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Meeting Report

ONTOGENY AND SOCIAL TRANSMISSION OF FOOD PREFERENCES IN MAMMALS: BASIC AND APPLIED RESEARCH

International School of Ethology: Ettore Majorana Centre for Sciencific Culture, Erice, Sicily
8–14 June 1992

Directors of the Workshop: B. G. Galef, Jr (Hamilton) and M. Mainardi (Parma)

The meeting was sponsored by the Italian Ministry of Education, the Italian Ministry of University and Scientific Research, the Italian National Research Council, the Sicilian Regional Government and McMaster University. It convened in the mountaintop village of Erice, Sicily. The town is a tourist attraction, containing both Norman battlements and medieval churches, and it serves the Italian government as a site for academic conferences, workshops and courses.

The present workshop, the sixth sponsored by the International School of Ethology (D. Mainardi, Director), brought together scientists from around the world to discuss the following development of feeding and of flavor preferences; the role of social interactions in shaping both feeding and flavor preference and the relevance of laboratory findings in studies of ingestion to the control of mammalian pest species.

The first day of the conference was devoted to discussion of the development of feeding and food preferences. W. G. Hall (Duke University, USA) described contributions of his laboratory to understanding the development of feeding behavior in rats, emphasizing recent work (with Susan Swithers-Mulvey) on the oral factors in satiation and the integrative role of sensory adaptation in control of ingestive behavior.

David Booth (University of Birmingham, UK) reviewed his extensive studies, in both animals and humans, of the importance of positive postingestional consequences of foods on later food preference in different contexts.

Stelios Nicolaïdis (Collège de France) described recent work (with Alan Epstein) on aldosterone-mediated prenatal influences on the development of salt preference in rats.

Vilmos Altbacker (Eotvos University, Hungary) presented the final paper of the day. He described field and laboratory studies of social and other influences on the food preferences of young rabbits that he has carried out in collaboration with Robyn Hudson (University of Munich, Germany). Prenatal exposure to flavors, flavors in mother's milk and flavors in the fecal pellets that rat dams deposit in their nests and that their young eat were each shown to influence the food choices of pups at weaning.

The second day focused on social influences on food choice. Celia Heyes (University College, London) introduced the topic with a general discussion of the role of imitation and social learning in development of behavior. Heyes emphasized the insufficiency of either imitation or social learning to sustain traditions in animals in the absence of environmental support.

Bennett Galef (McMaster University, Canada) reviewed his programme of research on social enhancement of food preference in rats. Following a brief period of interaction, each member of a pair of rats exhibits an enhancement of its preferences for foods that its partner ate. Carbon disulfide, a chemical present in rat breath, appears to play an important role in producing such socially enhanced food preferences.

Fred Provenza (Utah State University) described an extended series of studies of the role of individual and social learning in development of both food preferences and avoidance of toxic plants found on grazing lands by ungulates. Provenza and his co-workers have found

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that, in sheep, mother's diet influences the flavor of mother's milk and exposure of lambs to milk containing flavors, such as onion, increases lambs preferences at weaning for foods containing those flavors. Further, lambs that eat a given food while in the presence of their mothers exhibit greater enhancement of preference for that food than do lambs that eat the same food while alone.

Paola Valsecchi (University of Parma, Italy) described studies showing that social interactions play a similar role in development of flavor preferences in wild and domesticated house mice (*Mus domesticus*) and in wild and domesticated Norway rats. Young mice prefer to eat foods that their mother is eating, will follow their dam to food, and, as the result of exposure to recently fed mice, will exhibit preferences for foods that the recently fed have eaten.

Finally, Joseph Terkel (University of Tel Aviv, Israel) presented a summary of his analysis of the spread of the behavior of stripping seeds from pinecones, exhibited by black rats (*Rattus rattus*) in the pine forests of Israel. Pine seed stripping allows black rats to live in mature pine forests, devoid of alternative sources of nutrition. Only young rats reared by dams that strip pinecones grow to be efficient strippers. The young snatch partially opened pinecones from adults and finish the job themselves. Experience with partially opened pinecones is necessary if young are to become pinecone strippers.

