



THE INTERNATIONAL ASSOCIATION FOR THE STUDY OF AFFECTIVE TOUCH: INAUGURAL CONGRESS

FRIDAY 20 TO SUNDAY 22 MARCH 2015

INVITED SPEAKERS' ABSTRACTS & BIOS + CHAIRS' BIOS

Friday

13:40-15:20: Plenary Session I (part 1): The Affective Touch Landscape

Chair: India Morrison

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Johan Wessberg: *The CT Afferent System: Peripheral Pathways*

Since the early 1990s, we have studied the system of human unmyelinated mechanoafferents with low mechanical thresholds, so called C-tactile or CT afferents. These afferent units respond well to light touch, particularly to stimuli moving with intermediate velocity (around 1-3 cm/s). We demonstrated that psychophysical ratings of pleasantness were correlated with the mean discharge frequency in CT afferents, but not with firing in the four classes of myelinated (A) afferents innervating the human hairy skin. We propose that this system has an important role in signalling emotional, rather than discriminative, quality of pleasant touch to the hairy skin, and that CT afferent units are optimally tuned to the characteristics of typical human skin-to-skin contact, such as caresses.

Johan Wessberg is Professor of Neurophysiology at the Sahlgrenska Academy, University of Gothenburg, in Sweden. He has studied human hand motor control, proprioception and tactile mechanisms using microneurography, where single identified nerve fibres are recorded or stimulated in human participants. He also has a strong interest in applying modern mathematical techniques such as Machine Learning in the field of neurophysiology. Current projects include CT afferents, combining microneurography and functional brain imaging, prosthetic touch, and computer display technology that integrate visual and tactile information.

Håkan Olausson: *The CT Afferent System: Central Pathways*

This talk will review the significance and functional role of C tactile (CT) afferents in humans through behavioural and brain imaging experiments, beginning with the original psychophysical and functional brain imaging experiments in healthy human subjects examining the role of CT-targeted touch. This will be extended to include acute human pain transmission and perception, and the role of CT afferents in dynamic tactile allodynia in healthy subjects and patients lacking large myelinated afferents.

Håkan Olausson, MD, is a Professor in Clinical Neuroscience at the University of Linköping, Sweden. He studies the CT afferent system from the peripheral receptors to the system's effect on brain and behaviour. He is also interested in the interaction between affective touch and pain and how affective touch can be used as a tool to study brain processing in psychiatric disorders.

15:50-16:40: Plenary Session I (part 2): The Perceptual and Affective Properties of Pleasant Touch

Chair: Giandomenico Iannetti

Giandomenico Iannetti is Professor of Neuroscience at University College London, where he has been since 2009. He was previously at the University of Oxford (2003-2009). He completed his PhD at "Sapienza" University of Rome, where he graduated in Medicine in 1999; www.iannettilab.net

Francis McGlone: *The CT afferent system: What is it good for?*

In this talk I will pose the question 'why do we have a system of slowly conducting gentle touch responsive nerves in the skin?' and provide some evidence-based, and some speculative, reasons why such a system has evolved in social species - from C-Elegans to humans. A sense of touch is fundamental for an organism to detect its environment and in humans we have one for sensing the physical world and one for feeling it. The latter's role in shaping the developing social brain is an intriguing one that CTs may well be playing an important role in - for better or worse....

Professor Francis McGlone is the head of the Somatosensory & Affective Neuroscience Group at the School of Natural Sciences & Psychology, Liverpool JM University, and Professor in Neuroscience at LJMU. He is also Visiting Professor at the University of Liverpool. His primary area of academic research is characterising the role of afferent c-fibres in humans, investigating their role in pain, itch (for which an IgNobel prize was awarded!), and more concertedly the functional and affective properties of a novel class of c-fibres - C-tactile afferents - hypothesised to code for the pleasure of intimate touch. Techniques used in this research span single unit recordings with microneurography, psychophysical measurements, functional neuroimaging, behavioural measures, and psychopharmacological approaches to investigate the role of the brain transmitter serotonin in affiliative and social touch.

17.00-18.10: Special Guest Address

Chair: Aikaterini (Katerina) Fotopoulou

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Camila Batmanghelidjh: *If My Hands Could Speak*

The language of the body is increasingly as important as the words that come out of our mouths and the thoughts that whirl in our heads. Trauma has a unique discourse, as it simultaneously unravels in the body and is revealed through it. No dictionary has yet fully captured the language of touch, but we're beginning to feel it.

