

# human CHEMOSENSATION 2018 - the lab meeting

where: Dresden, Germany

when: Thursday, Feb 22<sup>nd</sup> to Saturday, Feb 24<sup>th</sup> 2018



## Program

## Thursday, 22<sup>nd</sup> of February 2018

14:00 Welcome

14:15 Chair: Katie Whitcroft

14:15 Sinding, Charlotte: Brain mechanisms of flavor perception

14:30 Cavazzana, Ananchiara Social choices: Follow one's nose or one's eyes? It's a matter of age

14:45 Oleszkiewicz, Anna: Project presentation: Compensation of sensory function in deaf, blind, anosmic people

15:00 Fournel, Arnaud: Mental representation of smells in experts

15:15 Rottstädt, Fabian: Pre-aging of the olfactory bulb in major depression with high comorbidity

15:30 Croy, Ilona: Olfaction as a predictor for mental health?

15:45-16:30: Break

16:30 Chair: Alexander Fjaeldstad

16:30-17:15: Smith, Barry: Smell and consciousness

17:15 Loos, Helene: Human milk odour and its perception by the neonate: an example of aroma chemistry meeting ethology

17:30 Sieksmayer, Jan: Olfactory context in episodic memory formation

17:45 Shushan, Sagit: Congenital anosmics modify sniffing in accordance to odor content

18:00-20:00: Pretzels, pizza, leberkäs, beer, wine, soda

## Friday, 23<sup>rd</sup> of February 2018

9:00 Chair: Christian Margot

9:00-9:30 Sobel, Noam Altered Olfaction in Recurrent Spontaneous Miscarriage: Is there a Human Bruce Effect?

9:30 Chair: Ilona Croy

09:30 Walter, Sophie Idiopathic smell and taste disorders as predictors for the occurrence of Parkinson's Disease

09:45 Lecuyer, Fanny Evaluation of the olfactory system within the first 24 hours after a mild traumatic brain injury (mTBI)

10:00 Han, Pengfei Neural processing when reading odor-associated words: an fMRI study in patients with olfactory loss

10:15 Frasnelli, Johannes Effects of olfactory training in normosmia

10:30 Gorodisky, Lior Congenital anosmic subjects sample the world less frequently as compared to normosmics

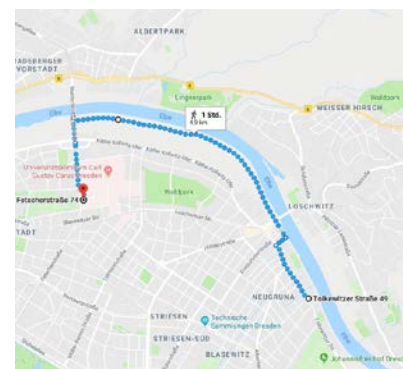
10:45 Whitcroft, Katie Position Paper on Olfactory Dysfunction

11:00-11:45	Break	
11:45	Chair: Monique Smeets	
11:45	Zakrzewska, Marta	An overprotective nose? When implicit prejudice is related to individual differences in body odour disgust sensitivit
12:00-12:30	Margot, Christian	Odorous androstenes: why not androstenol?
12:30	Chair: Maria Larsson	
12:30-14:00	Open Discussion I	(1) Katie Whitcroft: olfactory science network; (2) Charlotte Sinding: European olfactory neuroscience education (3) Monique Smeets: Demystifying human pheromone communication: setting the scientific roadmap for 2030 (4) Other, e.g., potential for research collaboration
14:00-15:00	Break	
15:00-16:30	Poster session: Mohebbi, Schäfer, Hummel, Sorokowska, Kärnekull, Schwambergerova, Kapicova, Roche, Tremblay, Masala, Würfel, Schreiner, Donner, Schriever, Georgsdorf	
16:30	Chair: Jan Havlicek	
16:30-17:15	Scherer, Klaus	Olfaction and emotion
17:15	Chair: Charlotte Sinding	
17:15	Lübke, Katrin	Empathic Cognitions Affected by Undetectable Social Chemosignals
17:30	Herrmann, Franziska	Trigeminal activation and EEG source localization in migraine patients
17:45	Rochor, Nora	Sniffin' away the feeding tube - The influence of olfactory stimulation on oral food intake in newborns and premature infants
18:00	Gellrich, Janine	Olfactory function in newborns - an EEG-based study

**The dinner** will take place on Friday evening at the Main Loge of the Dresden Free Masons – it will be open at 19:30, dinner will start at around 20:00h.

