The 1969 Summer Seminar on

THE MATHEMATICAL THEORY OF SCATTERING

An Advanced Science Seminar on the subject "The Mathematical Theory of Scattering" was held at Northern Arizona University in Flagstaff, Arizona during the four week period from July 20 to August 16, 1969. The seminar was sponsored by the National Science Foundation and was arranged by the Rocky Mountain Mathematics Consortium. The Seminar Director was Professor Calvin H. Wilcox of the University of Arizona (now at the University of Denver).

The study of the scattering of beams of elementary particles (electrons, protons, photons, α-particles, etc.) by metallic foils and crystals has played and continues to play a fundamental role in the development of atomic and nuclear physics. With the invention of quantum mechanics in the 1920's it became possible to make quantitative predictions concerning the scattering of particles. The mathematical methods which have been developed for this purpose constitute the quantum theory of scattering.

Similarly, the study of the scattering of waves (acoustic, seismic, electromagnetic, etc.) by obstacles has played a fundamental role in the development of classical physics. The theory of such waves, which has been studied intensively from the eighteenth century to the present, may be called the classical theory of scattering.

Scattering theory is also of basic importance in a number of areas of applied physics. Thus, in theoretical chemistry it provides a theoretical framework for the study of chemical reactions and prediction of reaction rates. In electron optics it provides theoretical basis for the design of electron microscopes and the prediction of their performance. In electromagnetic theory it has numerous applications, such as the prediction of radar echos, prediction of transmission and reflection coefficients for wave guides, etc. The list of actual and potential applications could easily be lengthened.

When the classical and quantum mechanical scattering problems are formulated mathematically an underlying unity of structure is revealed. In both cases the states of the system (particle or wave) may be described by the vectors in a Hilbert space $\mathcal{H}$. The evolution of the system with time is described by a group of unitary operators $U(t) = \exp(itH$ where H is a selfadjoint operator on $\mathcal{H}$. If the scatterer (nucleus or obstacle) is absent the evolution of the system is described by a second (simpler) group of unitary operators $U_0(t) = \exp(itH_0)$. A