Camila Batmanghelidjh, CBE is the founder of two children's charities - The Place 2 Be (now national) and Kids Company, where she currently works with some of the most traumatised young people living in London. Kids Company was set up in 1996. It employs 600 staff, benefits from some 11,000 people volunteering annually and reaches 36,000 children a year with therapeutic care. Camila trained as a psychotherapist, engaged in 20 years of psychoanalysis and has become an advocate for vulnerable children. In 2009 she was named Business Woman of the Year for the Dods and Scottish Widows Public Life Awards. Camila has also been awarded Social Entrepreneur of the Year by Ernst and Young, and Coutts and the Most Admired Chief Executive by Third Sector Magazine. She won the lifetime achievement award from the Centre of Social Justice. Kids Company has been awarded the Human Rights Awards by Liberty & JUSTICE and has been awarded Child Poverty Champion Status by the End Child Poverty Action Group. In 2010 Camila and Kids Company were given the Award for Innovative Excellence by Psychoanalytic Psychotherapy Now. In 2012 Kids Company received the Royal Society for Public Health Arts and Health Award. Kids Company currently has a partnership with the University of Cambridge and UCL involving research into neurodevelopmental trauma. Camila considers herself very privileged to be working with what she describes as extraordinarily courageous and dignified children. She has a good sense of humour and enjoys cutting up other people's curtains and wearing them!

Saturday

09:30-11:30: Invited Symposium: Neural Pathways of Affective Touch from Receptor to Brain

Co-ordinator: India Morrison

India Morrison: *Affective touch: brain and behavior*

Affective touch is proposed to carry hedonic and motivational weight. Unlike "discriminative" somatosensation, neural processing of affective somatosensation does not reduce easily to metrical terms, such as location on the body, stimulus intensity, stimulus duration, etc. Instead, it is postulated to play a functional role in social affiliative interactions. This talk will present neuroimaging and behavioral findings in the domain of affective touch, emphasizing the importance of behavior in characterizing affective touch. In particular, it will focus on findings from a population of individuals carrying a rare mutation on the nerve growth factor (NGF) gene, which selectively affects thin-diameter sensory afferent nerves, thus reducing the density of CT afferents in the body.

India Morrison is an assistant professor at Linköping University in Sweden, where she is co-director of the Group for Research on Affective Somatosensation and Pain (GRASP) lab. She received her cognitive neuroscience PhD from the School of Psychology, University of Wales, Bangor, UK (2006). Her postdoctoral training was at the Institute for Neuroscience and Physiology at Gothenburg University (2007-2010). Her Bachelor of Arts degree is from St. John's College, Santa Fe, USA (1996).

Emmanuel Bourinet: *Low threshold calcium channels determine low threshold mechanoreceptor function*

The T-type calcium channel Cav3.2 emerges as a key regulator of sensory functions, but its expression pattern within primary afferent neurons and its contribution to modality-specific signaling remain obscure. Here we elucidate this issue using a unique knockin/flox mouse strain where Cav3.2 is replaced by a functional Cav3.2-surface-eclipticGFP fusion. We demonstrate that Cav3.2 is a selective marker of two major low-threshold mechanoreceptors (LTMRs), Delta- and C-LTMRs, innervating the most abundant skin hair follicles. The presence of Cav3.2 along LTMR-fiber trajectories is consistent with critical roles at multiple sites, setting their strong excitability. Strikingly, the C-LTMR-specific knockout uncovers that Cav3.2 regulates light-touch perception, noxious

mechanical cold and chemical sensations, and is essential to build-up debilitating allodynic symptoms of neuropathic pain, a mechanism thought to be entirely A-LTMRs-specific. Collectively our findings support a fundamental role for Cav3.2 in touch/pain pathophysiology, validating their critical pharmacological relevance to relieve mechanical and cold allodynia. The presentation will emphasize on these data in light of recent molecular explorations of C-LTMR transcriptome unravelling the specific ion channel portfolio of these sensory neurons.

Emmanuel Bourinet has a background in physiology with specific training in electrophysiology. He has a longstanding interest in the molecular properties and regulations of voltage gated calcium channel. After thesis work in Montpellier on the regulation of L-type calcium channels by phosphorylation, he went to the University of British Columbia in Vancouver in 1993 working with Pr Terry Snutch as a post doc fellow where he studied structure function of cloned neuronal calcium channels. At that time he started to be interested in pain studying the effects of opiate receptors on presynaptic calcium channels. He got a position at the CNRS in France in 1995 and has been working in Montpellier since then. He has his own group working as a PI since 2005. They were the first to demonstrate that T-type ion channels can be effectively knocked down in sensory neurons by intrathecal injections on CaV3.2 antisenses.

