**Shahar Mendelson** (The Australian National University, Australia)

Title: Geometric parameters in Learning Theory

Abstract: The main question investigated in Learning Theory concerns the ability to find a "good" approximation of a target function $T$ from a given class of functions $F$ using empirical data. The learner is given a random sample $(X_i, T(X_i))_{i=1}^n$ where $(X_i)$ is sampled according to an unknown probability measure $\mu$. The question is "how large" must the sample be if one wishes to produce a function $f$ which is, with sufficiently high probability, a good approximation of $T$ with respect to the $L_2(\mu)$ norm. It turns out that the geometry of F plays the key role in the analysis of this question. In fact, geometric parameters such as the empirical covering numbers, the shattering dimension and gaussian averages $\ell_n = \mathbb{E}_\mu n^{-1/2} \mathbb{E} \sup_{f \in F} |\sum_{i=1}^n g_i f(X_i)|$, control the "complexity" of the learning problem. We will present several problems which appear naturally in the context of Learning Theory and also seem to be of an independent interest as pure questions in the Local Theory of Banach spaces.