

## Functional Organization of the Human Brain

A Window into the Architecture of the Mind

Nancy Kanwisher

**Jeudi 7 décembre - 14h**

### MODULARITY OF MIND AND BRAIN AND THE CASE OF THE FFA

Salle des Actes, École normale supérieure  
45 rue d'Ulm, 75005 Paris

Remise du Prix Jean-Nicod et cocktail après la conférence

**Vendredi 8 décembre - 10h**

### WHAT OTHER MENTAL FUNCTIONS GET THEIR OWN PRIVATE PATCH OF REAL ESTATE IN THE BRAIN?

Salle des Actes, École normale supérieure  
45 rue d'Ulm, 75005 Paris

**Mardi 12 décembre - 10h**

### HOW DOES ALL THIS FUNCTIONAL ORGANIZATION ARISE OVER DEVELOPMENT?

Salle Jaurès, École normale supérieure  
29 rue d'Ulm, 75005 Paris

**Jeudi 14 décembre - 10h**

### HOW AND WHY?

Salle Jaurès, École normale supérieure  
29 rue d'Ulm, 75005 Paris

Organisation  
Frédérique de Vignemont

Communication  
Marie Lods

INSTITUT JEAN NICOD  
École normale supérieure  
Pavillon Jardin  
29, rue d'Ulm  
75005 Paris  
Tél. : +33 [1] 44 32 26 96  
Fax. : +33 [1] 44 32 26 99  
<http://www.institutnicod.org>

## philosophie cognitive

Conférences Jean Nicod de

L'esprit humain, son organisation, sa nature, ses relations avec le corps et avec le monde sont depuis toujours parmi les thèmes centraux de la philosophie. La psychologie contemporaine elle-même a pris naissance au sein de la philosophie. Elle s'est émancipée, mais l'émergence des sciences cognitives consacre d'une certaine façon le retour de la philosophie dans ce champ de recherche. Les développements de l'informatique et des neurosciences, en jetant une nouvelle lumière sur les phénomènes mentaux, ont eu pour effet de relancer le débat philosophique. La « philosophie de l'esprit » est ainsi plus florissante que jamais. Ce retour n'a rien d'une régression, car la philosophie dont il est question est en phase avec la recherche scientifique, informée par elle et en constante interaction avec elle.

Les Conférences Jean-Nicod visent à promouvoir les recherches philosophiques se rapportant à la cognition et à faire connaître en France les travaux réalisés à l'étranger dans ce domaine. Le conférencier présente ses recherches au cours d'un cycle de conférences qu'il rassemble ensuite en un livre.

### CONFÉRENCIERS JEAN NICOD

JERRY FODOR (1993) ■ FRED DRETSKE (1994) ■ DONALD DAVIDSON (1995) ■ HANS KAMP (1996) ■ JON ELSTER (1997) ■ SUSAN CAREY (1998) ■ JOHN PERRY (1999) ■ JOHN SEARLE (2000) ■ DANIEL DENNETT (2001) ■ RUTH MILLIKAN (2002) ■ RAY JACKENDOFF (2003) ■ ZENON PLYSHYN (2004) ■ GILBERT HARMAN (2005) ■ MICHAEL TOMASELLO (2006) ■ STEPHEN STICH (2007) ■ KIM STERELNY (2008) ■ ELIZABETH S. SPELKE (2009) ■ TYLER BURGE (2010) ■ GERGELY CSIBRA ET GYÖRGY GERGELY (2011) ■ NED BLOCK (2013) ■ UTA ET CHRIS FRITH (2014) ■ DAVID CHALMERS (2015) ■ PATRICK HAGGARD (2016) ■ JOHN CAMPBELL (2017) ■ MARTINE NIDA-RÜMELIN (2019) ■ LEDA COSMIDES & JOHN TOOBY (2020) ■ FRANCES EGAN (2021) ■ PETER GODFREY-SMITH (2022)

### COLLECTION JEAN-NICOD

The MIT Press - F. Récanati (dir.)

J. FODOR, THE ELM AND THE EXPERT: MENTALESE AND ITS SEMANTICS (1994) ■ F. DRETSKE, NATURALIZING THE MIND (1995) ■ J. ELSTER, STRONG FEELINGS: EMOTION, ADDICTION, AND HUMAN BEHAVIOR (1999) ■ J. PERRY, KNOWLEDGE, POSSIBILITY AND CONSCIOUSNESS (2001) ■ J. SEARLE, RATIONALITY IN ACTION (2001) ■ R. G. MILLIKAN, VARIETIES OF MEANING (2004) ■ D. DENNETT, SWEET DREAMS: PHILOSOPHICAL OBSTACLES TO A SCIENCE OF CONSCIOUSNESS (2005) ■ G. HARMAN AND S. KUIKARNI, RELIABLE REASONING: INDUCTION AND STATISTICAL LEARNING THEORY (2007) ■ R. JACKENDOFF, LANGUAGE, CONSCIOUSNESS, CULTURE: ESSAYS ON MENTAL STRUCTURE (2007) ■ Z. W. PLYSHYN, THINGS AND PLACES: HOW THE MIND CONNECTS WITH THE WORLD (2007) ■ M. TOMASELLO, ORIGINS OF HUMAN COMMUNICATION (2008) ■ K. STERELNY, THE EVOLVED APPRENTICE: HOW EVOLUTION MADE HUMANS UNIQUE (2012) ■ C. FRITH AND U. FRITH, WHAT MAKES US SOCIAL? (2023)

# philosophie

# cognitive



CONFÉRENCES JEAN NICOD DE PHILOSOPHIE COGNITIVE

Fondation Meyer  
pour le développement culturel et artistique

Centre National de la Recherche Scientifique  
(Institut des Sciences Humaines et Sociales)

