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Empathy or Anthropomorphism?

Michael W. Fox, Editor-in-Chief

The recently published report of a British working party chaired by the very Reverend Dr. Edward Carpenter (ANIMALS AND ETHICS, Watkins Press, London, UK, 1980, £2.00) contains a revealing and possibly mistaken use of the word anthropomorphism. I believe that Carpenter et al. mistook empathy for anthropomorphism when they stated, “anthropomorphism— that is judgements made by man arising from his own subjective experience.” I would prefer to assign the word empathy to this meaning. According to Webster’s dictionary, to anthropomorphize means “to attribute a human form or personality” to some other being or entity, while empathy is “the imaginative projection of one’s own consciousness into another being,” or “the capacity for participating in or a vicarious experiencing of another’s feelings, volitions or ideas,” which is closer to Carpenter et al.’s assumed meaning of anthropomorphism.

One would hope that Carpenter et al. have not lost the understanding of or ability to empathize, or do they intend to demean the activity as being mere anthropomorphizing? No, I believe not, otherwise they would not have created their excellent report. Perhaps they are simply reflecting our culture’s increasing lack of contact with feeling and therefore with the true meaning of empathy.

Yet how can a person actually project his or her consciousness into another being? Preposterous, impossible, smacks of ESP and mysticism— until it is experienced. Then it need no longer be the subject of debate, for it is not like a belief or an idea. It simply is. When I empathize with an animal or person, that individual’s suffering becomes mine, for I experience, through imagining, that suffering. But when I anthropomorphize an animal, the reverse occurs: my suffering becomes its suffering because I judge it on the basis of my own subjective experience, as if the animal were a person.

Perhaps we should do both when we witness the suffering of animals. The dissonance or discrepancy between empathy and anthropomorphism will decrease as we develop greater understanding of animals, their needs and behavior as well as the role of our own psychology (values, wants, projections, fears, etc.). Then we have compassion and wisdom, this wisdom being the objective knowledge of the animal as distinct from instrumental knowledge acquired to satisfy human utilitarian goals, or mechanistic and reductionist knowledge generated by human curiosity. Perhaps “fellow-feeling” is a more appropriate term for sympathetic resonance with another being, a balanced state of understanding, anthropomorphism and empathy.
Predation—The Way of Life

James R. Rooney, Editorial Advisory Board

Considerations of the rights of animals have become fashionable and, one hopes, long-term concerns for people of a wide variety of interests and persuasions. In addition to the expected ecologists, zoologists, humanitarians, veterinarians and so on, philosophers and theologians are coming to grips with the existence of life other than man.

In this editorial I should like to emphasize a basic theory of human-animal interaction which will, I trust, be recognized immediately to be true although generally overlooked in the human-animal "rights" colloquy.

The first element of the theory is the simple fact that the universe and this world, as part of that universe, is an ordered system. While our understanding of all of the facets of that order is far from complete, it seems irrefutable that such order does exist.

The philosophical term 'cosmology' defines an ordered universe. What we loosely call "Nature" is, in fact, that portion of cosmology which applies to this earth. Nature, then, is the earth as an ordered system. Within that context there appear to be three major laws:

1) Survival of an individual life takes precedence over the survival of another individual.
2) Survival of the species takes precedence over the survival of the individual.
3) Survival of life takes precedence over the survival of the species.

It appears that there is a single operator, a single theory, which subsumes all three of these laws: predation, the basic interaction among all forms of life from the least to the most complex.

The food chain is a hard theory, indeed.

It is unnecessary to belabor the obvious role of predation in the first two laws. The third law has not, perhaps, been clearly stated previously. The extinction of species over the earth's history shows the law at work.

An excellent and provocative exhibit in the Museum of Science in Boston also makes the point. One aquarium contains unpolluted water and the variety of marine life as it may have been in the Boston harbor years ago. The second aquarium is appropriately polluted for the harbor today. While there are fewer numbers and varieties of species, there is still life. Indeed, it would be difficult to find anywhere on this planet a nook or crevice so foul, so noxious, that something alive was not in residence.

So far two elements of the theory I am developing have been identified: life on earth as part of an ordered system and predation as the operator within that ordered system. However, the theory remains incomplete. What is the ordered system, merely big fish eating small fish and being eaten by yet bigger fish? We yearn for some purpose, some goal, some ends for these means.

The best, perhaps, we can do to satisfy that yearning, omitting metaphysics, romanticism and theological speculation, is to appeal to another time-honored...
concept: *equilibrium*. While there may be questions about equilibria in the subatomic world and the cosmic world, there is no reason to doubt, in our world, that equilibrium is the *sine qua non*: for every action there is a reaction. Equilibrium does not tell us why; it does not provide a fixed goal, a god, or a good. It just is, and that is what we have to go on just now.

Struggle, violence and ugliness will be with us at the millenium because the theory of this earth, the governing cosmology, is that of an ordered system, and that system is ordered because of predatory interrelationships operating around the balancing concept, equilibrium. Remove predation, and there is no order, no equilibrium and ... no life.

Humans are, historically and presently, the most efficient predators that have ever existed on the earth. Humans, however, are not successful predators because they are destroying the host, the living and nonliving earth, upon which they prey.

Human predatory efficiency is based on a single element, the human intellect. The intellect has no natural enemy other than another intellect. There is only one conceivable way to restore the earthly equilibrium that man has so seriously disturbed, and that is by the use of intellect. We have thought ourselves into disequilibrium and have no choice but to think our way out of it again.

There are heartening signs that this process is already underway. It is hoped that the formulation provided will help in the structuring and ordering of the process.
COMPANION ANIMALS

Boyhood Cruelty Toward Animals

Emmanuel Kant argued that cruelty to animals should be avoided, not because such behavior is intrinsically wrong, but because it might predispose the perpetrator to behave in a sadistic fashion toward human beings as well. Although there are a number of anecdotal stories supporting this position, relatively few detailed studies of the phenomenon have emerged. The studies that have been done have focused on the apparent link between animal cruelty and enuresis (bedwetting) and fire-setting, rather than between animal cruelty and aggressive behavior toward other people (Am J Psych 122:1431, 1966; J Psych Law 2:45, 1974; J Forens Sci 24:240, 1979).

A recent paper by Dr. Alan R. Felthous (Child Psych Hum Dev 10:169-177, 1980) explores some of the relationships between childhood cruelty to animals and assaultive behavior directed at humans. Out of a population sample of 345 male psychiatric inpatients, 53 who fell into the most aggressive category denied repetitive cruelty to animals in childhood, while a further 18 highly aggressive individuals admitted to a history of repeated torture of dogs and cats. All but one of the 18 tortured cats, but only five tortured dogs. This disproportionately higher level of cat torture mirrors a long cultural history of persecution of cats in western societies.

As expected, most subjects in the animal cruelty group had histories compatible with a high level of aggressiveness against people. However, the animal cruelty group reported a significantly higher incidence of paternal neglect and/or abuse (either an alcoholic father or prolonged separation from the father). Other studies also indicate that the absence of a father figure is an important element in the etiology of cruel behavior toward companion animals (Child Psych Hum Dev 2:70, 1971), a stable father being considered influential to a boy’s developing capacity to control and channel aggressive impulses.

LABORATORY ANIMALS

Scientists Evaluate Alternatives

Of the many techniques which have been put forward as possible alternatives to laboratory animals, tissue culture and computer modeling stand to the fore. Although exaggerated claims have been made for the predictive power of both techniques, their potential for investigating biological mechanisms and reducing the need to use laboratory animals is undisputed. Three papers have appeared recently in scientific journals which explore the status of these two alternatives.

The Fund for the Replacement of Animals in Medical Experiments (FRAME) published a paper by Dr. M. Tute of Pfizer Research Laboratories (ATLA Abstracts 8 [1]:18, 1980) listing some of the ways in which computer models have been used in drug screening and in safety evaluation. One such model developed by the Genesee Computer Center, Inc. (US)
allows prediction of the oral LD50 (lethal dose for 50% of the target group) in rats for untested compounds. The proposers of the model claim that its use can materially reduce the amount of toxicological testing for new compounds and permit the drawing up of a rank order of compounds from least to most toxic (Toxicol Appl Pharm 41:220, 1977). However, Tute notes that the U.K. Commission on Medicinal Chemistry is strongly discouraging the Genesee method of calculating toxicity data for the time being. Recently, 80-90% success rates were reported for the prediction of carcinogenicity by another model system (Chem Ind 56, 1980), and given sufficient information in the data base, even better results should be possible. Still, Tute maintains that "...most scientists would agree that this and other predictive abilities of computer models were only in the infancy of their development as an alternative research tool."

Rees (J Roy Soc Med 73:261, 1980) and Smyth (J Roy Soc Med 73:229, 1980) discuss the contribution that cell culture can make to such fields of investigation as virology, oncology and toxicology and conclude that while cell culture has proved extremely useful in virology and in screening for anti-tumor activity, the technique suffers from a number of drawbacks in toxicology. For example, primary cell cultures which retain the biochemical characteristics of the parent tissue or organ necessitate the killing of an animal each time they are prepared. Some reduction would occur by virtue of the fact that one animal can provide cell material for a number of tests, but there is no possibility of replacement. In established cell lines, one animal can generate a virtually unlimited amount of cell material, but the cells lose some of their distinctive biochemical characteristics and thus are not as useful in investigating organ toxicity.

According to Smyth, Rees has placed the limitations and the potential of cell culture in proper perspective. He states: "...if biomedical research is to continue, animal experiments are going to be needed for a long time." However, Smyth has argued elsewhere (ALTERNATIVES TO ANIMAL EXPERIMENTS, Scholar Press, London, 1978, p. 68) that there do seem to be good prospects for developing cell culture alternatives to fairly specific toxicological problems such as the Draize eye and skin irritancy test.

**Ethical Principles in Animal Experimentation**

In August 1979, a group of French, Swiss, American and Canadian scientists and lawyers met at the Tufts University European Center of Talloires (France) under the auspices of the Marcel Merieux Foundation to formulate a set of principles on animal experimentation which would be acceptable to both European and Anglo-American patterns of thought and regulation. These principles have been published in two research journals (J Med Primatol 9:105, 1980 and Dev Biol Standard 45:185, 1980) and are reproduced in full below:

**Principles of Ethics in Animal Experimentation**

**Basic Principles**

**Article 1:** Progress in human knowledge is necessary, especially that related to biology and medicine in man and animals.

**Article 2:** In his quest for knowledge, man has a need to utilize animals just as he does for food and fiber and as beasts of burden; therefore he has a duty to respect animals as helpers and fellow living beings.
Article 3: Those utilizing animals in experiments must be aware of their sensitivities, capacity for memory, and capability of suffering and enduring pain.

Responsibilities of the Investigators

Article 4: The investigator is morally responsible for his actions and choices related to animal experimentation.

Article 5: Experiments involving live, vertebrate animals and the procurement of tissues from living animals for research must be performed by, or under the immediate supervision of, a qualified biological, behavioral, veterinarian or medical scientist. The housing, care and feeding of all experimental animals must be supervised by a properly qualified veterinarian or other scientist competent in such matters.

Article 6: In studies involving animals, there must be reasonable expectation that such studies will contribute significantly to knowledge which may eventually lead to the improvement of the health and welfare of either man or animals.

Article 7: Statistical analysis, mathematical models or in vitro biological systems should be used when appropriate to complement animal experiments and to reduce numbers of animals used.

Article 8: The investigator should use the animal best suited for his research, taking into special consideration the sensory and psychological development of the potentially suitable species. Endangered species, as listed in Appendix 1 of the Convention on International Trade in Endangered Species of Wild Fauna and Flora, should be used only when there are special, well justified circumstances. In so far as possible, animals intended for use in the laboratory should be specially bred for that purpose.

Article 9: The investigator should ensure that the animals which he utilizes are maintained and housed under optimal conditions and that they are properly cared for before, during and after experimentation.

Article 10: It is the investigator's responsibility to ensure that no animals which he utilizes suffer unnecessary pain or distress, and when this is unavoidable appropriate means are taken to limit such pain and distress.

Although activist members of the humane movement tend to view these principles as window dressing, some very influential scientists and government officials were involved in the drafting of the statements, and the fact that they considered this exercise worthy of their time and energy is a significant development in itself. American representatives included Dr. Joseph Held, Director of the National Institutes of Health Division of...
Research Services, and Dr. Henry Foster, President of the Charles River Breeding Laboratories. European representatives included Dr. Frank Perkins, Chief of Biological Standards at the World Health Organization, Dr. Charles Merieux of the Merieux Foundation, and Professor M. Bertrand of the Lyon Veterinary School.

In addition to the above principles, the *Journal of Medical Primatology* (9:101-159, 1980) and the most recent volume of *Developments in Biological Standardization* (45:175-225, 1980) contain a number of articles on the humane care of experimental animals and the development and use of alternatives. Papers which may be of special interest to readers are those by Rowan on the concept of alternatives (*Dev Biol Standard* 45:175-180, 1980), by Vallier on European ideas on laboratory animal welfare (*Dev Biol Standard* 45:189-195, 1980) and by Moor-Jankowski et al. on humane methodology in a primate laboratory (*Dev Biol Standard* 45:197-202, 1980).

**FARM ANIMALS**

**Animal Welfare and Electro—Immobilization**

"Most observers, when seeing electro-immobilization for the first time, are somewhat appalled by the appearance of the tetanic animal, the interference to respiration and the stifled sounds that emanate from the paralysed larynx" (*Aust Vet Assn Newslett* 6:3, 1980). This is an excerpt from a statement on the use of electro-immobilization techniques by the Australian Veterinary Association (AVA) Standing Committee on Animal Welfare.

A study on sheep indicated that after one application of the technique, the animals showed a strong aversion to it. In one group of animals, there was a high death rate. The report states: "...there is every reason to think that for sheep, the instrument was unacceptable from the humane point of view and was doubtful from the safety aspect."

On the other hand, work at the Queensland Veterinary School and the CSIRO Division of Animal Health indicates that cattle do not show such aversion. For example, haltered dairy cattle resume eating immediately after the current has been turned off. There is no response to pain stimuli during dehorning under electro-immobilization, and cattle leave a crush quietly after such an operation in distinct contrast to the violent behavior of nonimmobilized cattle following dehorning.

Human volunteers reported a thudding sensation on application of the current, but no pain or unreasonable discomfort. The findings indicate that electro-immobilization produces some attenuation of pain sensation, presumably via a spinal gate effect, and the AVA suggests that the technique's use would seem preferable to making no attempt at analgesia during dehorning, spaying and intradermal injection.

**Halothane Screening for Stress-Sensitive Pigs**

When it comes to the economics of pork production, pigs exhibiting the porcine stress syndrome (PSS) have the last laugh. Their pale, soft, exudative meat, a result of rapid, stress-induced physiological changes, is responsible for major losses to the pork industry. Although stress can be reduced through careful and humane transport, handling and slaughter, it can never be eliminated. However, since PSS appears to be confined to certain types of pigs, particularly the landrace and the pietrain, the problem can also be approached from the standpoint of selective breeding.