**Address:** Tolkewitzer Straße 49, 01309 Dresden (shortest walking distance about 3.1 km ~ 40 min; alternatively nice stroll along the Elbe river, 4,9 km, ~ 60 min – see map)

**To get there by tram:** take either tram # 6 or 12 (2.20 Euro single trip), towards *Niedersedlitz* or *Gustav-Freitag Strasse*, respectively Then exit at Heinrich Schütz Strasse, which is the 6<sup>th</sup> stop after the Augsburgerstrasse.



**Saturday, 23<sup>rd</sup> of February 2018**

9:00	Chair: Johannes Frasnelli	
9:00-9:45	Lötsch, Jörn	Machine learning in human olfactory research
09:45	Guducu, Cagdas	New ways to analyze electrophysiological studies in the chemical senses
10:00	Mantel, Marylou	The contribution of the orbito-frontal cortex in the mental representation of odors
10:15	Fjaeldstad, Alexander	Structural olfactory connectivity networks: durable insights to central olfactory processing?
10:30-11:00	break	
11:00	Chair: Charlotte Sinding	
11:00-11:45	Firestein, Stuart	Molecular and cognitive aspects of olfaction
11:45	Niklassen, Andreas	A new sensitive gustatory test method
12:00	Stankovic, Jelena	Pilot study – food neophobia amongst healthy Danish adolescents
12:15	Hald, Mathias	Food preferences among Danish adolescents
12:30	Chair: Thomas Hummel	
12:30-13:00	Open Discussion II	
13:00-13:30	break	
13:30	Chair: Valentin Schriever	
13:30	Zaraneck, Laura	Smell training in children with migraine
13:45	Fialova, Jitka	Can you smell the winner? The effect of competition on human body odour
14:00	Blum, Tobias	The more, the merrier? What Social Network Size does and doesn't have to do with Happiness and Odour Discrimination
14:15	Sparing-Paschke, Lisa	The influence of cognitive and psychological parameters on olfactory assessment in children
14:30	Sorkowska, Agnieszka:	A meta-analysis on olfactory function in blindness

## Poster session

Mohebbat Mohebbi	The effect of umami training in tasters and non-tasters - a fMRI study
Elena Schäfer	Smell, Space and Emotion: research on olfactory media
Thomas Hummel	Olfactory training changes electrophysiological responses at the level of the olfactory epithelium
Agnieszka Sorokowska	Food sharing
Stina Cornell Kärnekull	Effects of blindness on olfactory and auditory memory
Dagmar Schwambergova	Association between effectiveness of immune system and quality of human body odour
Lucie Kapicova	Influence of paternal body odour on female mate choice
Alice Roche	How to predict the odor profile of complex odor mixtures from their chemical composition?
Cecilia Tremblay	Central and peripheral electrophysiological response to trigeminal stimuli in Parkinson's disease
Carla Masala	Correlation among olfactory dysfunction, apathy and fatigue in patients with Parkinson's Disease
Helene Würfel	Odor thresholds with mixtures
Linda Schreiner	Investigations on the smell of wood
Laura Donner	"Smells like teen spirit" - the impact of body odor on bonding over the course of life: a developmental and neuropsychological approach
Valentin Schriever	The U-Sniff odor identification test for children
Wolfgang Georgsdorf	Precisely controlled high-frequency scent sequences in cinema-like environments for collective experience of larger audiences
Alexander Fjaeldstad	Chemosensory sensitivity is not static: Effects of coffee on gustatory and olfactory sensitivity
Susanne Menzel	Olfactory change detection
Jan Vodicka	Results of smell evaluation using respiratory olfactometer

