Abstract Submitted
for the MAR07 Meeting of
The American Physical Society

Antifreeze Protein (AFP) and Antifreeze Glycoprotein (AFGP) Kinetics at the Ice/Solution Interface SALVADOR ZEPEDA, HIROYUKI NAKAYA, YUKIHIRO UDA, Hokkaido University, ETSURO YOKOYAMA, Gakushuin University, YOSHINORI FURUKAWA, Hokkaido University — AFPs and AFGPs found in some fish, plants and insects are a necessary tool for surviving sub-freezing environments. They occur in a wide range of compositions and structure, but to some extent they all accomplish the same functions: they suppress the freezing temperature, inhibit recrystallization, and modify ice crystal growth. Here, we observe the exact location of AFGPs, Type I and Type III AFPs by 1-directional growth experiments using fluorescence and phase contrast microscopy as well as free growth experiments using 3-d confocal microscopy. In all cases, the proteins clearly adsorb at the interface. By comparing the fluorescent image with the corresponding phase contrast image we find that AFGPs incorporate only into the solid in veins and not into the ice lattice structure. Type I AFPs show similar behavior as AFGPs, but type III AFPs adsorb to specific planes within the ice lattice. We have also calculated the diffusion constants and the surface adsorption concentration from both types of experiments. Our results indicated that the different types of AFPs or AFGPs accomplish essentially the same function in slightly different ways and that it is not necessary for the protein adsorption to the ice interface to be as rigid as once thought.

Salvador Zepeda
Hokkaido University

Date submitted: 20 Nov 2006 Electronic form version 1.4