Previous studies have established a link between genetic suscep-
tibility to PSS and a severe reaction to the anesthetic halothane (See Int J Stud Anim Prob 1(3):153-154, 1980). Proceeding from this evidence and with knowledge of the probability that halothane sensitivity is carried by a single recessive gene, Dr. A.J. Webb of the Animal Breeding Research Organization (ABRO) in Edinburgh conducted halothane reaction screening tests on young pigs to investigate their possible application to reducing the frequency of PSS in affected herds (Vet Rec 106:410-412, 1980).

Seven week old pigs were allowed to breathe halothane in oxygen through a face mask for three minutes. Pigs who went rigid were classified as halothane positive (HP)/stress sensitive; pigs who remained relaxed or showed intermediate reactions were classified halothane negative (HN) and halothane doubtful (HD), respectively. Selection trials were then conducted in which individual breeds were divided into HP and HN lines. Trials run through a small number of generations demonstrated rapid changes in the frequency of HPs consistent with the single recessive gene argument.

Even though a correlation exists between PSS and the presence of a homozygotic halothane gene, the relationship between pale, soft, exudative (PSE) meat and halothane sensitivity is not entirely clear cut. Not all HP animals experience sudden death or yield carcasses with PSE meat. In fact, halothane reactivity is associated with a number of other production traits, both positive and negative. The carcasses of HP pigs are leaner and of higher quality; however, the reproductive performance and growth rate of HP reactors are reduced. Nevertheless, in the Pietrain and Hampshire lines studied at ABRO, the negative production traits conferred by the halothane gene (increased mortality, poor litter performance) caused greater economic losses than the gains from improved carcass quality.

Given these factors, the breeder who opts for a selection program is faced with the further choice of whether to decrease the frequency of the halothane gene to cut the incidence of PSS, or increase the frequency to a point where lean content of the carcass outweighs mortality losses. It may also be possible to crossbreed susceptible and resistant lines and produce progeny which are both stress resistant and leaner than the HN parent. Although the ABRO halothane screening test can reduce the frequency of the halothane gene in only a few generations, elimination of the gene could be accomplished only with a test that could identify the heterozygote carrier as well as the double recessive homozygote responsible for the HP reaction. (For more information on stress susceptibility in pigs, see Int J Stud Anim Prob 1(5);324-327, 1980).

WILDLIFE

Black Rhino on Endangered Species List

The black rhinoceros (estimated total population: 14,000) is now listed as endangered by the U.S. Fish and Wildlife Service. The rhinos have been hunted intensely in sub-Saharan Africa for their horns which are exported to the Far East as medicinal charms, to India where they are used in aphrodisiac potions, and most recently, to Yemen where they are carved into decorative, status-conferring dagger handles for men.

Trade in rhino horns has become quite lucrative over the past decade; an 8 lb horn now commands approximately $2,800. The poacher who kills the animal receives about $400.

The female black rhino matures at 5 years and then gives birth to only one calf every three years. This low reproductive rate is further com-
plicated by the fact that the rhino is a solitary rather than a herd animal and thus rarely breeds in areas where the population is sparse and mates are difficult to find.

Foot-Snare Vs. Leg-Hold Traps

The Ontario (Canada) Ministry of Natural Resources has been engaged in research to improve animal traps and trapping methods since 1972. Initial studies showed that live traps are more economical and more selective than quick-kill traps. However, the most commonly used live trap, the leg-hold, presents serious problems when used to capture terrestrial animals. The leg-hold tends to be non-selective, i.e., nontarget wild and companion animals may be trapped, and if set by inexperienced trappers, the leg-hold can cause severe pain and mutilation.

The second phase of the Ministry's trap research program was therefore geared toward the development and testing of an alternative live trap, the foot-snare. A recent report in Ontario Fish and Wildlife Review (18(3):11-22, 1980) discusses the results of field tests conducted to compare the steel jaw leg-hold trap and the new foot-snare.

Two experienced trappers independently tested both kinds of trap during trapping seasons in 1978 and 1979. They used three kinds of sets (dirt hole, trail, scent post), two types of site (sandy soil, clay soil) and checked the traps daily.

Statistical analysis of the collected data revealed no difference in the frequency of animals releasing the leg-hold as opposed to the foot-snare, no difference in capture rate with the exception of skunks, which tended to elude the foot-snare, and no difference in escape rate. However, a major difference was found in the rate of injury sustained by captured animals: 52% of the animals in the leg-hold traps received cut skin, broken bones, or more serious injury, while only 2% of those caught in the foot-snare suffered comparable damage. The author of the report states: "[F]ield results to date have shown that the foot-snare is just as effective in capturing furbearers as the leg-hold trap but with a greatly reduced injury rate. Although the two trappers were initially skeptical of this new device, they eventually expressed preference for the foot-snare over the leg-hold trap because of the foot-snare's comparable efficiency and greater humaneness."
The Clever Hans Phenomenon Conference

Susan Fowler

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Clever Hans, a horse owned by a retired schoolteacher named Wilhelm Von Osten, became famous in the early 1900’s for his extraordinary learning ability. The horse had been taught how to read, spell and do arithmetic by the same methods Von Osten had used with his human pupils, with the addition of a head-shaking, hoof-tapping code the horse needed to communicate with his teacher.

However, as Oscar Pfungst, a skeptical observer from the University of Berlin’s Psychological Institute discovered, Hans did not know how to read, write and do ‘rithmetic. When Hans was given a question, he would watch Von Osten or another questioner very closely. The horse could see that the questioner unconsciously leaned forward as he counted the hoof taps, and jerked his head back very slightly when the right number of taps had been reached. Hans stopped tapping when he saw that jerk.

Hans was a clever observer and communicator, but not a good calculator. The horse not only was unable to put two and two together, he didn’t know what a “two” was. Van Osten had misunderstood what was being communicated.

Since that time, whenever researchers have claimed that they have taught an animal to communicate, critics have cautioned that the results may be due to the Clever Hans Phenomenon: The researcher may have unconsciously clued the animal into the right answer, and the animal may only know that the code can be used to get something tasty out of the researcher, not that the different signs in the code mean anything in themselves.

Controlling for Clever Hans is very important in the recent communication research with apes and dolphins, if only because apes and dolphins are so smart—more capable than horses of hoodwinking unwitting humans. There are other pitfalls besides unconscious cuing in animal communication research, too, including anthropomorphization, the ubiquitous human capacity for reading meaning into any random sign (the basis for the Rorschach test), and simple self-deception. Another problem is having to use meaningful signs—speech, printed words—to describe what a meaningful sign is—tantamount to defining an eraser as something with which you erase.

A conference on the Clever Hans Phenomenon would seem a likely place to discuss these problems. It could have drawn savants from the wide variety of dis-
ciplines which view the development of language and thought as important areas of study—linguistics, neurology, ethology, child psychology, anthropology, archaeology, artificial intelligence, and ape language research, for instance.

Instead, the New York Academy of Science's "Conference on the Clever Hans Phenomenon: Communication with Horses, Whales, Apes and People," held last May in New York City, turned out to be an unprofessional, unpleasant attempt on the part of a semiotics professor to discredit the whole area of ape/human communication research.

Thomas A. Sebeok, director of the Research Center for Language and Semiotics Studies at Indiana University, and Robert Rosenthal, Harvard professor of social psychology, organized the conference. According to Duane Rumbaugh, an ape communication researcher and one of the invited speakers, Sebeok and his wife had claimed in an as-yet-unpublished manuscript that the Clever Hans Phenomenon had confounded every contribution to the data base in the chimp and gorilla studies—in other words, that apes did not have, and communicate, ideas, but only watched, imitated and manipulated the researchers.

**Setting the Stage**

At the beginning, the point of the conference and its direction were unclear. The first two speakers were Heini Hediger, an eminent zoologist from the University of Zurich, and Paul Bouissac, a student of the circus from the University of Toronto. Their talks were interesting, but not controversial. It seemed strange, however, that although Hediger had no trouble understanding questioners who agreed with him, he seemed unable to understand the English of those who were critical of his statements.

Then Duane Rumbaugh, foster parent of the computer-communicating chimps, Lana, Austin and Sherman, stood up to speak. After a quiet start, he launched into an attack on Sebeok and other critics who, he said, contrary to good scientific practice, drew their evidence too often from secondary sources and reported only negative results.

Sue Savage-Rumbaugh was more direct. She started her talk by saying, "Tom Sebeok maintains that there is 'no way to assess the language skills of apes which does not involve human cuing.'" She continued: "When told of a recent study in which Sherman and Austin were videotaped using symbols to regulate the exchange of food—with no human present—he refused to view this unedited tape, stating that the camera angle would render the work unacceptable though he had no idea of the camera's position nor the scope of the picture." Referring to the Sebeoks' unpublished manuscript, which had been sent to the Rumbaughs before the conference, Savage-Rumbaugh then said that she was obliged to forgo presenting data she had prepared for the meeting in order to have time to respond to the Sebeoks' attack.

When Savage-Rumbaugh had finished, Sebeok promptly took the floor to say that her polemics were "empty" because she had no data to present. Savage-Rumbaugh asked him why he and Jean Umiker-Sebeok had not come to see the Rumbaughs' lab before writing their critique. Sebeok said that they had not been invited. A little later, however, he admitted that he and his wife did not go to labs anymore, invited or not, because "the labs stage situations."
More Attacks

This sort of vindictive behavior continued throughout the two-day conference. When Marcello Truzzi, a sociologist from Eastern Michigan University, criticized how the conference had been set up, Sebeok made his most unpleasant attack on the animal communication researchers: One of the final problems Truzzi posed in his talk was the question of when to investigate an unlikely claim, that of a flying elephant, for example. It would depend on the circumstances and on the person who claimed to have seen this miraculous elephant, he said. For example, a drunk suffering from delirium tremens would not be a reliable witness. A circus in the center of town and a winch and crane nearby might explain a child’s claim. On the other hand, what would you do if a calm, generally unimpressionable colleague calls you up and says, “Listen, you’re not going to believe this, but I swear I just saw a flying elephant?” Truzzi answered his own question: “There are probably no Dumbos around, but if you generally trust the man, you have to believe he saw something and you might be willing to find out what it was.”

Sebeok stood up during the question and answer period and started talking about this question of Dumbos. A few sentences into his explication, “Dumbo” had inexplicably changed to “Rumbaugh” (the names rhyme).

Truzzi (interrupting): Dumbo the flying elephant, you mean.
Sebeok: Yes, “Rumbaugh,” the flying elephant. As I was saying—
Truzzi: Am I hearing you right? You’re saying Rumbaugh?
Sebeok: Yes, I’m saying Rumbaugh. As I was saying....

The last speaker, magician James Randi, had made his scientific reputation, it would seem from his own remarks, by debunking mentalist Uri Geller on a number of continents. A magic trick, he said, is partly a matter of directing the audience’s attention away from what is actually going on. When asked at the end of his talk if he thought the chimp communication researchers were committing some kind of fraud, he said yes. When asked if he had any evidence — if he had ever read the studies or seen the films, he said no, then directed the audience’s attention to its watches and closed the conference before anyone could ask another similar question.

Do You Want to Talk About It?

For some, language has been the last barrier separating Homo sapiens from the Pongidae, and this barrier too would seem to be falling. The historical evidence suggests that the vehemence of such critics of animal communication research as the Sebeoks and linguist Noam Chomsky stems from human chauvinism.

However, the Rumbaughss did not set out to discover whether chimps were humans in some bizarre disguise (or vice versa). They inaugurated their experiments, Duane Rumbaugh stated, to develop a computer keyboard language (“Yerkish”) that could be used by severely retarded human children to communicate their needs and interests.

What is more, it is not only the ape language researchers who are knocking down the barriers between species. Physiological and genetic research have
found uncanny similarities between chimps and humans. For example, the chimp’s brain shows the asymmetry which in the human denotes handedness and a differentiation between speech and nonspeech (nonverbal) areas (Desmond, 1979). Second, according to recent molecular anthropology studies, Homo sapiens and the African apes (the chimpanzees and gorillas) split from a common ancestor no more than 4 to 6 million years ago, not very long in evolutionary time (Zihlman and Lowenstein, 1979). Third, “the fine structure and genetic organization of the chromosomes of man and chimpanzee are so similar that it is difficult to account for their phenotypic differences” (Yunis et al., 1980).

The Piagetian models of human cognitive development are a neutral yardstick for measuring reasoning ability which have been used successfully in a number of areas, including archaeological anthropology (Marshack 1972). In her presentation at the conference, Suzanne Chevalier-Skolnikoff said that she had applied two of the Piagetian models to apes and found that the apes passed all of the cognition tests up to Stage 6 (18 months of age in human terms) regardless of whether they were able to make signs or use a computer keyboard. Since children are beginning to speak at that age, there would seem to be little reason why chimps would not be able to learn signs or words as well, provided that they wanted to and had some mechanism with which to do so. Originally, finding the right mechanism was a problem. The Gardners at the University of Nevada made one of the first breakthroughs in the field when they hit upon using sign language.

**Chimps as “Animal Models”**

Duane Rumbaugh says that of the nine retarded children in the program at the Georgia Retardation Center in Atlanta who had “essentially no ability to speak intelligibly” before being taught Yerkish, five are now able to communicate to a “very significant degree.”

If it is true that these children were helped, arguments about whether language acquisition by chimps makes them “human” (or makes us chimpanzees) are trivial. If it is also true that the retarded children are successfully manipulating “arbitrary symbols,” as Duane Rumbaugh puts it, this may raise questions about our theories on the brain and on mental retardation. According to an instructor in special education at Southern Connecticut State College, it is now standard practice to teach severely retarded children sign language because they learn signs much more quickly than speech (personal communication). The Bliss system of pictographs* works well too, although no one really knows why. The problem in severe retardation is not with blockages in the communication channels, but with the child’s ability to make sense of what he or she sees and hears. Why should the child be able to understand and use signs or Bliss symbols if he or she cannot handle speech?

Chimps could not learn to speak very well either. Although the simplest explanation is lack of the proper vocal apparatus, it would be enlightening if the apes’ troubles with speech could be found to have more complicated roots. And

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*A communication system which uses abstract pictorial symbols rather than words.
it would be helpful if the next cross-discipline animal communication conference would address these questions instead of serving as a showplace for its organizers’ prejudices.

References


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Amputation of Vibrissae in Show Dogs

Thomas E. McGill

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Dogs of many different breeds competing in the show-ring are routinely subjected to amputation of the vibrissae, organs that are commonly and incorrectly called “whiskers.” This procedure is thought to give the animal’s head a cleaner look, which in turn supposedly increases its chances of winning. There are several tricks involved in “whisker trimming” since the animals can retract each vibrissa at least one-quarter inch. Furthermore, they often object strenuously to the operation.