On day three, conference participants took a break from their labors, visited the magnificent Greek ruins at Selinunte and Segesta and relaxed on one of the many beautiful Sicilian beaches.

When the conference formally reconvened on the fourth day, the morning was devoted to studies of development of feeding behavior in primates. Paul Rozin (University of Pennsylvania) described his researches into the causes and origins of human responses to foods. His discussion focused on the development of disgust reactions in Western societies and the role of processes akin to sympathetic magic in induction of disgust by contamination.

Elisabetta Visalberghi (Instituto di Psicologia, CNR, Rome) both critically reviewed evidence of the imitation of behavior in primates and described results of her own laboratory studies of development of food-washing behaviors in capuchin monkeys and crab-eating macaques. Both species are surprisingly quick to develop food-washing behavior and will do so even if washing a food causes it to dissolve. Visalberghi's findings cast doubt on earlier interpretations of the sweet-potato-washing behavior exhibited by Japanese macaques living on Koshima Island. The behavior has been widely interpreted as spreading by imitation of the monkey genius Imo, who first exhibited it.

Marc Hauser (University of California, Davis) described results of field work carried out in Amboseli, Kenya, on the transition to independent foraging by weaning vervet monkeys. Hauser's observations indicate that infants must learn the relative quality of food items in their diets during the first 3 years of independent feeding. Adults and juveniles are more reluctant to abandon high-quality than low-quality food to an approaching dominant monkey. Infants do not exhibit this discrimination. Further, by comparing the weaning of infants born to social groups occupying habitat of varying quality, Hauser was able to examine the impact of habitat quality on weaning. Infants living in poor habitat suckled longer, weaned later and added foods to their dietary repertoires more slowly than did infants living in rich habitat. Last, the degree of success that infants exhibited in calling their dams predicted their probability of surviving through the first year.

The afternoon of the fourth day served as a transition from basic to applied topics. Manuel Berdoy (Oxford University, UK) described his research on the feeding behavior of wild Norway rats living in large outdoor enclosures. Description of circadian rhythmicity in the feeding behavior of individual radio-collared rats living within social groups and exposed to both familiar and novel foods was augmented by experiments under seminatural conditions, demonstrating social effects on food choice in the wild rats identical to those reported by Galef for domesticated rats in laboratory cages.

Grant Singleton (CSIRO at Lyneham, Australia) described his work on predicting and controlling outbreaks of mouse plagues in Australia and discussed results of studies of wild house mice (*Mus domesticus*) living in large seminatural enclosures. Singleton found social influences on choices between novel foods, but not on choices between novel and familiar foods. The former effects were similar to those described by Valsecchi and Galef working with domestic mice in laboratory cages.

Giacomo Santini (University of Pisa, Italy) summarized his many years of experience in control of rodent pests in the forests of Italy and demonstrated the importance of knowledge of life histories of individual species in designing effective methods of pest control that minimize negative impact on the general environment. For example, dormice were effectively controlled in pine forests by installing multiple-capture, nest-box traps that allowed dormice to enter but not to escape.

Ishwar Prakash (Zoological Survey of India) discussed the extent and diversity of rodent control in India as well as problems in inducing farmers and shopkeepers to use rodenticides other than acute poisons.

Russell Mason (USDA and Monell Chemical Senses Center, USA) described his field work on use of carbon disulfide as a rodent bait enhancer in rats and mice and discussed both the general attractiveness of sulfur compounds to mammals and field studies of chemical repellents of birds and mammals.

Rumei Xu (Beijing Normal University, Peoples' Republic of China), who was scheduled to speak on pest control in China, had to return home early and could not present his paper.

Each of the 17 conference participants brought a completed chapter to Erice, and a symposium volume, edited by B. G. Galef, Jr, M. Mainardi and P. Valsecchi, is scheduled to be published in mid-1993.

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