**Social choices: Follow one's nose or one's eyes? It's a matter of age**

Cavazzana A1, Wesarg C2, Parish-Morris J3, Lundstrom JN2,4,5, Parma V2,3,4,6; 1 Interdisciplinary Center Smell & Taste, Department of Otorhinolaryngology, TU Dresden, Germany; 2 Monell Chemical Senses Center, 3500 Market Street, Philadelphia, PA, 19104, USA; 3 Center for Autism Research, Children's Hospital of Philadelphia, 3535 Market Street, 19104, Philadelphia, PA, USA; 4 Department of Clinical Neuroscience, Karolinska Institutet, NobelsvÄg 9, 17177 Stockholm, Sweden; 5 Department of Psychology, University of Pennsylvania, 3720 Walnut Street, 19104 Philadelphia, PA, USA; 6 SISSA, Neuroscience Area, Via Bonomea, 265, 34136 Trieste, Italy; [annachiara.cavazzana@gmail.com](mailto:annachiara.cavazzana@gmail.com)

Recognition of emotional facial expressions is a crucial skill for adaptive behavior. Affective matching tasks have been used to investigate across development how facial information is integrated with other sensory information. Considering the suggested affective power of olfaction and its relevance in mediating social information since birth, we assessed olfactory-visual matching abilities in a group of 140 children between the ages of 3 and 11 years old. We presented one of three odor primes (pleasant, unpleasant, and no odor) before a facial preference task (happy vs. disgusted face). Children were instructed to select one of two faces. As expected, children of all ages preferred the happy faces. However, children younger than 5 years of age were biased towards choosing the happy face, irrespective of the valence of the odor prime, whereas from age 5, an affective matching strategy guided the choice of children. Indeed, the odor considered pleasant significantly predicted the choice of happy faces, whereas the odor considered unpleasant predicted the choice of disgusted faces. The present study fills a gap in the developmental literature by demonstrating olfactory-visual affective strategies that affect decision making and it represents an important step towards understanding the underlying processes that shape the typical social mind.

**Androstenol**

Cayeux I, Vuilleumier C, Truan Z, Margot C; Firmenich, Corp. R&D Division, Geneva, Switzerland; [Christian.MARGOT@firmenich.com](mailto:Christian.MARGOT@firmenich.com)

The alcohol androstene-3-ol was discovered in pig testes by the Nobel Prize laureates Prelog and Ruzicka in 1943. It likely is the biological precursor of the famous ketone, androsten-3-one. The latter has received far more attention in the scientific literature than its alcohol precursor. Because the alcohol is volatile and released by bacteria from both human sweat and urine, it is important to study its perception. Androstenol was described as musky by its discoverers, yet we found through cross-adaptation experiments that it shares perceptual characteristics with typical sandalwood odorants. Approximately 5-10% of the population is hyposmic to androstenol, however there is no sensitivity correlation with the derived ketone androstenone. Subliminal incorporation of androstenol to a blend of typical sweat components does not lead to discrimination from non-tainted mixtures. The verbal assessment of the affective components of androstenol is very similar to that of other sandalwood odorants. Despite its intriguing structure and origin, androstenol does not appear to affect human chemical communication at the conscious level.

### **Structural olfactory connectivity networks: durable insights to central olfactory processing?**

Fjaeldstad A, Gleesborg C, Fernandes H, Stiller F, Hummel T; Dept. of Otorhinolaryngology, Hospital Unit West ; Aarhus University, Denmark; [Alexander.fjaeldstad@psych.ox.ac.uk](mailto:Alexander.fjaeldstad@psych.ox.ac.uk)

The etiologies of olfactory deficits are commonly sinonasal, however, it can be a prodromal symptom of neurodegenerative, neurologic, or psychiatric disorders. In some cases, the distinction can be a conundrum, where only time can aid the diagnostic progress, as diagnostic tools are warranted. Several neuroimaging studies have shown structural changes in olfactory areas with voxel-based morphometry (VBM); however, measures are crude and do not aid in inferring causality.

By measuring a fingerprint of structural olfactory connectivity in diffusion imaging, the binary measure of VBM can be replaced with measures of connectivity to key secondary olfactory regions - regions that differ in involvement in the various central causes of olfactory deficits.