Sarah Lloyd-Fox: *Staying in touch with baby brains*

From the first moments a human infant comes into this world, as an altricial species she relies on her parents' touch for nourishment and support and continues to do so for many months and years to come. Until recently this sense, and in particular affective touch, remained largely understudied during human development. Over the last few years we have been studying the role of affective touch in infancy, gaining perspective on how caregivers and infants interact, and studying the brain's responses to different forms of touch. The latter has involved the use of functional near infrared spectroscopy, an infant friendly, non-invasive optical technique, providing maps of regional cortical oxygenation which can be used to assess localised brain activation. Here I review some of this work, providing our most recent neuroimaging findings, and outlining some of the challenges we have faced during our study of affective touch.

Sarah Lloyd-Fox is a research fellow at the Centre for Brain and Cognitive Development (CBCD), Birkbeck, University of London. Following her cross-disciplinary PhD in developmental neuroscience and medical physics she became an MRC Research Fellow & the fNIRS Research Coordinator at the CBCD. Her work focuses on the use of fNIRS to investigate the developing brain in infancy focusing on social cognition and developmental neuroscience. Her work also examines brain function in infants at risk of compromised development due to neurodevelopmental disorders and most recently under nutrition. This has led to the novel application of fNIRS in resource-poor countries.

Steve Guest: *Psychophysical Assessment of Pleasant Touch*

Somatosensation is most commonly studied by measuring the stimulus magnitude at which various types of highly controlled stimuli (e.g., vibrotactile stimulation, touch against the skin) can be detected, that is, by obtaining psychophysical thresholds. However, the study of affective touch does not fit within such a framework; threshold-level stimuli do not elicit strong affective responses, and the stimuli used to obtain sensory thresholds were not engineered with the aim of engendering such responses. I will describe the suprathreshold percepts that form the cornerstones of affect, and which are therefore important in assessing affective touch. I will also review some of the devices that have been developed to facilitate the study of affective touch. The percepts, devices, and associated psychophysical methods, are quite different from those used to study 'traditional' (sensory) aspects of somatosensation.

Steve Guest is a senior research associate at the School of Social Work, University of North Carolina at Chapel Hill. After early career forays in visual perception, until recently he was based in the School of Dentistry at UNC (2002 - 2014), where he studied a wide range of topics in affective perception, with specific focus on industry-academia collaborations addressing consumer product assessment.

12:00-12:50: Plenary Session II: Theme: Affective Touch Beyond CT Afferents

Chair: Aikaterini (Katerina) Fotopoulou

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Charles Spence: *Affective Touch: Commercial Applications*

In this talk, I will consider the commercial application of the latest findings concerning the affective touch system. I will look at the question of whether technology can be used to deliver affective benefits through the skin, and highlight the results of some of the latest research that has started to investigate the commercialization of affective touch findings in the world of home and personal care and high-end cuisine.

Professor Charles Spence is the head of the Crossmodal Research Laboratory at the Department of Experimental Psychology, Oxford University (<http://www.psy.ox.ac.uk/research/crossmodal-research-laboratory>). He is interested in how people perceive the world around them. In particular, how our brains manage to process the information from each of our different senses (such as sight, hearing, touch, pain, smell, and taste) to form the extraordinarily rich multisensory experiences that fill our daily lives. His research focuses on how a better understanding of the human mind will lead to the better design of multisensory interfaces, products, environments, and foods in the future. His research calls for a radical new way of examining and understanding the senses that has major implications for the way in which we design everything from mobile phones to household products, and from the food we eat to the places in which we work and live. He is currently working on problems associated with the design of neuroscience-inspired multisensory warning signals for drivers and other interfaces that maximally stimulate the senses. His latest

publication is Gallace, A., & Spence, C. (2014). 'In touch with the future: The sense of touch from cognitive neuroscience to virtual reality' at Oxford University Press.

