

# Growth without gravity

by Steve Tonner

For researchers at Dalhousie, the prospect of being able to perform experiments under the proper conditions sometimes cannot be realized. But for several fortunate people, that goal can be achieved. NASA currently runs a program of launching smaller experiment packages, called "secondary payloads", which are carried in the main cargo bay, or inside lockers on the shuttle's mid-deck, where the crew does most of its work. In the bay, these packages are usually stored in canisters about the size of gas cans. On the mid-deck, they are to be stored until the crew is ready to work on them.

Dalhousie has a number of projects that require some work to be done in orbit. For instance, Professor Wassersug of the Anatomy Department participated in an experiment to determine the need for gravity in the development of frog embryos which went up in a shuttle launch last year. Its purpose was to determine whether the embryos, which are heavier at one end in order to right themselves towards up and down, would be able to develop properly in a microgravity environment. Another experiment, on the

agenda for 1995, is going to study why scallop larvae develop such dense shells as they do, because this seems only to make it harder to stay buoyant in the water.

Experiments such as these rely specifically on the microgravity environment of earth orbit in order for them to work. In many cases the experiments would either not have been possible on Earth, or would have had to rely on less accurate methodology.

And that's not the only problem facing researchers who want to have their experiments performed in orbit. The opportunities for getting experiments in space are rare. Space on board shuttle missions is very limited, and the waiting list is so long that experiments are scheduled sometimes for up to 8 or 10 years in advance. This is partly because of the demand, and partly because of the delays of the bureaucratic process.

There are several ways that a researcher can get his or her work onto a space mission, if they are prepared to wait. NASA publishes an announcement of opportunities, listing possible missions for researchers to apply to have their experiments included on. For instance, a mission is scheduled for

neuroscience, and scientists can apply to have their experiments put on that mission, if they conform to its theme.

In addition, hardware could be built for a specific purpose, and then invitations could be issued for scientists to collaborate with NASA to have their work made part of a specific mission, as was the case with Professor Wassersug.

Of course, there are many other ways to get work in space other than through the space shuttle, or even NASA at all. The European Space Agency also has such missions, as well as several international cooperative projects, involving Canada, Japan, and Russia.

# Telescope threatens squirrels

by Jennifer Peng

TORONTO (CUP) — From a mountain top in Arizona to a Canadian campus, frustration is building over a project which pits universities against environmentalists and native communities.

The controversy began in the mid-1980s when the University of Arizona's astronomy department introduced plans to build its \$200 million Columbus astronomical observatory on Mount Graham, home of the endangered Mount Graham red squirrel.

Environmentalists have long claimed that an observatory on Mount Graham would kill off its indigenous red squirrels and also threaten other life forms. As well, native groups claim that the mountain top is sacred territory.

John Fernie, acting chair of the U of T Astronomy department, said the likelihood of the university getting in-

involved in the Columbus project is very slim because of the multimillion dollar cost of involvement.

Community groups say they want the University of Toronto to disavow the project entirely. Andrea Calver, spokesperson for the Ontario Public Interest Research Group, said she "wants U of T to absolutely say that even if money was available we won't participate."

All U of T will state is that it will consider all the opponent's concerns if it ever gets involved with the telescope project. They also said they would do a full environmental and cultural study.

One of the Columbus telescopes has already been built. Others are planned. Proponents of the project say it will actually help protect the red squirrel by securing its habitat.

But Calver argued that the project would create widespread ecological damage. "I do think it also has to do with an incredibly unique and fragile

ecosystem," she said.

Moreover, Calver is critical of the University of Arizona's decision to lobby the US Congress to exempt the project from the full impact of the Endangered Species Act.

"It has circumvented environmental assessment hearings and has been the subject of court cases and litigation," she said.

Calver also argues that the university has no business building a telescope on the mountain because it is sacred Apache land.

"I demanded that the department of astronomy not fund the telescope because the telescope interferes with the Apaches' ceremonial grounds," said Danny Beaton of Mohawk Turtle Clan.

"That telescope will bring a lot of tourists to Apache grounds and disrupt the ceremonies they have been doing for thousands of years," Beaton said. "They [the Apaches] are under extreme pressure."

## POINTLESS PONDERABLES

Last week's solution:

You must assume at least one of the other two students is of reasonable intelligence. Label the three students A, B & C (You are student A). Look at the possibility that your candle is unlit. Students B & C raised their hands so they saw each other's lit candle. B should then notice that the only candle seen lit is over C's head yet C raised their hand. From this B can deduce that their own candle is lit. A similar deduction is possible from C's point of view, but in the few minutes you waited, neither B nor C lowered their hand, thus indicating they didn't know an answer. Hence you can deduce your candle is not unlit, leaving only the option that your candle is lit.

Question:

Placed before you are three boxes, each with a label. The first label is "RED MARBLES," the second "BLUE MARBLES," and the third "RED AND BLUE MARBLES." Each box is unfortunately mislabeled. You may draw one marble from any one box of your choice. From that you must correctly label all three boxes. What box do you draw from and how do you label them?

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