This enables us to investigate the breakdown of the structural connectivity profile in the olfactory cortical networks and how this differs across individuals with different olfactory function. By investigating olfactory brain networks in people with normosmia, “hyperosmia”, congenital anosmia, and people with idiopathic olfactory loss, we aim to map the spectrum of central structural olfactory changes. In this talk, the focus will be on the difference in structural olfactory connectivity between normosmia and “hyperosmia”.

### **Chemosensory sensitivity is not static: Effects of coffee on gustatory and olfactory sensitivity**

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Chemosensory sensitivity has great variation between individuals in both health and disease. This inter subject variability complicates the creation of a universally hedonic meal, and it complicates diagnosing disorders of the gustatory and olfactory systems. In order to ensure more accurate testing, this has resulted in strict guidelines for testing chemosensory function; a common rule is the avoidance of food and beverages one hour before chemosensory testing. However, this rule of thumb does not have a solid scientific foundation, as the effects of foods on subsequent chemosensory sensitivity have not been thoroughly tested. The aim of the current study was to test if recent coffee consumption would affect subsequent gustatory and olfactory sensitivity.

By applying a battery of olfactory and gustatory tests before and after coffee stimuli, we investigated subsequent changes in chemosensory sensitivity. This revealed a significantly altered sensitivity for several different tastant stimuli, but not for olfactory stimuli a few minutes after drinking coffee. We have shown that consumption can alter the subsequent perception of taste, which may be interesting from a gastronomy perspective. However, olfactory sensitivity tested by olfactory threshold detection was unaffected by the recent consumption of coffee. This questions the importance of avoiding food and beverages one hour before olfactory testing.

### **Can you smell the winner? The effect of competition on human body odour**

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[jita.fialova@seznam.cz](mailto:jita.fialova@seznam.cz)

The results of previous studies indicate that human body odour can provide relevant information about various affective states like stress, anxiety or happiness of other individuals. Moreover, it was shown that the odour of dominant males is perceived by women as more attractive and body odour collected during competition elicits higher skin conductance response compared to non-competitive context. Here, we investigated whether winning and losing a match, a marker of possible change in dominance hierarchy, will influence hedonic valence of body odour. We employed mixed martial arts (MMA) as a model of real-life physical encounters.

We collected body odour samples from 39 MMA fighters before and after their fight during four rounds of Czech Amateur MMA league. Body odour was collected for 30 minutes on cotton T-shirts. Obtained stimuli were subsequently rated on a 7-point scale regarding their pleasantness, attractiveness, and intensity by 140 raters (31 males). The ratings did not differ between the sexes and therefore, they were analysed together.

We found significant differences in body odour samples collected before and after the fight in individuals who lost their fight. Their body odour was rated as less attractive after the fight. In contrast, there was no change in odour attractiveness in the winners. Further, no similar pattern was observed in pleasantness and intensity.

Our results show significant effect of competition outcome on perceived quality of human body odour with decreased attractiveness in losers. These results might be due to the differences in affective states which were previously shown to affect the quality of body odour.

### **New ways to analyze electrophysiological studies in the chemical senses**

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There are some limitations on the analysis of chemosensory related brain activities.

Especially for the electrophysiological studies, many challenges are decreasing the strength of the signal. In this context we are trying to establish new methods for the both clinical and research use such as entropy and frequency analysis. With these new techniques it could be possible to observe the brain responses in very hard conditions and classify the patients by means of their brain responses with an automated tool. Also, the degree of dysfunction will be the one of the future targets of the new analysis methods.

### **Food preferences among Danish adolescents**

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**Objectives:** In wealthy countries with people having the choice of which food items to ingest, food preferences are important. Such preferences may have serious health related consequences, especially during childhood and adolescence. Our overall goal is to thoroughly investigate food preferences among Danish adolescents, and in this respect a valid questionnaire is warranted. Therefore, the aim of the present study was to validate a questionnaire about food preferences in a group of Danish adolescents.

