Arctic micro-organisms may hold key to dealing with oil spills in the North

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Marcel Babin, Canada Excellence Research Chair in Remote Sensing of Canada's New Arctic Frontier at the Université Laval, will be discussing his research on the effects of environmental changes in the Arctic as part of an upcoming press breakfast panel discussion. The February 17 Canada Press Breakfast on the Arctic and oceans will be part of the 178th annual meeting of the American Association for the Advancement of Science, to be held in Vancouver, and will feature a variety of prominent researchers.

Babin's research focusing on Arctic micro-organisms may soon allow researchers to have the information they need to accurately predict the environmental impacts of events from oil spills to climate change while other changes are also happening.

For example, Babin is uncovering how melting sea ice may be leading to an increase in the amount of algae in Arctic waters. By the end of this year, Babin's models will have produced initial results that can predict algae production in the Arctic over the next decade.

"Light is necessary for algae to grow. Less sea ice means more light, which means more algae if there are enough nutrients to support increased production," he says. "As the algae are at the basis of the trophic [food] chain, we expect that all these changes will modify the structure of whole communities in marine environments."

Babin and his research team are using the most recent advances in

satellite remote sensing to develop new ways to monitor environmental changes such as these in the Arctic, as well as to create advanced computer models of Arctic ecosystems, and to design powerful new tools to archive and analyze the vast stream of research data he is creating about the North. Key to the team's research is the phytoplankton that lives in the Arctic.

"Phytoplankton fuels the whole trophic chain," he says. "So the experiments we are doing in the lab and at sea are designed to determine how it—and a number of other key organisms—respond to environmental factors such as temperature, light and nutrients."

In the lab, Babin's experiments simulate the environment experienced by these organisms in Arctic waters. He grows phytoplankton in a bioreactor and then changes levels of nutrients, light and temperature, observing what happens and how their physiological properties change.

Based on these experiments, Babin develops mathematical models that are then embedded in physical, biological models of the ocean. These models can then be used to predict the fate of marine ecosystems under various climate change scenarios.

"We are currently looking at variations in the production of marine algae over the past decade and observing the impact on that production of receding ice cover and the increase in cloud cover in the Arctic," he says. "We found that receding sea ice had a positive effect on primary production, as it allows more light to penetrate the ocean. It seems there are enough nutrients to support additional production of phytoplankton."

However, Babin has also observed that the increased cloudiness that has happened at the same time is slowing the increase caused by receding ice, as it reduces the amount of incident light.

"Overall, there is now more light available for phytoplankton, and the production of algal biomass is now greater than before," he says. "Now we wonder what the impact will be on the whole trophic chain."

Changes in the community structure of phytoplankton have recently been observed in the Arctic Ocean, and blooms are occurring earlier in the spring. This is an important change, since it shifts when in the season production is highest, and when the entire food chain is set.

Babin sees another vital impact of understanding these changes—one that might have wide-reaching consequences. The knowledge will help predict what will happen if, for example, there is an environmental accident in the Arctic.

"If someone asks me what the impact of an oil spill in the Arctic will be, the only way I can give an accurate answer is by knowing and understanding how these systems work," he says. "We know only very partially at the moment. Part of this research will make us ready to answer that question."

Babin will discuss his research and answer questions from the press as part of the Canada Press Breakfast on the Arctic and oceans, being held at the 178th annual meeting of the American Association for the Advancement of Science. The breakfast will be held in Room 306 of the Vancouver Convention Centre at 8 a.m. on February 17, 2012, and will feature Canadian research experts from across natural sciences, engineering, health, social sciences and humanities.

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