Press release

The 21st *Colloque Médecine et Recherche* of the *Fondation Ipsen* in the Neurosciences series:

"New frontiers in social neuroscience"

Paris (France), 23 April 2013 – Human brains are relatively huge – and we live in highly organised societies. Traditionally in the neurosciences, the brain has been studied in isolation but now the young discipline of social neuroscience is demonstrating how the influences of social factors on the individual have been critical in shaping the present day structure and function of our nervous systems. By applying biological principles to social behaviour, social neuroscience is also providing a fertile interface with social sciences. Contemporary research into the social brain, highlighting evolutionary, physiological, psychological and clinical aspects, will be the focus of the 21st Neuroscience colloquium hosted by Fondation IPSEN. Researchers from Europe and North America will present their latest studies at the meeting to be held in Paris on April 22nd, which has been organised by **Jean Decety** (University of Chicago, USA) and **Yves Christen** (Fondation IPSEN, Paris, France).

Social living is found throughout the animal kingdom, although it is most highly developed in insects and primates. The demands of life in a social group are much greater in terms of sensory stimulation, need for cooperation, competition and the regulation of aggression, among other factors. These operate through neural, hormonal, metabolic and immune mechanisms to shape the behaviour of the individuals to the needs of the group. A beautiful illustration of the effects of switching from solitary to group life within a single species is provided by the desert locust, Schistocerca gregaria (**Steve Rogers**, University of Cambridge, Cambridge, UK). As population density increases and food becomes scarcer, individuals change from solitary to gregarious forms that differ in behaviour, appearance, and the size, morphology and chemistry of the brain. The transition can be studied very precisely, even to the level of single, identified neurons.

In primates, it was established about twenty years ago that in each species, the volume of the neocortex relates to the size of the social group, the so-called Dunbar number (**Robin Dunbar**, University of Oxford, Oxford, UK): solitary species have a smaller cortex than those living in large groups. Both cognitive processes and the role of the endorphin hormones in maintaining relationships seem to have been important in producing the distinctive differences in the brains of social primates. Another probable factor in the evolution of the social brain was care of infants, particularly the involvement of others in the group in parenting, which may have already emerged in the human ancestor, Homo erectus, about 1.8 million years ago (**Sarah Blaffer Hrdy**, University of California, Davis, USA). This cooperation may have driven both the development of social intelligence as well as language, morality and conscience. Infants under one-year old already have the ability to make social evaluations that resemble the moral sense of adults, even though the infants lack experience (**Kiley Hamlin**, University of British Columbia, Vancouver, Canada). They rely on information about mental states and not on outcomes, and their evaluations depend on context rather than the absolute values of specific acts. Both these characteristics point to the moral sense in humans evolving from a universal capacity for social evaluation.

Communication is an essential basis for cooperation in social groups and provides an excellent example of neural processing that cannot be studied in isolated individuals – there has to be a sender and a receiver (**Jakob Bro-Jorgensen**, University of Liverpool, Liverpool, UK). Multiple signalling channels seem to be more efficient for the nervous system, although they cost more in structural and energetic terms, but more needs to be known about the neural circuits involved to understand why such complexity evolved. The combination of facial expression and body language is a good example

of multi-channel communication, although the whole-body aspect has been little studied to date (**Beatrice De Gelder**, University of Tilburg,Tilburg, The Netherlands). One question is whether emotional state and category-specific information are both signalled by face and body to the same extent and how far is this determined by context.

In human social groups, a collective consciousness sometimes operates, called the 'hive mind' in comparison with the collective social behaviour of bees and ants (**Jay van Bavel**, New York University, New York, USA). Group membership influences how we perceive and evaluate others, ultimately the basis of racism and violence, and the brain mechanisms underlying these processes are being determined using imaging studies. The emergence of leaders in groups also depends on signals, both implicit and explicit (**Mark van Vugt**, VU University, Amsterdam, The Netherlands). Leaders display prestige, charisma and dominance whereas followers practise mimicry, tracking the gaze of the leader and forms of voting.

Empathy, the ability to appreciate the feelings of others, is an ability fundamental to human social living. But care has to be taken when attributing empathetic behaviour to other species: sand-dwelling ants will rescue colony members that have become trapped, which could appear to be empathetic behaviour (**Elise Nowbahari**, Université Paris 13 - LEEC EA 4443, France). However, quite simple mechanisms may be involved, such as stimulation by chemicals released by the trapped individual. Empathy in humans seems to consist of several neurobiological processes, each with a unique evolutionary history (**Decety**). These include the subcortical and neuro-hormonal mechanisms associated with the communication of emotions, parental care and social attachment.

Some of the brain circuits active in various social states, including mother/infant bonding, aggressive and sexual motivation, and fear of predators are being revealed by functional brain imaging in rats (**Craig Ferris** Northeastern University, Boston, USA). Hormones also contribute substantially to the functioning of the social brain: oxytocin, sometimes dubbed the 'feel-good' hormone, is involved in empathy, trust, the understanding that others also have a mind and construction of inner images of the outcomes of different actions (**Ilanit Gordon**, Yale Child Study Center, New Haven, USA). Testosterone is usually associated with anti-social behaviour but its influence on empathy, morality, trust and social cooperation depends critically on the individual's level of exposure to sex hormones in the womb (**Jack van Honk**, Universiteit Utrecht, Utrecht, The Netherlands). The claims in the media that testosterone drove the greed that contributed to the recent financial crisis has been tested in an experimental poker game. The data reveal that testosterone has no money-oriented objectives, but motivates for authentic forms of social dominance even if this is materialistically disadvantageous.

Evidence from chimpanzees and humans indicates that cooperative care promotes infants who, though helpless, are able to monitor and evaluate the state of their carers, a requisite both for the infants' survival and the development of social skills (**Hrdy**). It is this development that seems to be compromised in people on the autistic spectrum. Work with rats indicates that in autism the brain may be able to process threatening stimuli but not rewarding ones (**Ferris**). Oxytocin, with its action on the various social skills that are compromised in autism, holds out promise as a treatment (**Gordon**). High-functioning autistic children given oxytocin in a nasal spray showed increased activity in brain areas associated with these skills and an improved ability in tasks requiring the processing of complex social information.

Although it is only about twenty years old, social neurobiology is already showing its power to analyse and explain the intricate behaviours that characterise human life, to bring insight into the evolution of our social organisation, to track its development in infancy and to contribute therapeutically when this development is compromised. The meeting will afford a preview of what may be to come in the next twenty years.

About the Fondation Ipsen
Established in 1983 under the aegis of the Fondation de France, the mission of the Fondation Ipsen is to contribute to the development and dissemination of scientific knowledge. The long-standing action of the Fondation Ipsen aims at fostering the interaction between researchers and clinical practitioners,

which is indispensable due to the extreme specialisation of these professions. The ambition of the Fondation Ipsen is to initiate a reflection about the major scientific issues of the forthcoming years. It has developed an important international network of scientific experts who meet regularly at meetings known as Colloques Médecine et Recherche, dedicated to six main themes: Alzheimer's disease, neurosciences, longevity, endocrinology, the vascular system and cancer science. Moreover the Fondation Ipsen has started since 2007 several meetings in partnership with the Salk Institute, the Karolinska Institutet, the Massachusetts General Hospital, the Days of Molecular Medicine Global Foundation as well as with the science journals Nature, Cell and Science. The Fondation Ipsen produced several hundreds publications; more than 250 scientists and biomedical researchers have been awarded prizes and research grants.

For further information, please contact:
Isabelle de Segonzac, Image Sept
E-mail : isegonzac@image7.fr
Tel. : +33 (0)1 53 70 74 70