Research in the area of animal behavior has shown that we can be terribly ignorant regarding the sensory capacities of animals, capacities that can sometimes far exceed those of our own species. Consider for example the extension of the hearing range of many animals into the “ultrasonic;” the fact that bees can perceive ultraviolet radiation that is beyond our limits; and the remarkable capacity of bats and porpoises to find their way about by means of echo-
location. But beyond the extension of familiar sense modalities, animals possess senses that are completely absent in humans. There are fishes that produce an electric current and then detect objects that alter the electrical field that surrounds their bodies. It has recently been determined that pigeons, and probably other birds, can sense the earth's magnetic field. New discoveries in the area of animal sensory processes are occurring all the time, but progress is sometimes slow since it is difficult for us to hypothesize and then investigate sources of stimulation that we are incapable of perceiving. It is possible that vibrissae act to detect some as yet unknown stimulus. It seems more probable that they function to extend some aspect of the animal's tactile sensitivity.

A literature search was undertaken to determine what is known of the functions of vibrissae, organs that humans and most other primates do not possess, but which are universal in the carnivores and several other mammalian orders. Unfortunately, definitive research on the functions of these organs in common domesticated animals appears to be lacking, although many interesting speculations exist. As might be expected, we know considerably more about their functions in the familiar laboratory rodents. Therefore, in the following paragraphs I cite some of the research findings for rodents and certain other species, followed by presumptive evidence as to the importance of these organs in species as yet unstudied, particularly the dog.

Behavioral and neural approaches to the functions of the vibrissae have been summarized in an excellent review article (Psychol Bull 84:477, 1977). Amputation of vibrissae in rats affects locomotor activity, depth perception, swimming ability, shock-induced fighting, emotionality, tactile maze learning, equilibrium, and discrimination of surfaces. Removal of the vibrissae lowers general activity level in cats. The vibrissae of seals are sensitive to vibrations from 50 to 1000 Hz, and it is thought that the animals use these organs to detect prey in dark waters (J Zool 188:443, 1979).

The length of the vibrissae appears to be correlated with the ecology of the animals. Burrowing mice have vibrissae that are shorter than arboreal species. Among carnivores, the vibrissae of bears are considerably shorter than those of the hunting canines and felines. It is also interesting to note that whales, having forsaken the land for an aquatic environment, lost all body hair except the vibrissae.

While firm evidence of the importance of these organs in dogs is lacking, there is presumptive evidence of their potential significance: 1. The very ubiquity of vibrissae in carnivores suggests important sensory functions. Evolutionary theorists agree that nature is conservative and does not expend energy on the maintenance of useless organs. 2. Vibrissae are constructed differently and are much more heavily innervated than other body hair. 3. The vibrissae in dogs are served by the largest of the twelve pairs of cranial nerves. 4. It is generally recognized that the amount of sensory cerebral cortex devoted to a particular body area is in direct proportion to the importance of that area in the sensory world of the animal. In plotting the sensory areas of the cerebral cortex of the dog it has been determined that "face representation clearly accounts for at least 50 percent of somatic area 1 and for a third or more of somatic area 2" (J Neurophysiol 19:485, 1956). The upper jaw occupies a disproportionately large amount of the face area.
We may presume, then, that vibrissae are important sense organs in dogs. But what is the effect of their removal? As noted above, behavioral data are lacking. Similarly, appropriate neurophysiological studies have not been conducted. But again, we can speculate on the basis of studies done with rodents. If vibrissal papillae are damaged in newborn mice, the fourth layer of the cerebral cortex exhibits permanent abnormal development (Neurosci Lett 6:151, 1977). If the damage occurs later in life, the brain is less severely affected (J Comp Neurol 170:53, 1976). Of particular interest is a study using adult rats (J Comp Neurol 178:629, 1978). The investigators cut off some of the animals' vibrissae. The next day they injected a radioactive sugar and allowed the rats 15 minutes to explore a strange environment. The animals were then killed and the radioactivity levels in various parts of the brain were determined. Their findings indicated reduced metabolic activity (cellular uptake of the radioactive sugar) in those areas of the brain associated with amputated vibrissae. If similar results occur in dogs, one wonders what the effects are in animals subjected to chronic, weekly amputations when the animals are "on the show circuit."

From anatomical data on dogs themselves, and from behavioral and neurophysiological data on other mammalian species which may apply to dogs, one can hypothesize that the vibrissae are sense organs of some importance to the animal. With this possibility in mind, we may question the moral legitimacy of vibrissal amputation. Why is it done? The answer is simply for cosmetic purposes in order to compete; to have one's dog placed above others in terms of conformation. But since the practice is so common, in effect it is performed to avoid losing an advantage rather than in hopes of gaining one. Many owners and handlers would be happy not to use this particular procedure if others abstained. No one claims that vibrissal amputation helps the dog in any way. It is simply viewed as a harmless technique that is thought to improve the animal's appearance. But the research literature suggests that it may not be harmless; instead it may be damaging. At best it is unnecessary, and at worst it may be a form of sensory deprivation, the effects of which are beyond the current state of our knowledge.

The solution to the problem is simple in conception but will doubtless prove difficult in implementation. Ideally, the American Kennel Club and governing bodies in other countries should recognize the potential importance of vibrissae as sense organs and instruct judges to excuse from the ring animals whose vibrissae have been trimmed. Competition would be equalized by the universal prohibition of this entirely unnecessary procedure. At the very least, the national kennel clubs and/or the individual breed clubs should explicitly state that vibrissal amputation is optional, and no dog with these organs intact should be penalized.
Ethology and Laboratory Animal Welfare

James A. Cohen

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At its annual conference, held this June at Colorado State University in Fort Collins, the Animal Behavior Society (ABS) passed a resolution opposing HR 4805, a bill which would establish a National Center for Alternative Research to develop and coordinate alternative methods of research and testing which do not involve the use of live animals. The ABS, which represents some 1750 North American animal behavior researchers, took issue with the bill on the grounds that: a) it discourages replication of previously-obtained results, b) there are currently no satisfactory substitutes for live animals in behavioral research, c) it would complicate and delay research that may be of great potential benefit to society, and d) it fails to provide adequate protection for animals while greatly increasing the cost of research or decreasing the amount of research which can be adequately conducted.

In my view, the ABS (of which I am a member) has taken the proper position on this bill but I cannot accept their reasons for doing so. The ABS claim that replication of results is “necessary to confirm and verify scientific findings” is not under question when the purpose of the research is to extend, generalize, or refine these findings. To replicate the original conditions of an earlier study so that this may then be done is fully justified. However, if the goal is merely to replicate and reconfirm with no thought of original work to be done, then we have the kind of case which HR 4805 seeks to avoid. Many scientists will stop reading here and say, “Well, nobody does that!” Indeed, if that is the case, then there should be no reason to argue with this provision of the bill. If such pointless replication does occur, then it ought to be stopped.

In its second objection to the bill, while recognizing the need for humane treatment and alternative methods of research, the ABS points out that there are currently no substitutes for live animals in behavioral research. This point is generally valid, especially when behavioral processes per se are of interest, rather than used as an index of some underlying organic condition which might be studied by other means. For example, a behavioral toxicologist might study the effects of administration of lead on the reflexive behavior of rats, not because he or she is interested in the organization of such behavior per se but rather because he or she wants to know whether there are neurotoxic side effects of lead. Supporters of alternatives would rightly inquire whether a tissue culture method...
might be developed to replace the live animals in such experiments yet yield the same practical information. Similarly, one might—and, in my view, should—ask whether alternatives to, or modifications of, live animal use in studies of drug addiction, learned helplessness, and the like could be developed in order to spare the animals any pain and/or suffering they might otherwise undergo. I do not accept the view, espoused by some, that since pain and suffering are difficult to define, they may therefore be disregarded. The animal should always be given the benefit of the doubt. Analogously, consider the concept of “play.” Ethologists have struggled for years, attempting to define what play is. At present, we can only state some of its typical properties but most of us recognize it (at least among mammals) immediately. What prevents us from extending the same approach to our consideration of animal suffering?

I do not mean to imply here that ABS members commonly conduct pain-inducing studies—but some do and we may as well have qualms about it. That is not the point. The point is whether, giving the animal the benefit of the doubt, alternatives are possible and desirable. These questions must continually be asked.

In its third objection, the ABS claims that the bill would “complicate and greatly delay the initiation of research that might have great potential benefit to society.” This contrived line has been trotted out so often by groups seeking to avoid “governmental interference,” that I fear it is wearing very thin and losing credibility. Animal behavior research is important, fascinating, rewarding, and enjoyable, and may even occasionally have “great potential benefit to society.” But, for a more objective look at this issue, I recommend picking up a recent copy of Animal Behaviour, the ABS-sponsored journal (or any other journal, behavioral or otherwise, for that matter) and asking yourself squarely which of these albeit well-done and interesting studies are of such timely importance that they could not withstand a few months of delay in the interests of animal welfare. By no means do I wish to slight behavioral research—it is, after all, my chosen profession—but I do feel that each researcher should ask himself or herself what kinds and extents of professional sacrifice he or she is willing to make in order to help ensure that research animals will not face unnecessary pain and suffering.

Finally, the bill is not intended directly to “provide adequate protection of animals.” That is the direct purpose of the Animal Welfare Act. HR 4805 seeks to protect animals indirectly by reducing their unnecessary uses (and, therefore, abuses.) This is a very real benefit indeed. The ABS charge that the use of alternatives necessarily increases the cost of research is, unfortunately, misinformed, as witnessed by the Limulus lysate test for endotoxins. This simple in vitro test utilizes the blood drawn from horseshoe crabs (whom it is not necessary to harm or kill) and completely eliminates the need to equip and maintain expensive laboratory colonies of rabbits outfitted with rectal thermometers. Not only is the lysate test significantly cheaper than the live animal model, but it is many times more sensitive. Numerous other economically preferable alternatives could be cited.

Animal behaviorists may well wonder what relevance such a biomedical example may have for them. The answer is that separate pieces of legislation cannot practicably be developed for each field of science. We cannot have one law for ethologists, one for psychologists, one for endocrinologists, etc. Thus, to object to a bill on the grounds that it rarely applies to one’s own field of interest is unjustifiably provincial.
The ABS has, in recent years, taken preliminary measures to protect laboratory animals used by its members. Reviewers of manuscripts submitted to Animal Behaviour are now asked whether the research infringes on any laws relating to animal welfare—*as far as the reviewer is aware*. But it should be recalled that one may inflict tremendous pain and injury on animals in the name of science without infringing on a single US law and that a great part of the reason why those laws are so permissive is that professional societies (e.g., National Society for Medical Research) continually attempt to block, rather than contribute to, appropriate legislation.

In another, otherwise commendable move, the ABS recently adopted its own set of guidelines for the care and maintenance of research animals by its members. The stated purpose of the guidelines is “to promote the continuing interest of the ABS in furthering of scientific knowledge and conscientious awareness of human responsibility toward animal life.” Unfortunately, only 4% of the ABS membership (i.e., 72 persons) bothered to vote either for or against adoption of these guidelines, while some 25% voted in each of the years 1978 and 1979 for election of society officers. When faced with such facts, it becomes difficult to see where the “continuing interest” of society members lies.

The new ABS guidelines create an Animal Care Committee empowered to use welfare criteria as bases for rejecting manuscripts submitted for publication in Animal Behaviour, or for presentation at society conferences. Of course, only abstracts of conference papers are available in advance and the methods are usually not detailed in these. Nevertheless, the committee apparently did not react when in Fort Collins this year, an ABS member presented a paper on the behavior of anubis baboons required to smoke cigarettes in isolation cages for over three years. My choice of this example clearly reflects a personal distaste for studies of this kind and it is a distaste which I cannot expect everyone to share. My point, however, is to ask whether the information derived from such studies is useful and, if so, whether alternatives might not be developed to replace, or reduce the numbers of animals used in such studies. If the answer to this is negative, then we should ask what we can do to alleviate the probable pain and/or suffering of these animals (e.g., Must they be kept in isolation cages?). The important thing is that these questions be continually asked, and that we want to ask them.

HR 4805 is by no means a perfect bill and there is a perfectly good reason to reject it in its present drafting. It requires that 30-50% of all federal monies now spent on live animal research be reallocated toward the development of alternatives. Moreover, it does this *without ever defining* “live animal research.” If enforced to the letter, such an across-the-board reallocation would hamper not only painful and stressful research but also wholly non-interventional ethological, ecological, or other research on free-ranging animals, endangered species, or even animal welfare-related research itself, since these too are studies “using live animals.” HR 4805 is clearly too loosely worded to be passed in its present drafting. The major problems, however, could well be rectified in congressional hearings prior to forwarding to the Congress for approval. Unfortunately, rather than requesting hearings on the bill in order to correct its flaws, the ABS has voted to throw the baby out with the bathwater.

A bill on alternatives has been needed for a long time and we currently have
before us one such bill with widespread popular support and as many as 52 con­
gressional co-sponsors. It deserves a chance to be repaired in committee even if
only because the chance may not come again soon. Ethologists have a unique
opportunity to play a very constructive role in the development of appropriate
legislation since it is they who, by training, should be most sympathetic to the na­
tural needs, fears, and vulnerabilities of laboratory animals.
Stress: What Is It and How Can It Be Quantified?

T.H. Friend*

Abstract

An animal may be considered to be in a state of stress if abnormal behavior or extreme adjustments in its behavior or physiology are necessary in order to cope with adverse aspects of its environment. Methods used to determine if an animal is stressed can be either behavioral or physiological. Behavioral methods may be highly erroneous due to their subjective nature since alterations in behavior do not necessarily prove that an animal is stressed. There is no single measure of stress that can be used in all situations at this time. Every measure must be critically evaluated to ensure that it is valid for each application. An integrated approach using both behavioral observations and physiological measures is necessary.

Introduction

Stress is a phenomenon which everyone acknowledges, but few can agree on a definition. Fraser et al., (1975) discussed various definitions and concepts of stress in a nine page paper in the British Veterinary Journal. These authors proposed that an animal is in a state of stress if it is required to make abnormal or extreme adjustments in its physiology or behavior in order to cope with adverse aspects of its environment or management. The behavioral and physiological responses to a challenge are the effects of stress.

It should also be recognized that animals can make both physiological and behavioral adjustments in the presence of a stressful situation which can eliminate that event from being a stressor (Moberg, 1976). In fact, morphine-like compounds (endorphins), which promote emotional detachment from the experience of suffering, have recently been identified in the brain (Goldstein, 1976). There is speculation that they may aid in tolerating stressful conditions.

It is immaterial whether the stressor is pleasant or unpleasant. All that counts is the intensity (Selye, 1973). Parents who are suddenly told that their only son died in battle would suffer the same stress if the news turned out to be false.

