1046-M1-1671 **John E. Gray*** (john.e.gray@navy.mil), Code Q-23, Electromagnetic & Sensor Systems Dept, 18444 FRONTAGE ROAD SUITE 328, Dahlgren, VA 22448-5161. *The Doppler Effect in Radar as a Source of Mathematics.*

The Doppler Effect in physics has a rich history in physics dating back over a 150 years. The final resolution of the underlying explanation for the Doppler Effect lies in Special Relativity for objects moving at constant velocity. For objects moving at a non-uniform rate, the physically correct explanation requires general relativity. The perfect model for understanding the Doppler effect in radar is model of a moving mirror which can be used to understand the effect of motion on radar waveform. The functional form of radar return signal due non-uniform motion allows one to analyze the effect of target motion on the received signal. There has been a great deal of mathematics developed under the domain area of the "signal analysis" in electrical engineering that has lead to advances both in pure and applied mathematics. Wavelet theory and time-frequency methods are examples. In our talk, we briefly illustrate all of this. By demonstrating what the effect of non-uniform motion is on radar waveforms, we illustrate a resulting functional equation. This functional equation suggests several new approaches to thinking about how to represent information in physical signals which we discuss. We illustrate how this is connected to physical wavelets. (Received September 16, 2008)