YORKSCIENCE

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The Sahara desert could revive its former fame as the granary of the Roman Empire and Canada could possibly become a desert wasteland if pollution by man made particles continues to grow.

Research into atmospheric condensation processes is an important concern to York Physics Department Chairman, Dr. W.J. Megaw. Speaking at the first of noon lectures, "Physics Research at York', Dr. Megaw summarized his research interests.

One of the most trivial things in the atmosphere are aerosol particles. Ranging from ionic sizes (billionth of a meter) to hailstones (often several centimeters long) these particles are responsible for many atmospheric effects including our climate.

The most important particles or aerosols are called 'active condensation nuclei', which are about one ten-millionth of a metre in size. These small particles act as centres (nuclei) for the condensation process causing rain, fog and snow, thus controlling the weather processes in our atmosphere. Although most of the atmospheric particles are natural, there are steadily growing proportions of polluting particles. Dramatic effects may occur if man continues to inject these particles into the atmosphere since these will also condense water. The effects are at present unpredictable, but significant changes in distribution and intensity of rain will certainly occur. "Even here in Toronto where we have the best air pollution controls in the world, an increase in artificial aerosols (particle pollution) could dramatically affect the weather," Dr. Megaw stated.

Dr. Megaw's experiments help explain how humidity in the air causes water droplets to grow. This was illustrated with metal oxide dusts during the talk. After these

dusts were exposed to humid air they grew into large water droplets. An unexpected discovery by Dr. Megaw's research team occured while studying supersaturated condensation processes in a cloud chamber. Clouds form in this apparatus as a result of saturation and condensation of moist air similar tc that in our atmosphere. The experiment was going well until a slight modification involving the purification of water resulted in the failure to form clouds. After much investigation it was found that the distilled and deionized (very pure) water actually had a chemical contaminent present in small amounts, thus preventing cloud formation in the test chamber. This slight impurity found in the ultra pure water was part of an organized group of chemicals called amines. After other experiments it was found that comparatively few molecules of pentyl amine on a particle would prevent the condensation of water. The importance of this discovery is that treating particles with such substances may subsequently prevent water condensation causing inadvertant weather modification.

By treating particles with a specified amine, no water will condense and the natural balance will remain.

Dr. Megaw illustrated how science and physics often fit into seemingly unrelated experimental designs. An example has been in the case of mosquito repellants. Mosquitos find their subject, not by sight, sound or smell, but because of the concentration of carbon dioxide (a by-product of respiration), i.e. this indicates a warm blooded animal is in the vicinity. The mosquito then homes in on you by following the water vapour concentration. Since humans and animals are constantly giving off water vapour from their skin and breath, the mosquito will follow the humidity gradient until it reaches the individual. Mosquito repellents such as "Off" use an amine (diethyl toluamide) as the active ingredient. When the mosquito picks up a molecule of diethyl toluamide on its humidity sensor, it is suddenly deprived of all further water vapour information and flies off at random.

Additional research by Dr. Megaw involved the thin layer of brown haze over Toronto. When the haze was visible, Dr. Megaw's group would get into an airplane and fly through the layer taking samples. It was found that the brown haze occurred at a ponit about 800 meters above Toronto where there was a sharp rise in the humidity of the air. Changing the angle of sight caused the brown haze to disappear, which led Dr. Megaw to believe that the brown colouration was due to sun light scattering by droplets rather than nitrogen dioxide as thought by other scientists. This was supported by observation of the haze on dayswhen the pollution index was very low. A similar phenomenon causes the red sky at sunset.

Atmospheric aerosol research by Dr. Megaw and his graduate students Richard Leaitch, Bob Miller and Zbish Turlej is helping unravel the mysteries of condensation processes such as fog, rain and snow. This research indicates that unnatural condensation of water by man made aerosols may be prevented leading to a healthier and cleaner environment.