



In Memoriam

Tribute to Jean-Pierre Signoret



Jean-Pierre Signoret passed away on the 17th of December 2008. He was one of the founders of endocrine ethology in farm animals. For us, his colleagues, his scientific career as well as his kindness, cheerfulness and enthusiasm for science remain firmly engraved in our memories and encourage us to pursue his work.

In 1958, he started working at the “Laboratoire de Physiologie Animale” in Jouy-en-Josas (INRA, France) by investigating sexual behavior in pigs. Right from the start he realized that ethology was focused mainly on the study of wild animals (K. Lorenz, N. Tinbergen, K von Frisch) or humans (I. Eibl-Eibesfeldt) and paid little attention to farm animals. He also realized that ethology needed careful and controlled experiments to avoid anthropomorphism and he borrowed from psychophysiology its goal (i.e. the physiological bases of psychological processes) and its rigorous methods.

His first work on pigs enabled him to identify the various stimuli emitted by the boar that induce complete immobilization in the sow in order to accept copulation. He showed the primary role of auditory and olfactory cues emitted by the boar. In particular, he discovered the importance of androstenone, a metabolite of steroids, which is able to facilitate the posture of immobilization in the estrous female. In the

early 1960s, he made a film showing the different behavioral sequences of pig sexual behavior and the sensory stimuli involved which was a big hit in the whole scientific community. Interestingly, these results also contributed to the success of artificial insemination in pigs: the use of a spray of androstenone was very helpful for inducing immobilization during insemination. J.-P. Signoret was very proud of these findings because he was always very concerned for his work to lead to prospective applications.

It was also in the 1960s, when he was appointed at the “Laboratoire de Physiologie de la Reproduction” in Nouzilly (INRA, France), that he started to study the hormonal control of behavior in farm animals, which constituted at that time an unexplored field. He found that in the sow estrogens alone are sufficient to induce sexual behavior and progesterone is only inhibitory, in contrast to the ewe. He also undertook pioneering work on the process of sexualization, showing that the pig was an interesting model because injections of estrogen could induce the full repertoire of female sexual behavior in males even when they had been castrated a month or more after birth, contrary to the rat and the sheep. Unfortunately, and to his deep regret, this research area was not investigated further after the 1980s.

From there he went on to study a particular phenomenon of estrus synchronization in sheep and goats called "the male effect." This refers to the ability of rams and bucks to induce ovulation in seasonally anestrus females within 2 days of contact. His contribution to analyzing the physiological and sensory control of the male effect was essential. For instance, he showed with Joëlle Cohen-Tannoudji that olfactory compounds contained in the ram's fleece are sufficient to induce luteinizing hormone secretion leading to ovulation. His papers on the male effect are still very frequently cited, and have also continued to have profound consequences on breeding management. Breeders have in their hands a simple method to control reproduction.

During the last part of his career, he was a pioneer in the field of welfare issues of farm animals in France. As early as the 1970s, he informed the head of INRA (the French institute of agronomy research) of the importance of studying problems related to farm animal living conditions, especially in intensive animal production systems. These conditions were beginning to be vehemently criticized by animal welfare organizations. He contributed importantly at INRA, CNRS, and French universities to building a school of applied ethology producing scientific results which helped construct the bases of the European policy for animal welfare in mammals and birds which is now extended to fishes. His role was further strengthened by being the vice president of the European Union's Advisory *Veterinary Committee* in Brussels which makes decisions on welfare regulation.

In 1969, he founded the Laboratory of Animal Behavior at the INRA center at Nouzilly. His initial idea was that sexual behavior could be regulated by the social interactions occurring within a group of animals. He offered Marie-France Bouissou an opportunity to study the way social structure could be regulated by hormonal and sensory factors in cattle. He also realized that the specific relationship that is established between the mother and her young in domestic ungulates was of particular interest, in comparison to rats, which were mainly investigated by Jay Rosenblatt's laboratory in the USA. The physiological and sensory mechanisms of individual recognition in sheep constituted an unexplored field which Pascal Poindron began to investigate in the early 1970s. In the late 1980s and early 1990s, Frédéric Lévy, Richard H. Porter and Raymond Nowak joined him to study, respectively, the olfactory mechanisms of maternal behavior and the behavior of the newborn lamb. As for the study of sexual behavior, he proposed to Pierre Orgeur and to Claude Fabre-Nys,

respectively, the study of its development in the immature individual and the neuroendocrine bases in the adult. Just before his retirement, he paid a lot of attention to successfully passing on the management of his group to his younger colleagues and was very happy to see the enlargement of the group after he retired.

Jean-Pierre Signoret was not only an outstanding scientist, he was also extremely curious about the vast repertoire of behaviors expressed by domestic as well as wild animals. When we worked with him, he always had a small funny story to tell about one or another extremely specific behavior of a little known animal species from a far away desert. His natural optimism, his cheerfulness and his passion for the study of behavior will be deeply missed by our scientific community, but people who are now working in his laboratory are here to transmit his spirit and to continue his work on farm animal behavior and its hormonal and sensory regulation.

Short list of references for further information about the research programs referred to above

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