**September 16, 2019:** David Vogan (MIT), *Involutive automorphisms.*

In the first talk I said that the seminar would be about unitary representations of a real reductive algebraic group $G(\mathbb{R})$, and explained Harish-Chandra's results relating those to Hermitian $(\mathfrak{g}(\mathbb{R}), K(\mathbb{R}))$-modules (Harish-Chandra modules).

In this talk I'll explain Elie Cartan's proof that (isomorphism classes of) real reductive algebraic groups $G(\mathbb{R})$ are in one-to-one correspondence with (isomorphism classes of) involutive automorphisms $\theta$ of a complex reductive algebraic $G$. I'll always write $K = G^\theta$ for the (complex reductive algebraic) group of fixed points. For example, the real group $GL(n, \mathbb{R})$ corresponds to the involutive automorphism $g \mapsto {}^t g^{-1}$ of $GL(n, C)$, with fixed point group $K(\mathbb{C}) = O(n, \mathbb{C})$.

I'll explain how to reformulate the definition of Harish-Chandra modules in terms of $(G, \theta, K)$, so that it lives entirely in this complex algebraic world. Then I'll look at the software (I hope putting it on zoom correctly this time!) to see how $G$ and $\theta$ and $K$ are being described and computed internally.