**Methods:** A questionnaire used in large-scale twin studies in UK was translated and modified for Danish adolescents. The original questionnaire contained questions about liking using a Likert scale from 1 to 5. Six various food categories were included with a total of 64 food items. A few items not known to the Danish population were substituted by more familiar items. Furthermore, we registered the familiarity with the items as well as the frequency by which the items were ingested, also by means of a 1-5 scale. A test-retest procedure with two weeks interval was conducted.

**Results:** Preliminary results were obtained from 24 adolescents (13-16 years of age) at a municipal school in Aarhus, Denmark. Snacks as a group exhibited the highest liking of all the groups, but was not the most frequently consumed group of food items, which were starches and dairy. Students tended to provide the same answers for liking, familiarity and frequency on both questionnaires and the test-retest revealed a Cohen's kappa value of 0.5953.

**Conclusion:** According to these preliminary results, the modified and extended food preference questionnaire appears as a reliable tool for assessing food preferences of adolescents.

### **Neural processing when reading odor-associated words: an fMRI study in patients with olfactory loss**

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Perception of olfactory information is mediated by both bottom-up (from molecules to percepts) and top-down (e.g. cross-modal associative learning) processes. Acquired olfactory loss is a frequent disorder which is typically due to changes in the bottom-up pathway. However, it is unclear how the top-down modulation of olfactory processing is affected by olfactory impairment. Our study aimed to compare the top-down olfactory processing in patients with acquired olfactory loss and participants with normal olfaction. Using a functional MRI - passive reading words with olfactory associations (OW) (e.g. "Rose") and control words (NW) (e.g. "video") were presented to 14 patients and 16 controls. The "reading odor" condition (contrast between OW and NW) was associated with stronger neural activations in the amygdala, hippocampus, insula, and orbito-frontal cortex (OFC) in patients compared to controls. Duration of olfactory loss among patients was negatively associated with activations in hippocampus, lateral OFC, and the superior temporal gyrus in the "reading odor" condition. Furthermore, odor identification performance was positively correlated with activation in the hippocampus among patients. Taken together, these findings suggest an enhanced olfactory top-down modulation in patients with olfactory loss.

The function of this enhanced cognitive processing in patients is discussed in terms of compensatory mechanisms.

### **Olfactory Imprinting-like effect in humans – project proposal**

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Previous research has shown that humans tend to prefer and choose partners similar to their opposite-sex parent in various characteristics (imprinting-like effect). This effect is presumably positively modulated by the quality of relationship with opposite-sex parent during childhood. The olfactory imprinting-like effect has not been examined so far. Therefore, the aim of our study is to test resemblances between partner's and opposite-sex parent's body odour, its chemical composition and axillary microbiome. Further, we will test whether the level of similarity is modulated by the quality of the relationship with the opposite-sex parent during childhood. Moreover, we are interested in the impact of imprinting-like effect on relationship and sexual satisfaction, and stability of the relationship. The sample will consist of 65 heterosexual women (age 18 – 35 years) and 65 heterosexual men (age 18 – 40 years), who lived with their opposite-sex parent at least until the age of 12 years. The participants will complete a set of questionnaires assessing relationship with the opposite-sex parent during childhood (S-EMBU), the quality of relationship with partner (RAS) and sexual satisfaction (NSSS). Participants' partners (female age 18 – 35 years/male age 18 – 40 years) and opposite-sex parents (maximum age 65 years) will provide their body odour samples for hedonic ratings and chemical analysis and axillary microbiome samples. The perceived body odour similarity between opposite-sex parent and partner will be evaluated by 520 independent raters (heterosexual women and men, age 18 – 35 years). The qualitative and quantitative patterns of body odour similarity will be tested using Gas chromatography/Mass spectrometry (GC/MS). The similarity of the axillary microbiome will be tested by Polymerase Chain Reaction (PCR). We expect that participants will choose partners resembling their opposite-sex parent in perceived body odour quality/chemical profile/microbiome and that the level of similarity will be positively modulated by the quality of relationship between them. Furthermore, we expect that the similarity of partner and opposite-sex parent odours/chemical profile/microbiome will positively affect the relationship and sexual satisfaction, and stability of the relationship.

