The talk “The Functional Neuroanatomy of Face Perception”, presented by Kalanit Grill-Spector, mainly focuses on the computational neural basis in cortical system for face perception. She first gives a brief introduction of the face-selective regions in the human ventral stream using fMRI in previous studies, including IOG-faces (inferior occipital gyrus), mFUs-faces (middle fusiform gyrus) and pFUs-faces (posterior fusiform gyrus). Also, she shows a video of how stimuli certain cortical areas on subject’s cortical area would change his perception of face, which confirms the role of facial perception for those areas. However, according to Gill-Spector, her recent research shows that the face viewing is not position invariant – people tend to fix on the center of the face. This is contradictory to the classical theory, and can be modeled by population receptive fields (pRF), since the model gives prediction that corresponds to the actual data. The advantage of this model is that it is a generative model, and therefore it is able to generate same signal for face in any size and any space. Their experiment uses fMRI to compare pRFs in earlier and later facial recognition process, and found that those fields show the similarity in a way that they are contralateral and fovea-biased. Also the size of the field increases from earlier to later, and therefore reveal a hierarchy of face selective regions. Secondly, attention modulation of the pRFs in face-selective regions also enhances representations at the attended location. The hypothesis targets on three possible underlying reason related to pRFs: it might be due to shifting pRF to attention location with eccentricity that have small change in early areas and more towards face later, or affects later areas by changing pRF size, or increase response amplitude that selectively affect later areas. They used three different tasks, including digits task, dot-task, and face-task to test the attention. Results show that attention affects all three ways. Also, attention enhances representation in the periphery areas, where the visual acuity is very low. Then, the professor talks about how face-selective regions are arranged in consistent with the spatial layout relative to other regions such as human body. MFS (mid fusiform sulcus) predicts location of face-selective activations, and faces tend to align to this sulcus. Finally, she talks about the finding that long-range white matter connections constrains the location of functional region, as well as coupling between cytoarchitectonic and functional regions in ventral temporal cortex. The computational utility of lateral - medial segregations is to fast parallel processing of independent information between person and place, and for posterior-anterior segregation is the hierarchical processing of linear separable representations at higher stages of the hierarchy. To conclude, the research addresses computational and anatomical properties of neural populations in the ventral stream, which is important in understanding face perception.

The colloquium presented by Lisa Feldman Barrett has the theme of “How emotions are made”. Classical view of emotion is that it stimulate specific brain region, results to specific actions, expression, and serves as an autonomic fingerprint. However, essentialism cannot be supports by physiological evidences, even though it was wildly accepted previously. In contradictory, emotion is a population of brain states that associated to unique instances. With
In this regard, Barrett introduces the theory of constructed emotion, that emotions category with variable instances, and is built from core networks. Firstly, she demonstrates the concept of construction by presenting a simulation (i.e. playing music in head, imagination). Several brain regions are associated with simulation, and it implies that emotion in brain is not reactive, but predictive. Then she explains Barbas’s structural model of corticocortical connections within agranular and granular tissues that enables prediction. They mapped out limbic reference map, and overlaid it with intrinsic networks from resting state. The first map involves 45 percent of limbic. The brain network associates with emotions, memory, prospection and other cognitive function, and is called default mode network. The second network involves atypical emotions, affect, atrophy in mental illness and so on, and is called salience network. According to her, default mode network initiates simulations as concepts respect to past, present and future, it also relates to many other systems such as immune system. Salience network also associates with attention. Physiology evidences show that ascending interceptive signals are modulated by descending visceromotor predictions. For conclusion, emotions are constructions of the world. To study the emotion, we should treat it as a population of brain states.

April Benasich’s talk has the topic of “Brain waves, oscillations, and precise timing: Determinants of pre-linguistic auditory mapping”. She first introduces the early acoustic processing and language acquisition in babies, as well as the disorders that associated with early development. Previous studies show that the ability of fine-discrimination of sounds can be useful to predict the later language impairment. Using EEG and ERP, experiments show non-speech stimuli at 6 months were significantly associated concurrently and predictively with language comprehension and expression at 16 to 48 months. Also children with family history also show atypical lateralization. The main focus is on the oscillation mechanisms involved in processing of brief, rapidly changing auditory stimuli in early development for language acquisition. Physiological and neuroimaging studies show that perception and behavioral responses are characterized by time-varying dynamics of functional distributed networks within the brain, and synchronized neural oscillations in the both low and high brain waves are the key of construction of cortical acoustic maps. The hypothesis is that the synchronized brain oscillations in left and right cortices supports rapid frequency discrimination in infants. Delta theta oscillations reflect rate and tone discrimination, and gamma oscillation relates to native phoneme preference. The she talks about the plasticity in early development, and how active auditory exposure impacts paralinguistic acoustic mapping. The critical period is within the first year. Studies with younger than 1-year old babies are trained with active auditory exposure or passively in 7-months, and results show that active group respond significantly faster than passively trained babies, and passive training group is better than the naïve group. For oscillation mechanism, infants with auditory experience respond to syllables by activating early high gamma while naïve group activates low gamma. Therefore, acoustic experience group is improved in using acoustic mapping
while naïve uses discrimination. Finally, she introduces the real-world application based on the studies. The prototype is called RAPT AABy. It can track babies’ eye movement, has attention fixation screen and reward screen to encourage baby to watch the video when the sound changes. The device can give baby for acoustic experiences without screening babies, and will be improved in the future.