Abstract Submitted
for the NES16 Meeting of
The American Physical Society

Theory of mud sediments at the bottom of the ocean[1] ALLAN PIERCE[2], Retired, WILLIAM SIEGMANN, ELISABETH BROWN, Mathematical Sciences, Rensselaer Polytechnic Institute, Troy, NY — In a large fraction of the world's oceans, the bottom is covered by a layer of mud, which can be regarded as a fluid with unusual properties. In many cases, the density is actually less than that of water, and the density varies with depth below the interface. Theory currently under development is the card house model, where the tiny clay particles (shaped like platelets) in the mud carry a net electronic charge and repel each other when oriented face to face. Experiments suggest that, insofar as the propagation of sound within the mud is concerned, mud behaves as an anisotropic fluid, with the speed of sound in the horizontal direction being greater than that in the vertical direction. Paper attempts to explain this using statistical mechanics and also explains the anomalous density gradients at the water-mud interface. With gravity taken into account, the equilibrium separation distance between two parallel vertically aligned platelets is one to two orders of magnitude greater than a typical length scale of the face of a platelet. When platelets touch, edge to face, there is an attractive force between platelets, and the net effect is that the platelets tend to be separated at a much shorter distance than the stand-off distance deep within the sediment.

[1]Work supported by the Office of Naval Research
[2]Professor Emeritus, Boston University

Allan Pierce
Retired

Date submitted: 11 Mar 2016 Electronic form version 1.4