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and the son unexpectedly walked into the room. There is also evidence that psychological stressors such as being confronted with conspecifics or species enemies may be more potent in eliciting physiological reactions indicative of stress than physical stressors such as electrical shock applied to the feet of an animal (Peters, 1977).

According to Hans Selye (1973), who is generally considered to be the founder of human stress research, stress is not something to be avoided and in fact, cannot be avoided. No matter what an animal does, there arises a demand to provide the necessary energy to resist and adapt to the changing environment. Selye continues to point out that complete freedom from stress is death. Contrary to public opinion, we must not—and indeed cannot—avoid stress.

Current methods of measuring or quantifying stress of animals involve measuring its manifestations. Once a stressor is perceived, the animal reacts either behaviorally, physiologically, or most often, in combination, to enable it to resist and perhaps alleviate the challenge. The use of behavioral observations, physiological measures and combinations of both as measures of stress will be discussed as they apply to farm animals.

**Behavioral Measures of Stress**

A stressful condition obviously exists, for example, when overt fighting occurs or when an animal is frantically trying to break out of a cage. Measures of chronic or long-term stress, the behavioral signs of which can be very subtle, are far more controversial. What has been presented in the popular press as measures of stress range from subjective, anthropomorphic evaluations with no foundation to well substantiated, scientifically acceptable measures. Even the best measures, however, must be critically examined for each application. Several of the most frequently used methods are discussed below.

**Occurrence of a Specific Abnormal Behavior**

The occurrence of a specific “abnormal” behavior such as tailbiting in groups of swine kept in confinement, stereotyped movements (e.g., incessant pacing in zoo animals or stall weaving in horses), or other displacement or vacuum activities, are frequently presented as possible indicators of stress. There are, however, serious problems with their use. The behavior of an animal is very complex and even a specific behavior can be attributed to many different factors.

The tailbiting syndrome in swine is a very good example of the complexity of an apparently simple behavior. In acute tailbiting many of the pigs in a pen may be afflicted. In extreme cases, the attacking pig or pigs may continue to consume the victim, resulting in crippling and perhaps death. Frequently there is only one tailbiter and if the attacker is not removed from the group, it may be the only pig with an intact tail. The incidence of tailbiting can be increased by potential stressors such as artificially high levels of ammonia gas (Van Putten, 1969). Hence, people often perceive it as a sign of stress, but generally the cause is more complex. Pigs are “poor sports.” If chased from a feeder by a more dominant pig, they will frequently retaliate by biting the tail of the defenseless dominant pig while its head is in a feeder. The tailbiter is frequently one of the smallest or a subordinate in the group, which supports the retaliation theory. Removing the
tailbiter will eliminate tailbiting in the group. One would expect another tailbiter to evolve if the activity were caused by stressful conditions, but this is not the case. Also, in a typical, very large confinement farm the author observed tailbiting in only one pen. If tailbiting is an indication of stress, what can be said about the other forty-nine identical pens in which it did not occur? Other potential causes and cures of tailbiting are covered in numerous review articles (e.g., Fritschen, 1978).

The appearance of displacement or vacuum activities does not necessarily prove that an animal is stressed. There may be signs of boredom or frustration (Wood-Gush et al., 1975; Hediger, 1950), but this may also indicate that the animal is coping with the situation. People will often do something they would not normally do to relieve boredom or frustration. Following this line of thought, we could even rationalize that it is the animal which does not show displacement activities (or, the person who fails to release his or her emotions) that is most probably stressed. It can also be argued that some vacuum activities are instinctive behavior patterns (e.g., nest building in swine) which the animal would perform regardless of environmental conditions.

Absence of “Normal” Behavior

Frequently the behavior of an animal in a potentially stressful environment, i.e., a cage or in confinement, is compared with that of conspecifics in more natural conditions. The prevention of dustbathing, or wing flapping, or simply the ability to move about in poultry cages is often considered indicative of a stressful condition. The mere inability of an animal to show behavior that typically occurs under a different set of conditions, even though they may be less restrictive, is not necessarily indicative of a stressful condition.

The Brambell Committee (Brambell, 1965) recommended that an animal should have freedom to turn around, groom itself, get up, lie down and stretch its limbs. There is a problem with blanket recommendations (or legislation) due to the immense amount of variation across and within a species. The basic behavioral repertoire of the species in question, as well as the experience and background of each individual within the species, must be considered.

For example, a farrowing crate prevents a sow from turning around and greatly restricts her activity during the four to five weeks she is confined in it. This may be stressful for an animal with a strong drive to travel, such as a wolf. A pig, however, will normally spend 80% of its time asleep if its environment is satisfactory (Haugse et al., 1965). Pigs that are accustomed to crates will not show signs of maladjustment (fighting the crate). When sows are released in the alley leading to the farrowing crates at our University Swine Center, the sows will sort themselves out and willingly enter the crate in which they last farrowed.

Defining normal behavior can also be a problem. Comparing the behavior of domestic animals to that of their wild relatives lacks meaning due to genetic differences. Domestication has exerted a strong selective pressure to develop animals that are adapted to domestic conditions. Feral or free ranging domestic animals would yield more relevant comparisons. If one thinks about this whole approach, it appears analogous to comparing a “primitive” tribe of humans to apartment dwellers in a major city. One would be making a strictly philosophical decision concerning how people should live. It would be necessary, for example,
to examine the health records of both populations to make a meaningful decision. There is a good chance of discovering that the population with no stress-related disease also had a much greater mortality rate.

**Change in Behavior Patterns**

This procedure generally establishes fairly quantitative behavioral patterns (e.g., time standing, time resting, or number of vocalizations) as indices of stress or the overtaxing of resources. This approach was used to determine the minimum number of free stalls (resting sites) required by dairy cattle in confinement barns before they became overcrowded (Friend et al., 1977b). Time spent resting per day was determined using time lapse photography as the number of free stalls were reduced at seven day intervals. A significant reduction in resting time occurred at .50 and .33 stalls per cow (Table 1). However, we could not say that the cattle were stressed based on this change in behavioral patterns alone. These data indicated only at what density the cattle were no longer able to rest as often as they had when space was abundant.

All three measures of stress discussed to this point need supporting evidence before they become valid measures of stress. It must first be established that preventing an animal of a particular species from turning around, or having a normal amount of resting time is stressful. This generally means measuring some change in an animal’s physiology indicative of stress.

**TABLE 1—Effect on reducing number of free stalls on daily free stall utilization per cow.**

<table>
<thead>
<tr>
<th>Free stalls per cow</th>
<th>1.0</th>
<th>.83</th>
<th>.67</th>
<th>.50</th>
<th>.33</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average time resting in stalls (hr)± SD</td>
<td>14.2±1.5</td>
<td>14.2±1.9</td>
<td>13.2±2.0</td>
<td>10.4±2.0*</td>
<td>6.9±2.0*</td>
</tr>
</tbody>
</table>

*Differs from 1.0 free stall/cow (Dunnett's test).

**Choice Tests**

Why not give the animal a choice between conditions and see which one(s) it prefers? This approach does not necessarily discern what is stressful or adverse to an animal's welfare, but merely indicates the animal's preference. The choice could be due to comfort or familiarity, especially if the second choice is novel. The influence of prior experience in choice tests was shown by Dawkins (1976). She found that when hens were offered a simultaneous choice between a battery cage and an outside run, birds from battery cages initially preferred cages. Hens given continuous access to both did not show evidence of a preference. Operant conditioning techniques in which the animal indicates its discomfort have the same limitation.
Physiological Measures of Stress

Once a stressor is perceived, physiological changes will occur within the body to help the animal resist stress. The degree and type of physiological measures of stress involve measuring some type of parameter that indicates that the body is responding to a stressor. Many parameters have been used; however, each has only limited application. In order to understand the commonly used physiological measures of stress, we must understand the changes in physiology that occur in a stressed animal.

Figure 1 is a simplified diagram of the major pathways by which an animal initiates physiological responses that are associated with stress. Neutral pathway A influences the body almost immediately whereas neural endocrine pathway B
T.R. Friend—Stress

may have a lagtime of several seconds. Vasoconstriction stimulated by these pathways causes an increase in blood pressure and a reduction of body surface temperature (less blood near the surface of the skin). Along with these changes, increased heart rate, respiration rate, and occurrence of ulcers (due to interference with normal digestion) have been used to measure stress. These pathways react rapidly, making them indicators of short-term stress. However, heart rate, blood pressure, and respiration are readily influenced by physical activity, which frequently confounds their use as measures of acute stress.

Pathway C is concerned primarily with long-term stress. While stimulation of this pathway occurs immediately, a 48 hr period of continuous stimulation is required before full symptoms appear. Due to alteration of gonadotrophins, such measures as conception rates, embryonic mortality, and irregular estrus can be signs of stress. Due to the suppression of growth hormone, growth rates can also serve as indicators of stress. People involved in livestock production, where reproduction and growth rates are extremely important, should be cognizant of this relationship for economic as well as ethical reasons.

The hypothalamic-pituitary-adrenal cortical axis is vital in enabling an animal to cope with stress (Selye, 1973). Adrenalectomized animals cannot survive even mild physical exertion without glucocorticoid therapy. Several minutes after a stressor commences, stored glucocorticoids are released from the adrenal in response to initial ACTH secretion. The stores are quickly depleted and glucocorticoid secretion returns to low levels until the adrenal undergoes hyperplasia and hypertrophy.

This surge can be measured by obtaining blood samples at close intervals after the onset of stress (Smith et al., 1972). Approximately 48 hrs after initiation of the stress, detectable hyperplasia and hypertrophy of the adrenal occurs (Selye, 1936a; Friend et al., 1977a). Increased glucocorticoid secretion then continues until either the stress is removed, adaptation occurs, or adrenal exhaustion occurs and the animal dies (Selye, 1973). Change in adrenal weight has been widely used as an indicator of stress exceeding 48 hrs (Christian, 1961; Selye, 1973), but this requires euthanizing the animal.

Measuring the adrenals' response in the form of glucocorticoid output after a massive dose of ACTH appears to be a good alternative to euthanizing an animal to determine adrenal function. Figure 2 (Friend et al., 1979) shows a change in adrenal output of glucocorticoids for cows kept at different free stall densities. A crowding condition probably occurred (P < 0.01) when the cows (four per treatment) had access to 0.50 or 0.33 stalls. This procedure shows considerable promise as a means of measuring long-term stress; however, what occurs during adaptation to long-term stressors requires more research. We are beginning to see trends in unpublished data which indicate that adrenal response decreases to normal levels after one or two weeks of exposure to certain stressors. It is not yet known if the return to normal indicates that the animal has adapted and the condition is no longer stressful or if the hypothalamic-pituitary-adrenal cortical axis is becoming refractory (Selye's "state of exhaustion," 1936). The severity of the stressor is probably a controlling factor in adaptation.

Since the enlarged adrenal releases increased amounts of glucocorticoids, many researchers have presented plasma concentrations of glucocorticoids as a measure of stress. However, there is a problem in interpreting plasma concentra-
FIGURE 2—Adrenal output of glucocorticoids after a massive dose of adrenocorticotropin (1.98 IU ACTH per kg body weight) in cows under different free stall stocking rates (Friend et al., 1979).

The effects of glucocorticoids on the body are very complex and are the object of considerable study. Figure 1 lists two effects that have been well documented. Glucocorticoids are known to be gluconeogenic; therefore, researchers can relate changes in plasma glucose to the occurrence of stress (Pearson and Mellor, 1976). The anti-inflammatory effect of glucocorticoids and the resulting change in resistance to standardized disease challenges also serve as measures of stress (Gross and Colmano, 1969; Gross, 1972). Animals that have been transported long distances often show a high incidence of disease. “Shipping fever” is considered a major problem in the cattle industry.

Discussion

The common anthropomorphic approach of assessing an animal’s welfare by attempting to place oneself in an animal’s situation as one perceives it lacks credibility. Each species lives in a totally different Umwelt (a term to describe the world around a living organism as that creature experiences it). Differences in perception (sight, taste, smell, touch, hearing), sense of time, experience and...
genetic factors can make what would appear idyllic to human beings exceedingly stressful to another animal and vice versa. People’s opinions about various species are also greatly influenced by experience and education (Kellert, 1980).

At present we do not have a simple, all-inclusive technique for determining when an animal is being stressed. The use of behavioral observations alone could easily lead to erroneous conclusions. Techniques based solely on physiological changes must be thoroughly evaluated for their applicability to the situation. An integrated approach combining behavioral observations with physiological data is more credible. For example, even though the free stall behavioral data presented earlier quantified a significant change in behavior, it was the concurrence of the physiological data that gave it credence.

Physiological parameters, especially hormone determinations, are expensive and time consuming. A practical alternative for many situations would be to use physiological data to establish whether a behavioral observation is indicative of stress and then to use that behavior (or change in behavior) as a measure of stress in comparable situations.

There has been very little research directed toward developing an objective method of assessing stress. Most of what is known is drawn from work with other objectives. People have become interested in this area only relatively recently, and financial support for such work in farm animals in the United States is still negligible.

Acknowledgements

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References


Friend, T.H. Guazdauskas, F. and Polan, C.E. (1979) Change in adrenal response...


Problems With Kosher Slaughter

Temple Grandin*

Abstract

Ritual slaughter to produce kosher meat is rooted in the teachings and writings of the Talmud. However, the preslaughter handling features of modern systems, particularly the shackling and hoisting of large steers, contravene the basic message of humanness included in the teachings. The throat-cutting of a live, conscious animal is relatively pain-free, provided that certain precautions are followed, but U.S. kosher plants need to install newly developed conveyor-restrainer systems to eliminate the abuses of shackling and hoisting. Conveyor-restrainer systems for large and small animals are discussed.

The Religious Ritual

In order for a piece of meat to be kosher, it must be slaughtered and processed according to ritual methods specified in the Talmud. These methods derive from explicit commands contained in the Torah on the types of animals that the children of Israel may eat and how these animals should be prepared for consumption. ‘Shechitah’, the act of killing for food, must be conducted by a learned, pious Jew, the ‘shochet’, who is trained in the slaughter ritual.

The shochet slaughters the fully conscious animal with a razor-sharp knife, which must be twice the width of the throat of the animal to be slaughtered. He uses a single, smooth deliberate motion, severing the carotids and the trachea. After each cut, the shochet checks the knife for nicks or imperfections. If the blade has a nick, then the animal is declared to be ‘tref’ or not kosher and the meat is sold on the regular market. Shochet Rabbi Garb (1977, personal communication) contends that, if the cut is made correctly and the knife has no nicks, the animal feels little or no pain.

The five rules of kosher slaughter are as follows:

1. ‘Shechiyah’ (Delay)—A delay or hesitation of even a moment makes the

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animal's flesh unkosher. The knife must move in a single uninterrupted sweep.

2. 'Derasah' (Pressing)—The knife must be drawn across the throat with little exertion. Any undue pressure renders the animal unkosher.

3. 'Haladah' (Digging)—The knife must be drawn over the throat so that it is visible while shechitah is being performed.