### **CORRELATION AMONG OLFACTORY DYSFUNCTION, APATHY AND FATIGUE IN PATIENTS WITH PARKINSON'S DISEASE**

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**Objectives:** Although Parkinson's disease (PD) is usually described as a movement disorder, it exhibits strong associations with non motor symptoms (NMS), including smell and taste dysfunction, neuropsychiatric symptoms, sleep problems and autonomic dysregulation. The olfactory deficit is considered the most common NMS in PD preceding motor symptoms. Aim of this study was first to investigate olfactory function, cognitive impairment, apathy and fatigue in subjects with Parkinson's in relation to healthy controls, and subsequently to analyse the correlation among these NMS in subjects with PD.

**Methods:** One hundred and forty seven subjects (51 controls, mean age  $65.1 \pm 11.8$  years and 96 PD subjects with a mean age of  $67.8 \pm 8.2$  years) were enrolled. Olfactory function was evaluated through the Sniffin' Sticks Extended Test comprised of three different subtests (odor detection threshold, discrimination and identification) and their sum (TDI score). The Montreal Cognitive Assessment (MoCA) test was used to evaluate cognitive impairment. Apathy was examined by self-report version of Starkstein Apathy Scale (SAS) and fatigue was evaluated with the Parkinson's Disease Fatigue Scale (PFS-16).

**Results:** PD patients showed severe impairment in odor detection threshold, discrimination and identification compared to healthy controls. Moreover, in PD patients apathy score was significantly increased in respect to controls. A negative correlation was observed among all parameters of olfactory function and apathy score.

**Discussion:** Our results identified a greater level of apathy in PD patients affected by severe olfactory loss. These findings suggest that possible common pathways might be involved in these two different NMS. Moreover, the present study confirms that alteration of olfactory parameters, such as odor threshold, identification, discrimination and TDI score, should be related to other NMS, influencing negatively the global quality of life in PD patients.

### **Olfactory change detection**

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The human olfactory system is characterized by poor temporal and spatial resolution. When determining changes of the environment, humans rather rely on visual than on olfactory information. Against this background, we developed a "one-back-change detection test" in order to investigate the human capacity to detect changes in the olfactory environment and to determine potential modulators.

In this test, participants consecutively received four odors (2 odor qualities in 2 concentrations each) which were presented via a computer-controlled olfactometer. The participants' task was to react as soon as they perceived a change of the odor. For control purpose, the same paradigm was also presented with visual instead of olfactory stimuli. A total of 83 healthy participants (aged 18 to 34 years, 50 women) were included; all of them were screened for attention, olfactory function, chemical sensitivity, subjective importance of the sense of smell, and the ability to lateralize odors.

While visual changes were detected above chance by all participants, olfactory changes, however, were reliably detected by only 18% of the subjects; these were characterized by high olfactory sensitivity, high subjective importance of olfaction and low chemical sensitivity. Across all participants, changes of olfactory quality were detected more frequently (68.5%) than changes of olfactory concentration (57%).

These results suggest that olfaction is tuned in to changes of quality rather than intensity.

### **A new sensitive gustatory test method**

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The sense of taste holds a key integrate role in assessing the flavour of food before swallowing is initiated. If the expectations for taste are not met, palatability and pleasure of the food can decrease. In patients suffering from taste disorders, this may impair appetite and nutritional state. Testing gustatory function can be important for diagnostics and assessment of treatment effects. However, the gustatory tests applied are required to be both sensitive and reliable.

In this study, we investigate the re-test validity of popular Taste Strips gustatory test for gustatory screening. Furthermore, we introduce a new sensitive Taste-Drop-Test, which was found to be superior for detecting a more accurate measure of tastant sensitivity, when more thorough evaluation is needed.