16:00-17:45: Invited Symposium: Affective Touch and the Bodily Self

Chair & Discussant: Paul Jenkinson

Paul Jenkinson is a senior lecturer in psychology in the School of Life and Medical Sciences at the University of Hertfordshire. Paul's research explores the relationship between the mind, body and self, employing various methods including experimental neuropsychology, and cognitive, behavioural, and psychodynamic neuroscience. His work aims to understand the neural and psychological mechanisms underlying body awareness, ownership, and interoceptive signals in neurological patients and healthy subjects. Paul is a member (and former Executive Committee officer) of the British Neuropsychological Society, and in 2012 was awarded a Neuropsychoanalysis Foundation research fellowship. Further information about Paul's work can be found at www.paulmjenkinson.uk

Aikaterini (Katerina) Fotopoulou: *The Touched Self: Affective Touch and Body Awareness in Health and Disease*

According to the 'embodied cognition' approach several facets of awareness are causally related to the physical body and its properties. Primary sensorimotor signals are integrated and re-represented in various levels of the neurocognitive hierarchy to form a number of neurocognitively distinct bodily representations. In this talk I wish to highlight the role of affective touch, and particularly gentle dynamic touch that is thought to be mediated by the CT afferent system, in multisensory integration and ultimately body awareness. I will discuss empirical group and single case studies on neuropsychiatric disorders of body awareness, including anosognosia for hemiplegia and somatoparaphrenia following right hemisphere stroke, as well as anorexia nervosa. Specifically, we have applied a number of neuroimaging and experimental paradigms from cognitive neuroscience in which simple psychophysical 'tricks' are used to systematically manipulate affective touch and other sensorimotor signals, promote their integration, or generate conflicts and illusions, and hence study their role in body awareness. Our results highlight that these disorders can be described as different aberrations of a core antagonism between bottom-up sensory and emotional touch signals, and top-down motor and higher-order signals at different hierarchical levels. I will particularly focus on some unique, spatial and social cognition deficits that deprive patients from the means to update their perception of certain sensory states. I will further highlight the unique role of affective touch in by-passing some of these deficits and thus allowing these patients to update their body awareness.

Katerina Fotopoulou is a Reader in Psychodynamic Neuroscience at the Psychology and Language Sciences Division at University College London. Funded by a Starting Investigator Grant from the European Research Council for the project 'Bodily Self', she runs KatLab, a group of researchers and students that conduct studies on topics and disorders that lie at the borders between neurology and psychology. See here for publications: www.fotopoulou.com. Katerina is also the Director of the London Neuropsychoanalysis Centre and runs the London Neuropsychoanalysis Group on: 'Psychodynamic Neuroscience and Neuropsychology'. She is editor of the volume: Fotopoulou, A. Conway, M.A. Pfaff, D. From the Couch to the Lab: Trends in Psychodynamic Neuroscience. Oxford University Press, 2012.

Donna Lloyd: *Can Pleasant Touch Moderate the Experience of Pain?*

The skin senses serve a discriminative function, allowing us to manipulate objects and detect touch and temperature (mediated by myelinated A-delta and A-beta fibres), and an affective/emotional function, mediated by c-fibres, manifested as itch or pain when the skin is damaged. More recent research has identified a third class of c-fibre afferents that code for the pleasurable properties of touch - c-tactile afferents or CTs. Very little research has looked at the interactions between these pathways and yet understanding more about the interactions between the sub-modalities of the somatosensory systems could, in the future, inform the development and delivery of clinical treatments that target pleasant, CT mediated-touch. In this talk I will present data on experiments that have investigated the interactions between painful, neutral and pleasant touch and suggest likely targets in the central nervous system where these interactions might take place.

Donna Lloyd gained her BSc in Psychology and Neuroscience from the University of Manchester in 1999 and a DPhil from the University of Oxford in 2003 where she investigated visuo-tactile integration in humans using fMRI at the Oxford Centre for Functional MRI of the Brain (FMRIB). She then completed a two-year post-doc at the Pain Research Institute/Magnetic Resonance and Image Analysis Research Centre, University of Liverpool using fMRI to measure neural activity in relation to chronic low back pain, trigeminal neuralgia and phantom limb pain before gaining her first lectureship at the University of Manchester in 2005. In 2013 she joined the School of Psychology at the University of Leeds where she is now Associate Professor in Cognitive Neuroscience. Her work focuses on the multisensory and cognitive factors underlying body representation and somatic awareness (including touch, pain and itch) in both healthy and clinical populations using multiple methodologies.

Chris Dijkerman: *Affective touch and body representations*

Somatosensory input is essential for how we experience our body and is crucial for building and maintaining an internal representation of our body. So far most studies have investigated the role of discriminative touch in body representations. However, it is clear that affective tactile input provided through c-tactile afferent fibres may be important as well. In this presentation I review several studies investigating the relation between affective touch and body representation. In particular the effect of affective touch on bodily illusions in healthy participants will be reviewed. Moreover, affective touch processing in patients with unilateral insular tumour resection will also be discussed.