4. 'Hagramah' (Slipping)—The limits within which the knife may be inserted are from the large ring in the windpipe to the top of the upper lobe of the lung when it is inflated, and corresponding to the length of the pharynx. Slaughtering above or below these limits renders the meat unkosher.

5. 'Ikkur' (Tearing)—If either the esophagus or the trachea is torn out or removed from its normal position during slaughter the carcass is unkosher.

The shochet's work is not done until he has inspected the internal organs for signs of disease. The Talmud contains detailed instructions on how to conduct a postmortem inspection. If any sign of disease is found the entire carcass is declared unkosher. The ancient Jews had considerable knowledge of anatomy and their postmortem inspection was the forerunner of the USDA inspection which takes place in all federally inspected meat packing plants. In a kosher plant, the carcass and internal organs are inspected by a shochet and either a state or USDA meat inspector. While the USDA rejects only the part or organ which is unwholesome or diseased, the shochet rejects the entire carcass. The shochet may, however, pass carcasses from a sick animal since there are many pathologies which are not specified in the Talmud.

After the carcasses have been inspected, the rabbi or shochet puts a kosher mark on the brisket of the carcass, and on the edible offal such as tongue. In a large kosher slaughter plant, 2 or 4 shochets will work together, slaughtering, inspecting organs and tagging meat. Rabbi Abe Krieter (1977, personal communication) explained that a different mark, corresponding to one of the 52 chapters in the five Books of Moses, is used each week.

If the carcass is held in the cooler or during transit for more than 72 hours after slaughter it must be washed; otherwise it will lose its kosher status (Wentworth, 1953). One of the major reasons for washing the meat is to remove blood. When the meat is consumed in the home, further steps are taken to remove blood. The meat must be soaked in cold water for half an hour and then salted before cooking (Gordon Geller, 1955). Another acceptable way of preparing meat is by broiling since the blood drips away through the rack.

Torah states that the blood contains the life, or soul, of the animal. The prohibition against eating blood is stated many times in the Bible. "Only be sure that thou eat not the blood: for the blood is life, and thou mayest not eat the life with the flesh" (Deuteronomy 13:23). The penalties for eating blood were severe: "If any Israelite or alien settled in Israel eats any blood I will set myself against the eater and cut him off from his people, because the life of the creature is in the blood" (Leviticus 17:10-11). The animal must therefore be presented fully conscious for slaughter not only because stunning constitutes a blemish and renders the meat tref, but also because it was and is believed that slaughter of a conscious animal maximizes bleedout. However, Cockrill (1974) maintains that "there is more blood remaining in the flesh of animals killed ritually than when they are first made unconscious before bleeding. The lighter color of ritually
slaughtered meat is due to the larger amount of oxygen in the blood as a result of heavier breathing of the animal before it dies.” In many instances, a stunned animal will bleed out as well as or better than one slaughtered without stunning (Grandin, 1980a).

Observations by the author in slaughter plants indicate that heavy steers killed by the kosher method have more bloodsplashed meat (small hemorrhages in the meat) than heavy steers which are stunned with a captive bolt. During the fall season, when animals are more prone to bloodsplashing, the incidence of bloodsplashed meat in ritually killed heavy steers may reach 2-10%. Bloodsplashing seldom occurs in ritually killed sheep.

The Importance of Kashrut (Dietary Laws)

Many people wonder why Orthodox Jews believe in maintaining dietary laws which from the practical standpoint of hygiene are no longer needed. According to Rabbi David Rebibo (1977, personal communication), Dean of the Phoenix Hebrew Academy, observing the dietary laws helps one to live a holy life. In Biblical references to dietary laws, the concept of holiness is integral. Deuteronomy 14:21 says, “Thou shalt not eat an animal that dieth itself, for a holy people are ye to the Lord.” The Handbook of Jewish Dietary Laws, which is published by the Union of Orthodox Jewish Congregations of America and the Rabbinical Council of America (Gordon and Geller, 1955) concludes: “Thus the Bible uniformly regards the Dietary Laws as a discipline of holiness. They are a discipline of the spirit imposed on a process that is otherwise entirely physical. They are an insistence that man’s eating should be not only a satisfaction of his bodily appetites, but also an exercise in holiness of the soul. Judaism takes eating and drinking and weaves them into the fabric of religious living.”

Grünwald (1955) stated that the person performing shechitah should think about the act of taking an animal’s life:

“A man may kill an animal but he should always remember that the animal is a living creature and that taking life from the animal involves responsibility.” (Levinger, 1979a)

Judaism attaches great seriousness to the act of taking life. One reason for the many laws detailing the precise manner by which animals are killed for food is to maintain controls on the act itself.

About six years ago, I started designing slaughter equipment and was disturbed by cases of brutality and desensitization. As I continued to work on the equipment used to end the lives of the cattle I became convinced that slaughter should be treated as a sacred ritual as demonstrated by this passage, written four years ago,

“I reached over the side of the chute and touched a steer’s back. I had empathy for the animal and maybe it sensed it because its fear diminished. In a few seconds the animal would become beef, and the essence of its individuality would return to God. For any living thing to continue to live another living
thing has to die. I felt a closeness and a respect for the steer I had never felt before."

"To become more aware and understand, not just in my intellect but in my heart, I realized that I would actually have to kill the animal. To refuse to participate in the killing part of the process would be a denial of reality. I was afraid to step over to the stunner's platform and kill the animal. There has been great progress made in the equipment used to kill food animals. It is easy to operate and painless for the animal."

"People have a conscience which enables them to be aware of the consequences and meaning of their acts. The ending of the life of a living thing should be approached with respect. This would help me become more aware of the meaning of my own existence. To become aware I had to be able to kill the animals, but at the same time maintain an attitude of gentleness and respect for them. Killing is a harsh act, but harshness is part of nature; gentleness is also part of nature. If you lose respect for the animals the killing process degenerates into assembly line box stapling, or you turn into a brute. On the other hand many people run away from the fact that the animals have to die.

"A person who is able to respect the animals and plants which we harvest for food will be able to take the first step of learning the meaning of life. A farmer is said to be close to the earth. Many people in our modern technological society have lost touch with the earth. Their values have become trivial."

(Grandin, 1976, unpublished).

The builders of high speed automated slaughtering equipment in Holland appear to have similar feelings. The Machinefabriek, G.J. NIJHUIS B.V., in Winterswijk, Holland named their most highly automated equipment "Walhalla". In Nordic mythology, Walhalla is the paradise for warriors who died gloriously in battle. (Davidson, 1972).

**Humaneness of Kosher Slaughter**

Preventing pain to an animal is a command of the Torah (Cohen, 1949) and great care is taken to insure that the throat cut will be as painless as possible. Morris Laub (1966) of the United Synagogue of America states: "Jews have been known for their active interest in humaneness of (sic) animals. Indeed, the very reason for shechitah items from our concern for humaneness towards animals. Our religious literature is replete with injunctions against tsaar baal hagim—inflicting pain upon animals." An animal is declared unkosher if the knife is nicked because a rough spot on the blade can cause pain. Levinger (1979a) cites many passages from the Talmud concerning the importance of humane treatment of animals. For example, "the righteous man knows the soul of his animal" and "he does not overfeed or overwork his animal" (Epstein, 1948).

Albert Einstein (1938) emphasized the importance of humaneness in general. "To
be a Jew, after all, means first of all, to acknowledge and follow in practice those fundamentals of humaneness laid down in the Bible—fundamental without which no sound and happy community of men can exist.”

**Throat-Cutting Without Stunning**

There has been a great deal of controversy over whether or not it is painful to cut the throat of a conscious animal as is done in kosher and Moslem slaughter, and in the slaughter of lambs in New Zealand and Australia. While the shackling and hoisting of a conscious animal is totally unacceptable, the use of a restrainer does not resolve the question of throat-cutting.

Nangeroni and Kennett (1963) conducted a careful study with the EEG to determine how long different animals remain conscious after they have had their throats cut by the kosher method (Table 1). Later studies, also using EEG techniques, confirmed that sheep are permanently insensible 3 to 10 seconds after their throats are cut (Blackmore et al., 1979). Baldwin (1971) demonstrated that it took 8-10 seconds for goats to become unconscious after the carotid arteries were tied off. It is possible that tying the carotid arteries could prolong the time to the onset of unconsciousness because the blood pressure would not necessarily drop. Small, one-week old calves may remain conscious (as determined by the EEG) for up to 100 seconds after having their throats cut kosher style. “In contrast to sheep, the vertebral artery in the calf directly contributes to all parts of the brain” and this delays cerebral anoxia (Blackmore et al., 1979). In addition, calves may remain conscious for longer than mature cattle due to their greater tolerance for anoxia (Baldwin, 1971).

My own observations of heavy steers being slaughtered by the kosher method indicated that many animals still had eye blink reflexes about 5 seconds after the throat was cut. Rowsell (1979) reported that 56% of the sheep slaughtered by the kosher method lost the blinking reflex within 15 seconds but that the time for individual animals varied from 5 to 75 seconds after having their throats cut. In adult cattle, the blinking reflex persisted for 27 to 32 seconds. However, the blinking reflex is not a reliable indicator of the onset of insensibility in kosher slaughter although it is valid in the use of the captive bolt stunner (Grandin, 1980b; Rowsell, 1979). It has been reported that week-old calves killed by the kosher method would respire, vocalize and show both palpebral and corneal reflexes when the EEG recordings indicated that they were unconscious and

**TABLE 1 — Number of seconds after the throat is cut to the onset of unconsciousness and cortical death as determined by the EEG**

<table>
<thead>
<tr>
<th></th>
<th>Sheep</th>
<th>Calves</th>
<th>Cattle</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unconsciousness</td>
<td>3.3-6.2</td>
<td>4.4-6.9</td>
<td>10</td>
</tr>
<tr>
<td>Cortical Death</td>
<td>20.8-35.4</td>
<td>18.8-139.2</td>
<td>120-150</td>
</tr>
</tbody>
</table>

1) Nangeroni & Kennett (1963)
2) Levinger (1979b)
insensible to pain (Blackmore et al., 1979). Levinger (1979b) and Nangeroni and Kennett (1963) also report that reflexes continued to be exhibited after the cessation of cortical activity.

There are several factors which could possibly prolong consciousness after throat-cutting. Thornton (1958) warned that unconsciousness could be delayed if the ends of the severed arteries sealed themselves off, or alternatively, if the blood supply from the vertebral arteries was sufficient (Baldwin, 1971). For instance, the vertebral arteries provide a greater proportion of the blood supply to a bovine’s brain than to a sheep’s brain. Suspending animals upside down after cutting the throat could also prolong consciousness since the blood would tend to pool in the head and maintain a sufficient oxygen supply for a few moments. However, this is a topic which needs to be researched using the EEG. It can be definitely concluded that the animal remains conscious for several seconds after having its throat cut.

Several authors report that bleeding, with or without stunning, increases the output of catecholamines, sometimes to a greater extent than other stressful procedures such as trucking (Althen et al., 1977; Kilgour, 1976; Ratcliff, 1971; Warriss, 1978). The data definitely indicate that cutting a conscious animal’s throat is stressful. It is vital that animals which have to be slaughtered for religious or other reasons without prior stunning should have both carotid and jugular blood vessels severed simultaneously to ensure rapid bleeding. In order to minimize pain, the edges of the wound should not touch until the animal becomes unconscious (Levinger, 1979b) and the shochet must be skillful. I have observed large steers walking around for over 60 seconds after their throats were cut by an unskilled shochet.

The kosher and Moslem slaughter methods are probably the least painful techniques of throat-cutting for conscious animals, provided a humane restraining device is used. For adult cattle and older calves, the kosher method would be acceptable from a humane standpoint under these conditions. For sheep, the method is probably relatively painless and is quick and humane. stunning sheep correctly with electricity takes skill. For young calves, the kosher technique presents problems from the humane standpoint because of the long time before onset of unconsciousness. Electric stunning has been tried but stunning on the head only is unacceptable because a proportion of the young animals regain sensitivity prior to or during bleeding (Blackmore and Newhook, 1980). In some countries, stunning is acceptable to religious authorities provided that the heart remains beating. Humane electric stunning must produce cardiac arrest and is not, therefore acceptable to many religious authorities. An exception has been made recently in New Zealand, where Moslem authorities have agreed to the use of electric stunning for young calves. This method does not reduce bleedout (Blackmore, 1980, personal communication). Moslem authorities in both New Zealand and Australia accept nonpenetrating captive bolt stunning for adult cattle.

The Humane Concerns—Shackling and Hoisting

Approximately two million heavy beef steers, one million sheep and half a million calves are slaughtered annually for the kosher trade in the United States.
This represents about 5% of the heavy steers and mature cattle slaughtered in the United States. From the humane standpoint the slaughter itself is not necessarily a problem. The main concern is with the methods used to restrain animals prior to slaughter, especially in the U.S. Many of the kosher plants suspend fully conscious animals upside down by a chain attached to one hind foot. A restraining pen, available through the American Society for the Prevention of Cruelty to Animals (Figure 1), is available for restraining large heavy steers, but at least 25% of these animals are still shackled and hoisted. Although the restraining chute is unsuitable for some plants, unwillingness to spend the extra money for the sake of humaneness is another reason why some plants have not had it installed. Almost all calves and lambs are shackled and hoisted. In fact, one of the reasons why kosher slaughter was exempted from the 1978 Humane Slaughter
Act was that humane restraining equipment was not available for sheep and calves.

The procedure involved in shackling and hoisting is as follows: Each animal enters a narrow stall equipped with a movable bottom which is tilted to cause the animal to trip and fall down, whereupon a chain is slung round one back foot. The bellowing, writhing steer is then yanked up in the air. The chain causes trauma to the animal’s leg approximately 50% of the time and the tissue damage is undoubtedly painful to a conscious animal. In addition, it must be extremely painful for a 1,200 lb. animal to be hung upside down. The weight of the fluid in the rumen bearing down on the diaphragm sometimes causes the animals to vomit. In some plants, up to five steers or calves can be hanging up at any one time waiting to have their throats cut. Employees wearing football helmets and face masks to prevent themselves from being injured by the thrashing animals then attach a clamp to the animal’s nostrils. After the clamp is attached, the steer’s neck is stretched out by a powerful air cylinder attached to the clamp by a cable. Figure 2 illustrates the tremendous strain placed on the animal’s neck by this technique. In addition, it should be noted that the nostrils are a sensitive part of the animal, evidenced by the fact that only a slight amount of pressure on the nose-ring of a bull is required to control the animal.

The procedure causes tissue damage to the hind leg, and the jerking of the limbs of live animals would thus seem to violate the principles expressed in some passages of the Talmud and Bible. Any type of injury to the animal prior to

**FIGURE 2** — Animal which has been shackled and hoisted in preparation for kosher slaughter. The animal’s neck is stretched with a tong placed in the nose.
shechitah constitutes a blemish. Furthermore, Shoshan (1971) in his book on Animals in Jewish Literature states: “it is not permissible to tie up the legs of any animal or bird in a way which is apt to cause pain.”