### **Pre-aging of the olfactory bulb in major depression with high comorbidity**

Rottstaedt, F.1; Weidner, K.1; Hummel, T.2; Croy, I.1

1. Dept. of Psychosomatic Medicine and Psychotherapy; 2. Smell & Taste Clinic, Dept. of ORL; TU Dresden, Dresden, Germany; [Fabian.Rottstaedt@uniklinikum-dresden.de](mailto:Fabian.Rottstaedt@uniklinikum-dresden.de)

Recent studies suggest that accelerated aging of the brain is a neuroanatomical signature of the state of mental diseases. In major depression, this pre-aging effect is negatively associated with the duration since the first onset of the disease. The Olfactory Bulb (OB) shrinks with age in healthy subjects and patients with mental diseases show reduced OB volumes, especially those with major depression. It is unclear whether this OB volume reduction in mental diseases resembles a pre-aging process and whether it is associated to the duration since the onset of the mental disease.

To this aim, we investigated OB volume in patients with major depression and mixed comorbid mental diseases (number of mental disorder ranged from 1 to 6, median: 3; n=73; aged 19 to 62 years, mean 40.4 years, 57 women) and healthy controls (n=51; aged 20 to 69 years, mean 39.2 years, 26 women) matched for age and sex. Patient's first onset of disease ranged from 15 to 53 years (mean 24.2 years). All participants underwent structural MR imaging with a spin-echo T2-weighted sequence covering the anterior and middle segments of the skull base. All results were corrected for total intracranial volume and sex.

Individual OB volume was calculated by planimetric manual contouring and the pronounced diameter change in transition from bulb to tract was used as the distal demarcation of the OB. Inter-rater correlation between two independent persons analyzing the data was high (IRC=.81,  $p < .005$ ).

An age-dependent decline of the OB volume was confirmed in healthy controls ( $r = -.34$ ,  $p < .05$ ). However this pattern was altered in patients where the OB volume was not related to age, but to the duration since the onset of the mental disease ( $r = -.25$ ,  $p < .05$ ). This association remained stable when controlling for age. Patients exhibited a smaller OB volume than controls ( $F[2, 130] = 4.2$ ;  $p < .05$ ) and the OB volume of patients seemed pre-aged as it was comparable to the volume of controls aged 15 years older.

We hypothesize that the manifestation of a mental disease results in cumulative pre-aging in the OB.

**Demystifying human pheromone communication: setting the scientific roadmap for 2030**

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In 2005, at Science magazine's 125th anniversary, the quest for human pheromones was listed as one of Science's Top 125 questions facing scientific inquiry over the next quarter century. While in 2005, the existence of pheromones of humans was still referred to as controversial, over the past 10 years, substantial progress has been made demonstrating that the chemosignaling human state and trait characteristics from one person to another is not a myth, but a reality. However, there are still substantial challenges to conquer. In this presentation, I intend to go over own data on chemosignaling of emotion, showing that that fear signaling is a robust phenomenon; that chemosignaling extends beyond fear to disgust, and even positive affect (happiness); and that there may in fact be a fingerprint of fear contained in the odor signal. Next, I will lay out a framework for next steps to elucidate the science and processes underlying signaling and receiving with the intent of sparking a discussion on how to best progress the science so it does not emerge again in the Science Top 150 questions by Science magazine's next anniversary.

**Pilot study – food neophobia amongst healthy Danish adolescents**

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Objective: The knowledge on food neophobia is sparse. Several challenges have been associated with food neophobia, as restricted food choices and ultimately deficits in nutrients. The literature does not fully cover the health-related issues in regard to neophobia and the social consequences of neophobia remain unclear.

Aim: Prior to a large-scale study, we aimed at a pilot study of the relationship between food neophobia level and quality of life in a sample of 23 healthy adolescents. The purpose was further to produce a hypothesis-generating pilot-study on food neophobia.

Methods: A Food Neophobia (FN)-Questionnaire consisting of 7-items with questions about novelty, frequency of eating and perceived behaviour towards tasting the item, a quality-of-life questionnaire and a behavioural test were administered to 23 children aged 13-16 years. Results: 63% of the girls versus 33% of the boys reported to be neophobic, whereas 53% of the boys

tated to be very satisfied with life compared to 13% of the girls. All the self-reported neophobic participants answered that the neophobic behaviour had social consequences. The participants showed greater willingness to taste the foods in the behavioural test than the intention in the FN-questionnaire. This is most likely attributable to a peer-effect amongst the participants. The level of familiarity was at 69%, 52% and 87% for three of the seven different food items respectively.