Chris Dijkerman gained his DPhil from Oxford University under supervision of Larry Weiskrantz and Faraneh Vargha-Khadem, investigating sensorimotor consequences of hemispherectomy. He subsequently worked as postdoc with David Milner on visual perception and action at St. Andrews University. Chris moved to Utrecht University in 2000, where he was appointed as professor of Neuropsychology in 2012. His research currently focuses on visually guided action, somatosensory function, body representation and peripersonal space in healthy individuals as well as neurological and psychiatric patients.

Sunday

09:30-11:10: Plenary Session III - When the Touch System goes wrong

Chair: Susannah Walker

Susannah Walker is a Senior Lecturer in the School of Natural Sciences & Psychology at Liverpool John Moores University (LJMU). With a background in the behavioural neuroscience, her current research focuses on how exposure to biologically salient sensory stimuli, specifically in olfactory and somatosensory domains, influences physiology, affect and behaviour. She is a member of the Somatosensory & Affective Neuroscience group at LJMU and Co-I on a Leverhulme Trust Funded project investigating the role of 5-HT in psychological responses to affective touch.

Martin Paulus: Affective Touch - Evidence for Dysregulation in Substance Users

Affective touch comprises a range of sensory afferents that - instead of communicating discriminative stimulus property of the outside world - are important for the evaluating of the outside world as it relates to the individual. Therefore, affective touch has a fundamental homeostatic function and can be considered part of the interoceptive system, which is important for regulating emotion and associated action selection. Substance use disorders are complex clinical conditions that are thought to emerge from allostatic dysregulation focused on reward-related processing. We have proposed that the development of substance use is partially a consequence of dysregulated interoception. Moreover, we have used affective touch as an experimental probe to examine dysregulation of the interoceptive system in individuals at various stages of substance use disorder. Here, we present results from three different studies: (1) adults with amphetamine dependence in early remission, (2) adolescents with substance use disorders, and (3) those individuals who are at highest risk for developing substance use disorders. In combination, these results show that brain processing of affective touch changes as the individuals progress in their substance use. Thus, altered processing of affective touch is an example of allostatic dysregulation, which develops during the course of substance use. Importantly, these findings have two implications: (1) neural processing of affective touch may function as a biological marker indexing the severity of substance use disorder; (2) modulation of the interoceptive system using soft touch may be a treatment target for individuals with substance use disorder.

Martin Paulus is an Adjunct Professor in the Department of Psychiatry at University of California San Diego and Scientific Director and President at the Laureate Institute for Brain Research (LIBR) in Tulsa, OK. His research focuses on the interface between interoception, i.e. the sense of the physiological state of the body, and decision-making as it relates to anxiety, drug addiction, and optimal performance. He has published over 200 peer-reviewed articles and has reviewed for public and private agencies both nationally and internationally. Dr. Paulus is currently supported by the National Institutes of Health and National Institute of Mental Health.

Carissa Cascio: The mind-skin connection: Affective touch in psychopathology

The role of touch in social-emotional development and neuroregulation makes it highly relevant to psychiatric conditions, although it is not well studied in this context. This talk will highlight behavioral and neural studies of touch autism spectrum disorder (ASD) and obsessive compulsive (OCD) and related disorders. Although ASD is thought to arise from multiple etiologies, converging findings of selective differences in affective touch processing contribute to a developmentally relevant theory of one such etiological pathway: that of cascading effects of altered affective touch perception early in life on social-emotional development. In OCD and related disorders, body-focused repetitive behaviors often involve disrupted affective touch, including diminished nociception and/or altered reward response to tactile stimuli. Neuroimaging and animal models implicate the interface of sensory systems with networks for affect and arousal in both classes of psychiatric conditions, but much more research is needed to clarify the role of touch in these clinical conditions.

Dr. Cascio is an Assistant Professor of Psychiatry at Vanderbilt University, USA, where she is part of the Psychiatric Neuroimaging Program, and the Kennedy Center for Research on Human Development, and the Vanderbilt Brain Institute. Her graduate training was in sensory neuroscience at Emory University; her postdoctoral training focused on neuroimaging and autism spectrum disorder at the Neurodevelopmental Disorders Research Center at the University of North Carolina, Chapel Hill. Her work is focused on the neural basis of affective sensory and repetitive behaviors in individuals with autism spectrum disorders, with an emphasis on proximal sensory systems, including touch; www.casciolab.com