Why does the American Jewish community tolerate a practice which defiles a sacred ritual? In fact, many shochets are disturbed by shackling and hoisting. The Board of Directors of the United Synagogue of America voted in 1965 to “endorse any state legislation which, while declaring Shechitah humane, would outlaw shackling and hoisting of larger animals” (Laub, 1966). However, the problem has economic and social aspects which complicate its resolution. Shackling and hoisting for kosher slaughter represents a clash between ancient ritual and modern technology. When the ritual was instituted, animals obviously were not handled according to the principles and practices of an industrialized society. Before the advent of large, high speed slaughter plants, each animal was cast on the ground for slaughter. This is no longer permitted in modern plants for sanitary reasons (Laub 1966). The U.S. Department of Agriculture does not permit animals to be bled while lying on the floor unless the floor is completely washed down after each animal. This is not practical in a plant which slaughters 40 to 100 cattle per hour or several hundred calves or sheep per hour.

Some kosher slaughter plants use shackling and hoisting because a minimum of capital investment is required, and it is sanitary and relatively efficient. Many plants are not willing to spend money to make their operation more humane, unless humaneness makes a profit. Laub (1966) reported that plants refused to install the ASPCA restraining pen and that they would only do so under compulsion of law. Another problem is that some plants jump in and out of the kosher market, and they can shackle and hoist for kosher slaughter with only minimal modifications in their present stunning pens.

A technological society also creates affluence, which tends to put distance between the consumer and the process used to make the product. Most Orthodox Jews in the United States have not witnessed slaughter operations. This is especially true of the younger generation. I interviewed a young Orthodox Jew who had no idea of what was occurring in some kosher slaughterhouses. She could not believe what she was told about shackling and hoisting and became extremely upset when shown a picture of a shackled steer. If Jewish consumers were made aware of how their sacred ritual has been corrupted in some plants, they would demand a stop to it. One large kosher slaughterhouse stopped shackling and hoisting and installed two ASPCA restraining pens because housewives picketed the grocery stores which owned the plant.

Although shackling and hoisting prior to kosher slaughter is practiced on a large scale in the United States, it is forbidden in most European countries (Carding 1971). In Canada, the practice is not permitted, nor is kosher slaughter exempt from humane slaughter laws.

The Kosher Meat Trade

Only the forequarters of heavy steers killed by kosher methods will be stamped kosher and sold on the kosher market. This is because the hindquarters must be deveined according to Jewish dietary laws and this is too time-consuming and costly. In addition, the entire carcass of approximately 30% of all...
ritually killed animals is declared ‘tref’ (unkosher) and sold on the regular market. Another 10-20% of ritually killed animals may be diverted into the regular trade to fill regular orders since most kosher slaughter plants sell both kosher and regular meat. In the final analysis, at least 65% of all the meat from kosher killed livestock in the U.S. is sold on the regular market.

**Kosher Slaughter Restraining Systems**

The first restraining system which was developed for large cattle was the Weinberg Casting Pen, a European invention. After the animal enters the pen, the entire pen is rolled over and tilted 180 degrees. The animal ends up on its back with its head protruding through the front opening. The Weinberg Casting Pen has a maximum capacity of 30 animals per hour and is better than shackling and hoisting for kosher slaughter, but there are other types of restrainers which are less stressful.

The next major advance in restrainer design was the ASPCA pen which can be licensed, royalty-free, to any plant which desires to use it. (Figure 1). The pen was originally invented by Peter Hoad of Canada Packers Ltd. The belly lift was added by Cross Brothers Packing in Philadelphia. They obtained a U.S. patent and then sold the patent rights to the ASPCA. The pen consists of a stall with an opening in the front for the animal’s head. After the animal enters the stall, a bumper pushes the animal forward, forcing the head through the front opening. A yoke then descends, locking the head in position and a lift comes up to support the animal under its belly.

A chin lift then raises the animal’s head and stretches the neck for the shochet. After the throat is cut the side door of the ASPCA pen is opened, the shackle is attached to the rear leg, and the animal is pulled out of the stall. The side door is then closed and the pen is ready for the next animal.

The design of the head holder is very important; otherwise the pen will not be acceptable to the rabbinical authorities. There must be sufficient clearance so that the shochet’s knife will not touch the chin lift. This lift can be used on many different types of restrainers.

There have been some problems with the ASPCA pen. All of the moving parts of the pen are controlled by air cylinders, and operators commonly use too much air pressure for the rear bumper and belly lift. The ASPCA pen causes relatively little stress only if a skilled and conscientious person operates it. Most of the problems which occur with the ASPCA pen are caused by trying to go too fast. This is a management rather than a design problem. However, the pen is mechanically complicated and will usually not reduce labor requirements over a shackle and hoist system.

**a) New large animal restrainers**

Restrainer designs which rely on gravity to restrain the animal instead of moving parts propelled by air cylinders make it nearly impossible for people to hurt an animal by squeezing it too hard or knocking it around in the restrainer. This idea originated from a restrainer that Cincinnati Butcher’s Supply Co. built but never developed into a workable form. I adopted the idea for use in kosher slaughter (Grandin, 1977).
The steer or bull enters a restrainer which consists of solid metal sides forming a V. After the animal is in the restrainer, it is lifted up by two air cylinders and suspended in the V with its feet protruding through the bottom. Refer to Grandin (1980c) for a diagram of the lifting restrainer. The lifting restrainer holds the animal in exactly the same manner as the conveyor-V-restrainer which is described in Grandin (1980c). As the restrainer is lifted up it also tilts forward, causing the animal’s head to slide through the front head opening. The opening would be funneled to guide the steer’s head through the front. This feature eliminates the belly lift and rear bumper which may cause injuries. After the restrainer is in the fully raised position the animal’s head is restrained in a standard kosher head holder.

While the shochet is making the cut, the shackler can attach the shackle to the rear leg. After a pause of several seconds for the animal to lapse into unconsciousness, the head holder is released and the animal is hoisted straight up through the top of the restrainer. The restrainer then returns to the floor and is ready for the next animal. Another advantage of this design is that the restrainer moves away from the blood pit when it resets itself for the next animal. This would make it possible to rinse the blood off the restrainer automatically after each animal, without running water into the blood pit. Cattle will enter the restrainer with less hesitation if the blood is washed off. (Grandin 1975).

Either the shackler or the drover would push a switch to close the tailgate after the animal entered the lifting restrainer. After the tailgate had closed it would activate a solenoid valve which would start raising the restrainer. Once the restrainer had reached the fully raised position the head holder would restrain the animal’s neck for the shochet. There would be a manual override switch in case the animal was in the wrong position. After the throat was cut the shackler would activate the hoist to lift the animal out of the restrainer. Activating the hoist would also activate a switch which would open a solenoid to release the head holder and then lower the lifting restrainer and reset it for the next animal. In order to prevent the shackler from starting the hoist before the animal had lost consciousness a time delay can be built into the equipment. When the shochet steps away to wash his knife he would trigger a five second timer. The shackler could not activate the hoist until the 5 seconds had elapsed. After the animal was lifted from the restrainer and it had returned to the reset position, the tailgate would automatically open for the next animal. This automation can be accomplished with standard industrial switching devices.

This restrainer could also be highly automated to save labor and force the operators to handle the cattle gently. Many plants refuse to replace their current shackle and hoist kosher system with the ASPCA Pen because there is no economic incentive, but automation of the lifting restrainer would eliminate the need for an operator and thus save labor costs.

A conveyor-restrainer system with a head holder was recently installed at Spencer Foods in Iowa for kosher slaughter of large beef cattle. (Figure 3). Up to 214 cattle per hour can be slaughtered in this system (Grandin, 1980d). A standard conveyor-restrainer, described in Grandin (1980c) was used.

A hold down rack is installed along almost the entire length of the conveyor-restrainer to hold the animals in the conveyor until they reach the head holder which is located at the discharge end of the restrainer. The operator of the system
FIGURE 3 — New kosher restrainer system. Head holder on the end of the restrainer-conveyor is ready to catch and lift the animal’s head for kosher slaughter.
can stop, start or reverse the conveyor-restrainer with foot controls. Hand controls are used to operate the head holder. After the restrainer is stopped, the animal’s head is caught in a clam shell-like cage. When the cage is lifted the animal’s neck is stretched for the shochet. The head holder is powered by both hydraulics and air. A hydraulic cylinder is used to raise and lower the clam shell to facilitate precise positioning. Air is used to power the clam shell because it moves the clam shell quickly.

After the shochet makes the cut the clam shell opens and releases the head. The animal is discharged onto a downward sloping take-away conveyor similar to ones illustrated in Grandin (1980c). The rubber belt is sterilized every time it makes a revolution. A stainless steel box under the take-away conveyor catches the sterilizing water and prevents it from diluting blood in the blood pit. Animals are shackled and handled in the same manner as a standard conveyor-restrainer system.

The new restrainer is much more humane than the old shackling and hoisting system. It also reduces labor requirements and provides safer working conditions for plant employees. In the old shackling and hoisting system three employees were required to hold the animals’ heads. With the restrainer these 3 people are no longer needed. The labor savings and reduction in bruises will enable the plant to pay for the restrainer and the new building which houses it in three to five years. In plants where this system could be installed in an existing building, it would pay for itself in two years.

b) Restrainers for small animals

A University of Connecticut research team (Giger et al., 1977) developed a double rail restraining system for kosher slaughter of calves and sheep. This system could also be used for Australian or New Zealand type slaughter of sheep. In the double rail system the animal straddles two rails. The double rail is especially recommended for small calves because they will either fall through or cross their legs in a V restrainer. The double rail is mechanically simpler and it would be easier to keep clean. Research indicates that the double rail is less stressful than shackling and hoisting, especially in the heavier calves (Westervelt et al., 1976).

The double rail concept could be used in three types of system. A small system where each animal is placed in the restrainer singly, a semi-automatic system for up to 225 animals per hour, or a continuous large automated system where up to 200 calves or 400 sheep per hour could be slaughtered. It could also be used for kosher, Moslem and regular slaughter where the animals are stunned. Figure 4 illustrates the working of the system.

Conclusion

From the standpoint of humaneness, the problem with kosher slaughter is not in the killing method per se, but in the preslaughter handling technique of shackling and hoisting heavy, fully conscious animals. The slaughter ritual was developed in a preindustrial society, and the handling methods were designed not only to adhere to the commands of the Torah concerning food animal slaughter, but also to ensure humane treatment of the animals. Humaneness, a
FIGURE 4 — Double rail restrainer: neck stretched and ready for shochet.
central tenet of the Jewish attitude toward animals, has become an issue in kosher slaughter only since the advent of large, high speed plants which must conform to secular standards of hygiene as well as to the religious proscriptions of the ritual. Thus a situation has developed in which the spirit of the ritual has been lost or perverted in the attempt to preserve ancient practices in a modern, highly technological setting.

However, although technology has in a sense created the problem, technology, or rather its proper application combined with some creative thinking, may be able to solve it as well. The evidence indicates that ritual slaughter can be at least as humane as other systems, provided that the shackling and hosting of large animals is replaced by some other kind of restraining device which will hold the animals in the correct manner according to Talmudic instruction and also spare the animal undue stress and suffering. The automatic conveyor-restrainer described above achieves these goals and has the added advantage of reducing labor costs.

References

Grandin, T. (1975) Survey of behavioral and physical events which occur in hydraulic restraining chutes for cattle. Thesis, Arizona State University, Tempe, AZ.
Farm Animal Welfare Legislation in the U.S.?

The legal profession is now giving increased attention to the question of animal rights, and more specifically, to the status of factory farm animals.

Attorney Jonny Frank has published an article entitled "Factory Farming: An Imminent Clash Between Animal Rightists and Agribusiness" (Boston College Environmental Affairs Law Review 7:423-461, 1979), which reviews the major welfare concerns in the factory farming of animals and presents a convincing case for the implementation of reforms.

According to Frank, current state anticyrueity statutes, by virtue of their legal definition, are ineffective in stopping factory farm animal abuse. Farm animals may not even be considered part of the definition of "animal" in these statutes (a problem similar to the meaning of "animal" in the federal Animal Welfare Act). Moreover, in order to fulfill the legal meaning of "cruelty," a practice must be shown to be "unnecessary or unjustifiable." However, necessity of and justification for a practice are more often determined by its economic benefit rather than by its effect on the animals' welfare.

Even in instances where the obstacles posed by legal language can be overcome, enforcement of the anti-cruelty statutes presents an additional set of problems. Agribusiness interests have traditionally exerted a great deal of influence on state agricultural and animal protection agencies. This factor, combined with the low priority usually given by law enforcement officers to animal protection and the frustration of private citizen efforts by current legal notions of the standing and rights of animals, makes enforcement of the statutes extremely difficult.

In view of the inadequacies of the current laws, Frank proposes a Model Farm Animal Protection Act (see below). The Act, which could be designed as either state or federal legislation, would be administered by a Bureau of Farm Animal Protection whose duties would include: "(1) investigation of the treatment of farm animals; (2) research into more humane alternative farming methods; (3) promulgation of rules and regulations for the protection of farm animals; and (4) enforcement of such rules and regulations" (p. 450).

Frank emphasizes the important point that the major costs of food production occur after the animal is slaughtered, with packing, shipping and marketing representing two-thirds of the retail cost (See J. Hightower, Eat Your Heart Out—How Food Profiteers Victimize the Consumer, Vintage Books, 1975). Therefore, savings in the growing of animals are not passed on to the consumer; they are pocketed by corporate factory farm enterprises. In fact, there is not even any definitive proof that the abusive factory farmer insures any savings at all in the rearing stage. One study of egg production revealed that the stress produced by overcrowding of chickens actually
decreased the net income per bird (J. Crober, Social and Economic Aspects of Commercial Poultry Production, Anim Food Prod 27, 1977). Because of the economies of scale, more eggs will be produced from having four or five birds in a battery cage than two or three, even though net income per bird will be depressed. When egg prices are high (and hens therefore relatively cheap) it is common practice to overcrowd. The economic savings of more humane systems of livestock husbandry may not, therefore, be sufficient, and without a significant economic incentive, farmers will generally resist change. Hence the need for consumer awareness and action, price incentives to farmers whose animal produce has been raised humanely (e.g., labeling such produce with a humane grade at retail outlets and selling it at a slightly higher price, as with free range eggs in Holland), state and federal legislation, codes of practice, licensing of farms and regular inspection for compliance.