Conclusion: The items chosen for the behavioural test were not novel to the participants. The participants showed a great willingness to taste the foods in the behavioural test than expected from questionnaire. The level of food neophobia was greater amongst girls, who

also reported their QoL poorer than the boys. The results of this pilot study will be used for designing a large-scale study comparing normal adolescents and adolescents suffering from ADHD.

### **Investigations on the smell of wood**

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Wood is a material humans come into contact with every day, e.g., in the form of furniture and building materials, products of daily use, or secondary products that are derived from wood such as paper and cardboard. Despite of being such an important material, only limited information is available on the odour-active substances. The present study therefore aimed at specifically elucidating the smell of wood. To gain an overview of the odour-active constituents in wood, different wood species were investigated combining modern odorant analytical tools with human-sensory evaluation. Following this concept, the odour profiles of the wood samples were first evaluated by human sensory analysis. The odorants were then characterized by gas chromatography-olfactometry (GC-O) and ranked according to their odour potency via aroma extract dilution analysis (AEDA). Using this approach, more than 60 odorous substances were detected and the most potent odorants were identified by gas chromatography-mass spectrometry/olfactometry (GC-MS) and two-dimensional gas chromatography-mass spectrometry/olfactometry (2D-GC-MS/O). The identified odorants belong to a variety of substance classes that exhibit a great diversity in odour character. Some of the substances are known constituents in wood whereas others were identified for the first time in wood or even for the first time as being odour-active. With these results at hand, in a next step the physiological impact of wood odor on humans can be elucidated

### **Relationship between reactivity of immune system and human body odour quality: project proposal**

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Several previous studies have shown that in mammals, the body odour of individuals who are sick or have an activated immune system is less preferred, causes avoiding behaviour, or leads to a lowering of pain perception, a mechanism that can help to flee in a stressful situation. In humans, we assume that analogical behavioural defence mechanism to avoid infectious diseases within population has evolved as well. The main aim of the project is to test a possible association between the effectiveness of the immune system response to foreign antigens and perceived human body odour attractiveness and healthiness rated by opposite sex individuals.

We will collect body odour samples from men who will receive hepatitis A and B (Twinrix) and meningococcal vaccine (Menveo) twice, before and two weeks after the vaccination. The participant's blood samples will be obtained three times to determine levels of IgG and IgM antibodies (markers of reactivity of immune system), testosterone, cortisol and CRP. Subsequently, a panel of female raters will assess body odour samples for their intensity, attractiveness, and healthiness. Next, relationship between hedonic evaluation of body odour and immune response will be analysed.

We assume that individuals with a more reactive immune system will receive higher attractiveness and healthiness ratings. These individuals are expected to be more desirable partners, because they should be more resistant to pathogens.

### **Results of smell evaluation using respiratory olfactometer**

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**Introduction:** Respiratory olfactometry is one of the promising methods in olfactory evaluation. We developed new instrument of olfactory evaluation. It is based on breathing reaction to odorant.

**Methods:** We tested new instrument (respiratory olfactometer). The olfactometer includes flowmeter and 5 boxes for different odorants (perfume, cat odour, valeraldehyde, butyric acid, and empty box without odorant). Odorants were inflated into the patients' noses through the cannula and the breathing pattern of the patient was measured during 32 seconds. We tested 10 subjects (women and 5 men of average age 51.6 years). We measured reactions to the odorants, breathing frequency and amplitude.

**Results:** There was no statistically significant difference in frequency and amplitude ( $p > 0.05$ ) for each odorant. There was tendency for decreased amplitude when malodorant was present (0.75 without odorant and 0.54 butyric acid). We found huge interindividual differences. Some of the subjects reacted strongly to unpleasant odorants, some of them reacted to pleasant odours.

**Conclusion:** Respiratory olfactometry gives interesting information on sense of smell, but there is huge interindividual difference in reaction.