection for aggression in a natural population. In E. C. Simmel, M. E. Hahn, & J. K. Walters (Eds.), *Aggressive behavior: General and neural approaches* (pp. 103–127). Hillsdale, NJ: Erlbaum.

Plutchik, R. (1980). *Emotion: A psychoevolutionary synthesis.* New York: Harper & Row.
Plutchik, R., & Kellerman, H. (Eds.) (1980). *Emotions: Theory, research and experience.* New York: Academic Press.
Scott, J. P. (1975). *Aggression.* Chicago: University of Chicago Press. 2nd ed.
Scott, J. P. (1987). The emotional basis of attachment and separation. In D. P. Schwartz, J. L. Sacksteder, & Y. Akabane (Eds.), *Attachment and the therapeutic process* (pp. 43–62). Madison, CT: International Universities Press.
Scott, J. P. (1988). Genetics, emotions and psychopathology. In M. Clynes & J. Panksepp (Eds.), *Emotions and psychopathology* (pp. 21–36). New York: Plenum.
Scott, J. P., & Fuller, J. L. (1965). *Genetics and the social behavior of the dog.* Chicago: University of Chicago Press.