After reading Shannon's 1948 paper 'A Mathematical Theory of Communication I learned a great deal about communication and the math that goes along with it. One topic I learned was the different types of information sources that exist to produce a message to be communicated. For example, there exist messages that contain two or more functions of time which are apparent in "three-dimensional" sound transmission. Another information source that is notable is messages that contain several functions of several variables such as in color television in which the message contains three functions defined in a three-dimensional continuum. With all of these messages needing to be sent over a channel, the capacity of a channel becomes useful in knowing how much a particular channel can transmit. Using the equation

$$C = \lim_{T \to \infty} \frac{\log N(T)}{T}$$

, one can get the capacity of a specific channel. Another fact I learned about messages is that some message sequences possess restrictions on what can be sent in what order. More specifically, only a certain set of symbols can be transmitted and once this symbol is sent, the state changes to a new state depending on the old state and the particular symbol that has been transmitted. An example of this is the telegraph case where there are two states that depend on whether a space was the last symbol transmitted. If the space condition is satisfied, only a dot can be sent next and the state always changes. Otherwise, any symbol can be transmitted and the current state will only change if a space is sent, else it stays the same. One last thing I learned that I found particularly interesting was that messages are encoded based on the likelihood of a certain symbol in a given sequence. For example in English, the letter E occurs much more likely than the letter Q. By knowing these trends, we can use a Markov Chain to represent the probability of each letter in a message sequence. Using this information, we are able to decide the proper way to encode the message for transmission.