As Frank shows, many European countries are already far ahead of the U.S., not only in accepting that there are serious welfare concerns associated with factory animal farming, but also in drawing up protective legislation and minimal codes of practice. These countries include Sweden, Denmark, The Federal Republic of Germany, France, Great Britain, Austria, Cyprus, Greece, Iceland, Norway, Switzerland and Turkey. However, Frank also cautions against misreading the political climate in the U.S.: "...admittedly, no political realist could believe that this proposed statute [the Model Farm Animal Protection Act] would be enacted today. Therefore, animal rights groups must formulate presently viable strategies for reform. Such activists must seek to create a congenial political climate; and in the interim, should challenge the most atrocious factory farm methods through civil and criminal court actions, and through civil disobedience if necessary."

Model Farm Animal Protection Act

101. Statement of Public Policy

All living sentient creatures are entitled to respect, protection and the minimum requirements for a healthy life such as shelter, a nutritious diet, proper medical care, opportunity for exercise and periods of rest. The legislature finds that modern farming procedures have caused severe physical and mental suffering to animals raised for food and fur production. While some of these procedures are essential to food production, others cause unjustifiable pain and suffering. The legislature finds that such infliction of unjustifiable pain and suffering corrupts the public morality and ignores the respect that these animals deserve.

Therefore, it is the policy of the [State of . . . . . . . . . . . . . . . . . .] [United States of America] to prohibit farming practices which cause unjustifiable pain and suffering and to conduct research to enhance the quality of life for all animals. The provisions of this Act are to be liberally construed to insure the implementation of policies announced in this section.

Comment:

This section recognizes the concept of legal rights for animals and recognizes the abuses of factory farming. The second paragraph indicates that research for a more humane farming method is an essential complement to government regulation. The last sentence is adapted from another model statute. It is designed to prevent the frustration of the aims of the Act by narrow judicial interpretation.

102. Definitions

As used in this Act unless other-
wise required by context or specifically stated:
(a) “Animal” means any living creature other than man.
(b) “Board” means the Board of Farm Animal Protection.
(c) “Bureau” means the Bureau of Farm Animal Protection.
(d) “Director” means the Director of the Bureau of Farm Animal Protection.
(e) “Farm Animal” means any animal used in the production of food, fiber, or fur.
(f) “Person” means any natural person, corporation, partnership, firm, association of other legal entity, whether for profit or otherwise.

103. Bureau; Board
There shall be in the [State Department . . . . . . . ] [Department of Agriculture] a Bureau of Farm Animal Protection. The Bureau shall be under the supervision and control of a Board of Farm Animal Protection consisting of nine members to be appointed by the [Governor], [President], with the advice and consent of . . . . . . . . . . . . Three members of the Board will be representatives of animal welfare and humane societies. Three members of the Board will be representatives of veterinary medicine. Three members of the Board will be representatives of animal husbandry. The [Governor] [President] shall initially appoint one member of the various representative groups for the respective terms of one, three and five years. Thereafter all appointments by the [Governor] [President], except those made to fill a vacancy in an unexpired term, shall be for five years, but no member who has served for a full term shall be eligible for reappointment.

Comment:
This section establishes the Bureau of Farm Animal Protection and the Board of Farm Animal Protection which supervises the Bureau. The Act intentionally makes the Bureau somewhat autonomous. This is a reaction to a history of close connections between State Boards of Agriculture and agribusiness interests.

104. Removal from the Board
Members of the Board may be removed for cause by the governor, with the advice and consent of the . . . . . . . . . . . . . . . . . . . for inefficiency, neglect of duty, misconduct in office, or other just cause. A board member shall be entitled to appear and be represented by counsel at a public hearing prior to his or her removal.

105. Powers and Duties of the Board
a. The Board shall investigate the treatment and condition of farm animals.
b. The Board shall conduct research and develop alternatives to farming practices which cause discomfort, pain or suffering to farm animals.
c. The Board shall analyze and report on the economic savings realized by the consumer, if any, from the utilization of modern farm techniques.
d. The Board shall annually publish a summary of its investigations conducted under paragraphs a, b, and c of this section along with its recommendations for change. A copy of this report shall be submitted to the [legislature] [Congress], [Governor] [President], and [list other desired agencies]. Copies shall be made available for public distribution.
e. The Board shall make rules and regulations protecting animals from pain and suffering and encouraging the implementation of more humane farm procedures. These rules and regulations shall include, but shall not be limited to:
  1. The prohibition of the keeping of any animal without the opportunity for exercise;
  2. the prohibition of the keeping of any animal in an environment which produces an inordinate amount of stress;
3. the prohibition of painful surgical procedures without the use of a properly administered anesthesia; and
4. provisions for a licensing system for all farms. Such system shall include, but shall not be limited to, the following requirements:
   i. all farms shall be inspected prior to the issuance of a license.
   ii. farms shall thereafter be inspected at least once a year.
   iii. minimum requirements shall be provided to insure a healthy life for every farm animal. These requirements shall include, but not be limited to:
      a. proper space allowances;
      b. proper nutrition;
      c. proper care and treatment of animals; and
      d. proper medical care.
   f. The Board may enter into contract with any person, firm, corporation or association to handle things necessary or convenient in carrying out the functions, powers and duties of the Bureau. However, it shall not enter into a contract with any such firm or person who has a financial or commercial interest in any activity to be regulated or prohibited by this Act.

106. Director

The [Governor] [President], with the advice and consent of the . . . . . . shall appoint a Director from a panel of not less than three names submitted by the Board. No person shall be appointed Director who has a financial or commercial interest in any activity to be regulated or prohibited by this Act.

107. Powers and Duties of Director

The Director shall be the executive and administrative head of the Bureau. In addition, the Director shall:

a. issue licenses in accordance with the procedures promulgated by the Board;

b. inspect and report to the Board on the treatment of animals in commercial farming;
c. investigate all complaints and allegations of unfair treatment of animals;
d. issue in writing, without prior hearing, a cease and desist order to any person if the Commission has reason to believe that that person is causing, engaging in, or maintaining any condition or activity which, in the Director's judgment, will result in or is likely to result in irreversible or irrepairable damage to an animal or its environment, and it appears prejudicial to the interests of the [State] [United States] to delay action until an opportunity for a hearing can be provided. The order shall direct such person to discontinue, abate or alleviate such condition, activity, or violation. A hearing shall be provided with . . . . days to allow the person to show that each condition, activity or violation does not exist; and
e. file a petition for custody of an animal whenever it becomes necessary to protect the animal from neglect or cruelty. The court shall order the animal committed to the Bureau if it finds that the welfare of the animal so requires. Animals committed to the Bureau may be sold or euthanized, or kept in the custody of the Bureau, as the Director determines.

Comment:

Subsection d was adopted in part from the Model State Animal Protection Act proposed by the Committee for Humane Legislation. That subsection, along with subsection e, are essential to protect abused animals from the delays of the judicial process. It is anticipated that the cease and desist order rather than the petition for custody will be used almost exclusively. Nevertheless, the power to petition for custody is included as an alternative remedy when cease and desist orders are inadequate.
108. Penalties
Violation of this Act or any rule or regulation promulgated by the Board is a misdemeanor punishable by a fine of not more than $.................. or by imprisonment for not more than one year, or both.

109. Private Right of Enforcement
In addition to criminal sanctions resulting from enforcement of the Act by the Director, any person may bring an action on behalf of an injured animal for any violation of this act or violation of any rules and regulations promulgated by the Board. Such action may seek civil damages as well as declaratory or injunctive relief. When civil damages are awarded, the judge may order the monies to be used either for the rehabilitation of the injured animal, or for research into more humane farming practices, or for both.


MEETINGS and ANNOUNCEMENTS

FORTHCOMING MEETINGS

The Foundation of Thanatology: Veterinary Medical Practice: Pet Loss and Human Emotion, March 27-29, 1981, Alumni Auditorium, Black Building, Columbia-Presbyterian Medical Center, New York, NY. Contact Dr. Austin H. Kutscher, Foundation of Thanatology, 630 West 168th St., New York, NY 10032, USA.


Wildlife Disease Association (Australasian Section): Fourth International
Wildlife Diseases Conference, August 24-28, 1981, Sydney, Australia. Contact Dr. E.P. Finnie, Program Chairman, Toranga Park Zoo, Mosman, NSW 2088, Australia, or Dr. M.E. Fowler, Dept. of Medicine, School of Veterinary Medicine, University of California at Davis, Davis, CA 95616, USA.

MEETING REPORTS

American Society of Animal Science

The 72nd annual meeting of the American Society of Animal Science (July 28, Cornell University, Ithaca, NY) included a half-day symposium on the role of animal behavior in food animal agriculture. Speakers discussed behavior as it relates to welfare requirements and appropriate management and housing systems. Synopses of each paper are presented below:

Roger Ewbank (University of Liverpool, Universities Federation for Animal Welfare): Behavior and behavior-related problems in farm animals. Behavior can be the symptom of an abnormal condition, a component of that condition, or synonymous with the condition itself. Tailbiting in intensively-raised pigs is an example of this third type of behavior, believed to be elicited by a breakdown in social order resulting from overcrowding. Research revealed that a high stocking rate produced tailbiting, increased fighting, and poor production figures, while a low stocking rate which enabled pigs to sort themselves into a rank order showed the opposite effect on productivity. Abnormal environments as well as incorrect social conditions can produce abnormal behavior, as in the case of bar-mouthing in stall-confined sows. Although this behavior does not indicate disease or injury, or even reduced productivity, it does indicate deprivation, which is a subtler and more pervasive aspect of poor management than outright abuse or neglect.

Edwin Banks (University of Illinois): Behavioral research to answer questions about animal welfare. Domestic animals have been selectively bred and genetically manipulated to the point where natural selection no longer determines their behavioral adaptedness to an environment. It is therefore necessary to gather ethological profiles (ethograms) of farm animals to discover whether common intensive management practices conform to species-specific behavioral needs. Once the ethogram is established and recognized, various factors can be manipulated to improve animal welfare. These include physical adjustment of rearing systems, social restructuring (e.g., stocking rate, sex/age ratios) and genetic modifications through selective breeding. The spectre of legislation looms over producers unless they begin to pay more attention to and cooperate with applied ethologists in the design of rearing and housing systems and the management of large numbers of animals under intensive conditions.

Thomas Hartsock (University of Maryland): Ethological approach to farm animal behavior research. Despite the relatively recent modifying influences of selective breeding, the modern farm animal evolved in an environment quite different from the one in which it is now living. Behavior which is sometimes labelled ‘abnormal’ may in fact be normal from an evolutionary point of view, but inappropriate due to the presentation of inappropriate stimuli by an unnatural environment. For example, early weaned (12 h) piglets sometimes choose to lie against a wall near a heat lamp rather than directly under the heat lamp. Far from being an aberrant avoidance of the heat source, this behavior is actually the piglet’s
attempt to make contact with an object in the environment as it would seek contact with the mother sow. Mistaken interpretations of farm animal behavior could be alleviated by the animal scientist, the veterinarian and the producer taking an ethological approach and familiarizing themselves with species-specific behavior patterns in both wild and artificial environments.

Stanley Curtis (University of Illinois): Status of farm animal behavioral research in North America. A survey was made of major agricultural journals and USDA information services to determine the extent and types of animal agriculture research devoted to behavior. The highest percentage of reported research dealt with feeding and reproduction, and the investigations tended to be confirmatory rather than novel. By contrast, the least frequent (7%) and most novel experiments and research projects were in the areas of social behavior and animal welfare. Dairy cattle and poultry were the primary animals studied.

Michael W. Fox (Institute for the Study of Animal Problems, Washington, DC) Discussant. Ethology is a powerful tool for assessing animal welfare, but it should not be the only method used. An integrated approach incorporating physiology, behavior and productivity is ideal. Whatever the approach, however, it should be emphasized that the abolition of suffering is not the goal of farm animal welfare research. The elimination of suffering could probably be achieved through the use of drugs and psychosurgery, but such measures can severely alter or even obliterate the essential nature of the animal. Instead, the needs, behavior, physical and social environment of the animal should be studied in order to create and implement management systems which maximize the animal’s opportunity to be itself. Enough welfare research has been done in the U.S. to set up minimal codes of practice similar to those established in the U.K. The livestock industry should be persuaded to support the formation of codes, if not for humane reasons, then out of the practical consideration that in the absence of voluntary codes, legislation will eventually be imposed on producers through the efforts of animal welfare advocates.

International Whaling Commission

The 32nd annual meeting of the International Whaling Commission (July 21-26, Brighton, England) could be characterized from the conservationists’ point of view as anything from a limited success to a major disaster. However, despite varying opinions on the degree of progress made at the meeting, conservationists agreed that the gains for whale protection fell far below their expectations. Many had been confident that the Commission would approve a total ban on commercial whaling. Instead, measures to institute either an immediate or a two year phased-in moratorium were defeated when they failed to obtain the necessary three quarters majority needed for adoption in the plenary session. Canada and South Africa, both nonwhaling nations, voted with the whaling bloc to prevent imposition of the moratorium.

Despite the failure of the moratorium vote, the overall quotas set for the 1981 whale kill were significantly lower than for the previous year, continuing a seven year trend. Next year, 13,851 whales are scheduled to die, compared to 15,656 this year and 45,673 in 1973. Conservationists were also disappointed by the failure of the IWC to ban the taking of sperm whales. Both votes, one for an immediate moratorium and one for a one year phase-in, lost the majority by one, with Canada casting the deciding vote.
ballot. Another dispute arose over setting the quota for the North Pacific stock of sperm whales. Japan demanded no fewer than 1,350, while the scientific committee argued that the only biologically acceptable quota was zero. A compromise of 890 was finally reached, despite scientific evidence indicating that the sperm whale stock will continue to decline with even a zero take.

Conservationists fared no better on the small cetacean question. Heated arguments took place during the entire meeting concerning the IWC's jurisdiction over smaller whales, many of whom live in coastal waters. Conservationists asserted that the IWC has the power to regulate the take of all whales, regardless of size or habitat. Many of the whaling nations, however, as well as Canada, argued that they have jurisdiction over any small whales inside their exclusive economic zones, which they claim extend 200 miles from the coast. The U.S. maintained that the only time a coastal state has the right not to follow IWC regulations is when it wants to institute stricter guidelines. Canada, bent on keeping complete control over its annual take of narwhal and beluga whales (at numbers which the IWC scientific committee considers dangerously high) argued that it alone has jurisdiction within coastal waters. A resolution stating their demand for a minimum quota of 26 struck and 18 landed was soundly defeated. The scientific committee recommendation was for a zero quota. A resolution to that effect failed as well. Finally, faced with the possibility of coming away with no quota at all, the commissioners emerged from a closed session with a compromise: a three year block quota of 45 landed and 65 struck, with no more than 17 landed in any one year. Not only will this scheme provide a built-in reduction over the three years, it will also temporarily remove the issue from the agenda, which conservationists hope will allow the commission to devote more energy to putting an end to commercial whaling.

ANNOUNCEMENTS

Felix Wankel Award

The 1979 Felix Wankel prize for research in animal protection (see Int J Stud Anim Prob 1(1):63-65, 1980), amounting to $11,500, has been awarded to Dr. Hilary Koprowski, Director of the Wistar Institute of Anatomy and Biology (Philadelphia, PA), for his work on the production of monoclonal antibodies in tissue culture.

