1003-94-1721 **Robert McEliece*** (`rjm@systems.caltech.edu;`), California Institute of Technology, Electrical Engineering Department, 136-93, Pasadena CA 91125-0001. *Achieving the Shannon Limit: A Progress Report.*

In 1948 Claude Shannon introduced the probabilistic tools of entropy and mutual information, and combining these tools with his celebrated random coding technique, proved that virtually every communications channel, however noisy, has a well-defined capacity, i.e., a maximum rate, in bits per second, at which reliable information can be transmitted over the channel. Shannon did not, however, describe a computationally feasible method for achieving this maximum rate. In this talk I will survey the remarkable post-1948 achievements of mathematicians and engineers who have cumulatively made Shannon's theorems practical. I will focus on the post-1993 (the year in which "turbocodes" were invented) circle of ideas, which boils down to approximate belief propagation on loopy graphical models - and I will introduce and explain these notions. We shall see that today, reliable and cheap communication at more than 90% of the Shannon limit is routinely possible. (Received October 18, 2004)