Applied Mathematics

McGill Applied Mathematics Seminar Series

January 27, 2003

Prof. M.E. Glicksman, Renssalear Polytechnic Institute

Material Science and Engineering Department

Title: "Dendritic Growth"

Monday, January 27 **Time: 2:35 pm** **Room: Burnside 1205**

Coffee and refreshments will be served after the seminar

Abstract:Dendritic growth is a fundamental crustal growth process occurring widely in nature (snow flakes, sea ice, minerals) as well as in the technology of casting and solidification processes. Dendrites are a ubiquitous mode of crystal growth in freezing alloys, because they exhibit morphologies suited to efficient heat and mass transfer at mesoscopic scales.

A brief history will be sketched, showing how the subject of dendritic solidification evolved from its early descriptive approaches in classical mineralogy and metallography, to its present status as a modern mathematically based applied science. Today, for example, dendritic growth can be simulated using advance numerical methods - such as phase -field and level-set computations. A truly comprehensive understanding and predicitive capability of dendrite behaviour of practical use to the foundry engineer, for example, remains elusive, as does a comprehensive theory of dendrite pattern formation.

A view of dendritic growth will be presented that includes heat and mass transfer, capillarity phenomena at the solid-melt interface, interfacial dynamics including morphological stability, side-branching dynamics, and phase coarsening. Experimental verification of analytical scaling laws using microgravity experimentation will also be presented to provide a contemporary view of this subject.

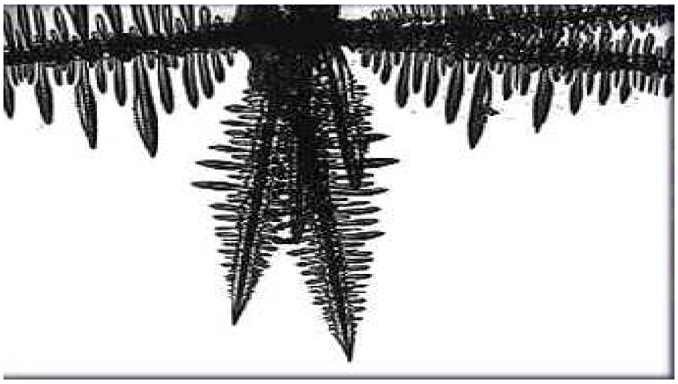

Figure 1: Dendrite grown in space `http://www.rpi.edu/locker/56/000756/`