Dr. Koprowski has had a distinguished career in medical research since leaving his native Poland in 1939. After spending four years in Brazil with the Rockefeller Foundation’s Yellow Fever Research Service,
he joined Lederle Laboratories, a division of American Cyanimid (Pearl River, NY) in 1944 and became one of the leading figures in the search for a polio vaccine. Dr. Koprowski has been with the Wistar Institute since 1957.

The production of monoclonal antibodies from somatic cell hybrids ("hybridomas," composed in this case of mouse myeloma cells and splenocytes of immunized mice) is a relatively new field which shows enormous potential for human carcinoma diagnosis and therapy. Antibodies produced naturally by an organism's immune system in response to an antigen have a wide range of binding specificities and affinities. Therefore, the use of antibody sera in diagnosis and in tests such as the radioimmunoassay are fraught with problems of cross reaction. As Koprowski et al. state: "...[P]olyspecific antisera in general are unable to discriminate among small antigenic differences on an otherwise identical background or small antigenic similarities on a different background" (Proc Natl Acad Sci USA 75(7):3405-3409, 1978). The production of homogeneous antibody solutions in which all the molecules have the same binding specificity and affinity would be a considerable advance. Koprowski and his team recently studied 19 antibodies secreted by hybridomas and found that 15 were specific for the surface antigens of human colorectal carcinoma cells (Somatic Cell Genetics 5(6):957-972, 1979).

The application of Dr. Koprowski's work to the concept of alternatives lies not in the aims of the research, i.e., to find a way to study the antigenic structure of human tumor cells, but in the technique used to produce the monoclonal antibodies. Instead of producing vaccines and antibody sera in the whole animal by means of inoculation and immunization, antibodies can be cloned from a cell line maintained in tissue culture. Although live animals would still be used to start the cell lines, their overall numbers would be considerably reduced. According to the Felix Wankel prize judges, "The production of antibodies in cell culture represents a genuine alternative with possibilities that we cannot even envision at present."

**North American Applied Animal Ethology Newsletter**

A quarterly newsletter to promote the exchange of information among people interested in applied animal ethology and related fields is being initiated. We are soliciting items for the first and subsequent issues relevant to agricultural, companion and zoo animals (including game farms) that may be of interest to your colleagues, e.g., announcements and brief summaries of meetings, research/employment opportunities, letters to the editor.

The results of a survey of applied animal ethology/behavior programs in North America will be a supplement to the first issue. Survey forms have been mailed by Dr. Ray Stricklin (University of Maryland) to all animal, dairy, poultry and veterinary science departments and colleges in North America.

Subscriptions cost $2.00 (U.S.); make checks payable to "AAENL." Address correspondence to Dr. Ted Friend, Editor, Applied Animal Ethology Newsletter, Animal Science Department, Texas A&M University, College Station, TX 77843, USA.
BOOK REVIEWS

ANIMAL TOOL BEHAVIOR: THE USE AND MANUFACTURE OF TOOLS BY ANIMALS by Benjamin B. Beck (Garland STPM Press, New York, NY, 1980, $24.50). The adjective "definitive" is much overused, but occasionally a scholarly work appears which merits its application. This book is one of them. The author has produced a comprehensive and erudite synthesis of everything you ever wanted to know about this fascinating topic. Its descriptive review of the literature is specifically informative, and its conceptualizing is lucid. It is the logical consequence of the empirical and theoretical studies that the author has pursued over the last 10 years, and his firsthand knowledge shines through repeatedly.

The introductory chapter tackles the problems of scope and definition. The former sensibly excludes cases of training by, or imitation of, humans, e.g., chimpanzees pulled on waterskis by dolphins. Comparison of the author's definitions with previously published efforts reiterates the problems of reconciling logical and biological criteria. However, the author's carefully considered (but wordy) definition is the best yet offered and is likely to become the standard. My only quarrel is with his allowance for tools to be animate. This would include many triadic social interactions not normally thought of as tool use, e.g., baby-passing in Colobine monkeys.

Chapter 2, at over 100 pages, is the meat of the book: it is a complete, up-to-date catalogue of our knowledge of the topic, far surpassing the previous best effort by Van Lawick-Goodall (1970). It is divided into sections on tool use and tool manufacture. Each of these is presented taxonomically, with subdivisions according to the author's 21 modes of tool use (e.g., aimed throwing, hammering, prying, wiping, etc.) and 4 modes of toolmaking (i.e., detachment, subtraction, combination, reshaping). The classic examples are presented clearly, e.g., ant-lions flinging sand at prey, Galapagos finches probing for insects, sea otters hammering molluscs, chimpanzees fishing for termites. Perhaps more captivating are the less well-known cases, e.g., ants carrying food home to the nest on little trays, or herons baiting fish with bread to attract them to the surface. Unfortunately, it is not always clear whether such incidents are habitual or unique, or are performed only by gifted individuals, or represent group norms.

The author next considers the generalizations that follow from the catalogue. Phyletically, it is not surprising that the apes are superior in range to all other nonhuman forms, but the total lack of tool use in amphibians and reptiles, and the impressive feats of invertebrates, which even exhibit 2 of the 4 modes of toolmaking, are notable. Functionally, the author limits himself to the most immediate consequences and finds that almost all known tool use falls into 4 categories: extension of reach, amplification of mechanical force, augmentation of agonistic display, and control of liquids. At a more complex level, one wonders how a chimpanzee's masturbation with a tool would fit into this scheme.
Borderline cases (i.e., object-oriented behavior which is outside the logical limits but is just as meaningful) are also treated. Such items include nests, webs, anvils, rafts, etc. Among these, it is hard to see why the ritualized presentation of objects, as in the courtship of empid flies, does not qualify as true tool use. Other unusual examples of borderline cases are omitted, e.g., fastidious marabou storks which wash dung beetles before eating them (Seibt and Wickler, 1978).

The chapters on the ontogeny of tool use and its ecological and evolutionary considerations are perhaps the strongest conceptually. The author strikes a suitably cautious note about the role of various mechanisms involved in the acquisition of tool use, e.g., insight, trial-and-error learning, stimulus enhancement, etc. Too many previous workers have been too quick to implicate imitative copying when more cognitively parsimonious explanations would suffice. The evolutionary origins of all tool use are shrouded in mystery, but the author's emphasis (however speculative) on likely environmental pressures is illuminating. Following Parker and Gibson, he pinpoints the critical ecological factor as the demands presented by extractive foraging for "embedded foods."

The chapter on cognitive aspects of tool use is the weakest, perhaps because the processes are the most resistant to direct study. The "pongo-linguistic" exploits of apes such as Washoe, Lana and Sarah in showing linguistic-like behaviors are accepted uncritically, in spite of their controversial nature. Beck's point that animals may exhibit complex cognitive capacities which are unconnected with tool use is well-taken, but one of the examples given, cognitive mapping, is not sufficiently defined. Similarly, his extended comparison of shell-dropping by gulls and termite-fishing by chimpanzees illustrates a major point that many cognitive abilities are not restricted to 'higher' forms. However, this is taken to extremes in virtually presenting the two types of performance as intellectually equivalent.

The final chapter on tools and human evolution is a masterful synthesis of a large and dense body of literature. The presumed importance of nonlithic (and therefore non-preserved) tools is rightly stressed. The likely evolutionary interaction between tool use and language is discussed, although an important paper by Hewes (1973) is omitted.

The format of the book is admirable. Three types of index are provided: author, species, and subject. The list of references exceeds 600 and will be a valuable resource for research workers in the area. My only complaint concerns the illustrations: none of the major tool-using forms are shown, even chimpanzees, of which many excellent photographs are available.

Finally, although the book is not 'applied' in nature, it contains useful information for those concerned with the problems of human-animal relationships. It underscores the importance of objects in the world of many species, and serves to remind the reader, by implication, of the harmful effects of deprivation of objects in a barren environment. Bears and elephants, for example, are two forms of object manipulators which may suffer in captivity from the absence of such items.

References
ANIMAL SUFFERING: THE SCIENCE OF ANIMAL WELFARE by Marian Stamp Dawkins (Chapman Hall, London, UK, 1980, $16.00). This is a scholarly, sensible and sensitive monograph on how animal suffering might be evaluated. It is a superficial but concise overview, intended primarily for those scientists and non-scientists alike who are not familiar with this new and rapidly developing interdisciplinary science of animal welfare.

The author reviews the major ways in which animal suffering and welfare can be evaluated, namely physical health, 'productivity,' comparison with animals in the wild, physiological measurements, behavior, free choice and operant responses to certain environmental conditions, and using ourselves as models and by analogy projecting ourselves into the animal's place. The author is to be congratulated on the clarity with which she demonstrates the potentials and limitations of each of these ways of evaluating animal welfare. Those readers familiar with one or more of these ways will not, however, appreciate the lack of depth and of reference citations which would have made this book a valuable resource. The author's treatment of physical indices of health, 'abnormal' and stereotypic behavior is to say the least, scanty. While a book giving an in-depth treatment of the complex field of animal welfare science is needed, it may still be premature. The author's intention, I believe, was instead to show that there is no single way to evaluate animal welfare. She does an excellent job of demolishing 'productivity' as an indicator (or guarantee) of farm animal welfare. What this monograph offers is a thought provoking glimpse into the technical difficulties of objectively assessing animal suffering and like Donald Griffin's book, THE QUESTION OF ANIMAL AWARENESS, should stimulate much discussion and further research in an area long neglected by both science and society. Dawkin's last statement reflects the balanced and objective way in which she deals with the subject of animal suffering. After making a convincing plea for more information on how animals are actually treated, for more research on the subject and clear evaluation of the consequences of humane reforms, she concludes: "Without this basic preparation, we may see suffering where there is none or, worse, overlook it because it does not have a human face."

The book left this reviewer with a feeling of incompleteness. Even if we had all the necessary scientific and other prerequisites to eliminate animal suffering, particularly in certain modern intensive livestock husbandry systems (which are the main concern of the author), there must be more to animal welfare science than the measurement and control of animal suffering. Animals do have an intrinsic nature or telos which some believe should to some extent be allowed to develop and be expressed. Thus, while simple habituation, or creation of a brain lesion, or drug injection might help an animal adapt to certain husbandry conditions and eliminate its suffering, does that animal not have a right to express and experience at least a part of its essential nature?

This book should be read by all who work with animals, be they involved in biology, ethology, animal science, psychology, laboratory animal care or veterinary and human medicine and research. For senior and
graduate students in these fields, it should a prerequisite.

M.W. Fox

BOOKS RECEIVED

COMPASSION IS THE BUGLER: THE STRUGGLE FOR ANIMAL RIGHTS, Clive Hollands (Macdonalds, Edinburgh, Scotland, 1980, $17.00). A personal account of the organization of Animal Welfare Year in 1976/7 and the subsequent campaign to put animals into politics in Britain. Provides a valuable description of these important campaigns in which the British animal welfare movement demonstrated more cohesiveness than has been seen for some time. Recommended for students interested in the animal rights and animal welfare movements and for those who want to understand the phenomenon.


BIOMETEOROLOGICAL SURVEY PARTS A&B, S.W. Tromp and J.J. Bouma (Heyden and Son, Inc., Philadelphia, PA, 1980, Part A [Human Biometeorology], $61.00; Part B [Animal Biometeorology], $45.00; Parts A&B together, $85.00).

SCIENCE, ANIMALS AND EVOLUTION, Catherine Roberts (Greenwood Press, Westport, CN, 1980, $18.95).

GUIDE TO THE CARE AND USE OF EXPERIMENTAL ANIMALS, VOLUME I, Canadian Council on Animal Care, Ottawa, Ontario, CANADA, 1980).

CODE OF PRACTICE FOR THE CARE AND USE OF ANIMALS IN RESEARCH IN AUSTRALIA, National Health and Medical Research Council, Commonwealth Scientific and Industrial Research Organization (NHMRC-CSIRO) [Australian Government Publishing Service, Canberra, AUSTRALIA, 1979].

NATIONAL SURVEY OF LABORATORY ANIMAL FACILITIES AND RESOURCES, Institute of Laboratory Animal Resources et al. (National Institutes of Health, Publication #80-2091, Bethesda, MD, 1980).

SAFETY TESTING OF TOXIC SUBSTANCES, J.P.W. Gilman (Canadian Federation of Humane Societies, Ottawa, Ontario, CANADA, 1980, $5.00).
INSTRUCTIONS TO AUTHOR(S)

Exclusive publication: Articles are accepted with the understanding that they are not being submitted for publication elsewhere. Material accepted for publication implies transfer of copyright to the Journal.

Manuscripts — including footnotes, references, tables and figure legends — must be typewritten, double-spaced on 8 1/2 x 11 inch bond paper leaving generous margins. Manuscripts must be in English using the preferred spelling in the Webster's Third International Dictionary. Submit original and two (2) copies.

Organize manuscripts as follows:
Title page (pg. 1) containing title of the article (48 characters), author(s), affiliation, present address, address to where proofs should be sent; Abstract (pg. 2); Text (begin pg. 3) which includes introduction, methods/procedures, results, discussion, conclusion, acknowledgements, references, tables, and figure legends. Special instructions for the copy editor or printer should be affixed on the original copy.

Abbreviations and units: Standard dictionary abbreviations are generally accepted. Other abbreviations should be explained when first mentioned. SI units are preferred.

References: The Harvard System, not a numbering system, should be used for the citation of references in the text; e.g., (Jones, 1971) or (Jones and Smith, 1971), or (Jones et al., 1971). Where more than one paper by the same author(s) has appeared in one year, the reference should be distinguished by 'a', 'b', 'c', etc. (e.g., 1971a). The list of references should be arranged alphabetically by authors' names and chronologically per author. References cited with (et al.) in the text should include all authors' names in the reference list.

Titles of journals should be abbreviated in accordance with the Chemical Abstract Service Source Index. References to books/monographs should include editors, edition/volume number, publisher, city and state/country where published and relevant page numbers. A paper in press may be referenced if it has been accepted for publication. References to personal communications and unpublished work are permitted in the text only.

Sample references
Tables: These should be concise and typed double-spaced throughout.
Figures: Submit 3 sets of glossy prints (no negatives) with identifying arrows and letters contrasting sharply with the background. Indicate on the back the author's name, figure number and 'top.'

Figure Legends: Captions should contain sufficient information to allow the figure to be clearly understood without reference to the text.

Types of articles: The following requirements are given as a guide only; one double-spaced typed page contains approximately 250 words.


Review Articles: 5000-8000 words with a comprehensive list of references to be used as source material.

Original Articles: 5000-8000 words or long enough to provide an adequate introduction (stating the objective of the study and why it is considered necessary), description of methods (including an outline on the treatment of the research animals and the number of animals used), and combined results/discussion section.