En partenariat avec :  
École Normale Supérieure  
École des Hautes Études en Sciences Sociales

cycle  
2023

## Nancy Kanwisher

# Functional Organization of the Human Brain

A Window into the Architecture of the Mind

# Nancy Kanwisher

Nancy Kanwisher received her B.S. and Ph.D. from MIT, working with Professor Molly Potter. After a postdoc as a MacArthur Fellow in Peace and International Security, and a second postdoc in the lab of Anne Treisman at UC Berkeley, she held faculty positions at UCLA and then Harvard, before returning to MIT in 1997, where she is now an Investigator at the McGovern Institute for Brain Research, a faculty member in the Department of Brain & Cognitive Sciences, and a member of the Center for Minds, Brains, and Machines. Kanwisher uses brain imaging and other methods to discover the functional organization of the human brain as a window into the architecture of the mind. Kanwisher has received the Troland Award, the Golden Brain Award, the Carvalho-Heineken Prize, and a MacVicar Faculty Fellow teaching Award from MIT, and she is a member of the National Academy of Sciences and the American Academy of Arts and Sciences.

## SÉLECTION BIBLIOGRAPHIQUE

- 2022** Khosla, M. et al. (2022). A highly selective response to food in human visual cortex revealed by hypothesis-free voxel decomposition. *Current Biology*
- 2022** Norman-Haignere, S.V. et al. (2022). A neural population selective for song in human auditory cortex. *Current Biology*
- 2022** Dobs, K. et al. (2022). Brain-like functional specialization emerges spontaneously in deep neural networks. *Science Advances*
- 2021** Kosakowski, H. et al. (2021). Selective Responses to Faces, Scenes, and Bodies in the Ventral Visual Pathway of Infants. *Current Biology*
- 2017** Schalk G. et al. (2017). Facephenes and rainbows: Causal evidence for functional and anatomical specificity of face and color processing in the human brain. *Proc Natl Acad Sci U S A*
- 2011** Fedorenko, E., Behr, M., & Kanwisher, N. (2011). Functional specificity for high-level linguistic processing in the human brain. *PNAS*
- 2007** Baker, C.I. et al. (2007). Experiential origins of functional selectivity in human extrastriate cortex. *PNAS*
- 2003** Saxe R, Kanwisher, N. (2003). People thinking about thinking people: fMRI investigations of theory of mind. *Neuroimage*
- 1998** Epstein, R. & Kanwisher, N. (1998). A cortical representation of the local visual environment. *Nature*

# Conférences Jean-Nicod 2023

## Functional Organization of the Human Brain

### A Window into the Architecture of the Mind

#### Jeudi 7 décembre

##### MODULARITY OF MIND AND BRAIN AND THE CASE OF THE FFA

Is the human mind structured, and if so what is that structure? Here I consider the case of face perception, charting the many lines of evidence that specialized neural machinery in the fusiform gyrus (FFA) plays a specific and causal role in the perception and recognition of faces. We found that the FFA responds twice as strongly to faces as to any other stimuli. The response of this region is correlated with awareness of a face in binocular rivalry, modulated by spatial and object-based attention, and selectively increased when people closed their eyes and simply imagine faces. Electrical stimulation of the FFA produces a face percept, demonstrating the selective causal role of this region in face perception. Hence, at least one patch of the human brain is extremely specific for the single mental function of face perception. But are there other mental functions that are as specific?

#### Vendredi 8 décembre

##### WHAT OTHER MENTAL FUNCTIONS GET THEIR OWN PRIVATE PATCH OF REAL ESTATE IN THE BRAIN ?

Here I shall fill out the picture of the human brain as containing a large number of regions that are highly specialized for particular mental functions, such as the extrastriate body area, the parahippocampal place area, as well as areas in auditory cortex for music, and in high-level visual cortex for food. Other regions are specialized in yet higher-level functions, including the perception of third-party social interactions and intuitive physics. Furthermore, theory of mind has been shown to have a distinctive developmental trajectory and a selective deficit in autism, and now a private patch of brain as well in the right temporo-parietal junction. Finally, the brain regions specific to language show almost no response during other high-level cognitive processes, including working memory and cognitive control. Thus, language and thought are not the same thing in the brain.

#### Mardi 12 décembre

##### HOW DOES ALL THIS FUNCTIONAL ORGANIZATION ARISE OVER DEVELOPMENT?

My account of the biological basis and origin of subjective experience has two elements. Part of the explanation is given in terms of the evolution of agency and subjectivity, as features of the animal way of being, and another part involves some particular characteristics of nervous systems. The evolutionary history of animals functions in my account as a constraint and a resource. I argue that there is probably a broad distribution of subjective experiences across different kinds of animals, both past and present, though the usual «yes or no» question will probably have to be replaced in a framework that recognizes gradual change and graded presence. Some specific groups will be discussed, including cephalopods and various arthropods, as well as vertebrates.

#### Jeudi 14 décembre

##### HOW AND WHY ?

The convergence between the organization and function of the brain and artificial neural networks (ANNs) optimized for similar tasks is transforming cognitive science to a deeply theoretical enterprise of asking (and sometimes even answering) why the mind and the brain work the way they do. ANNs now succeed at many tasks similar to those conducted in specialized brain regions, thus providing the first computationally precise hypotheses for how these functions might work in the brain. Further, to a remarkable degree, responses in visual, auditory, and language cortex are well predicted by ANNs. Finally, an ANN trained on both face and object recognition spontaneously segregated itself into two separate systems, without any built-in priors, suggesting that the statistics of experience may suffice, without face-specific innate predispositions, for the brain to achieve the functional organization it does.