The science of winter: snow machines

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This time of year, we find ourselves working hard, beginning a new semester, and preparing for Spring Break. This year is separate from others in one major way: the lack of snowfall.

After last year's huge amounts of snow, this year pales in comparison. This has put stress on many ski and snowboarding resorts, and especially those who are used to cold temperatures and plentiful snow.

The warmer temperatures have caused much of the powder to melt, leaving just ice, a surface both skiers and snowboarders despise.

Resorts haven't given up, as they are busy making snow and grooming the slopes, refusing to allow the lack of snow to keep customers unhappy.

So how exactly does this process work?

The need for a snow maker first became apparent with the popularity of skiing in the mid-twentieth century. Skiers had to rely on Mother Nature for a perfect base, but often found themselves waiting.

The invention of the snow machine was able to supply the snow when needed and lengthen the season. It all starts with water that is mixed with a nucleator, a powder of fine particles around which snow easily forms.

The water is then pumped underground to the site of the machine itself. Here, the water is combined with highly compressed air, which is important for several reasons.

It causes the water to separate into small droplets and then helps blow the droplets into the air while also cooling them.

If temperatures are above 28 degrees, an additional cooling unit is activated, causing the mist of air and water to combine and freeze prior to being released into the air.

Since this unit consumes a lot of energy, slopes typically only use it when temperatures aren't quite right. Determining if conditions are right is work done by a team of experts who carefully monitor the temperature and humidity.

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Snow makers often enhance a resort's ability to stretch the winter sports season.

Although very important, temperature isn't the only factor that determines if the mist will become snow. Humidity must be low, so that the water droplets can let off some water vapor in order to cool to freezing.

High humidity requires lower temperatures since there is already a considerable amount of water in the air.

However, if humidity is very low, snow can actually be made even with the temperature a few degrees above freezing.

After the snow falls to the ground, it is typically allowed to gather in a pile before being spread by snow groomers who compact it while leaving the surface covered in a soft thin powder.

Snow machines are constantly advancing and are quite effective at what they do, allowing kids as far south as Atlanta to experience snow for tubing and sledding.

So next time you get off the lift and onto the slope, you'll know where all that powder came from, even though it hasn't snowed in a week.

Top Science News:

Scientists explore color structures of dinosaurs

Paleontologists believe they have found the first clue leading towards an understanding of the coloring of dinosaurs. By studying fossil feathers, scientists are able to analyze the "morphology of color-imparting melanosomes," which allows them to reconstruct color structures.

In the report published this week in Science, co-author Richard O. Prum writes of their success in mapping these feather color patterns. He gives an example of a late Jurassic basal paravian theropod dinosaur.

"Quantitative comparisons with melanosome shape and density in extant feathers indicate that the body was gray and dark and the face had rufous speckles," he said. "The crown was rufous, and the long limb feathers were white with distal black spangles."

The report also speculates that feathers may have also played a role in sexual selection or other communication.

Obama budget boosts science budgets, cuts NASA moon plan

President Obama calmed fears of many scientists across the nation this week, announcing through his budget request that funding for the National Science Foundation would receive $7.4 billion, roughly an eight percent increase from last year's budget.

The budget also boosts the Environmental Protection Agency's budget by $2.7 billion, a 35 percent increase.

The budget includes $6 billion for cancer-related research. The money intends to allow the National Institutes of Health to begin 30 new drug trials, and double the drugs and vaccines in clinical trials over the next six years.

However, the budget has effectively axed NASA's effort to return astronauts to the moon in 2010. Nasa's Constellation program – including aims to build the Orion spacecraft and Ares rockets for manned moon mission – would be cut, according to the budget request.

Overall, NASA's budget was proposed to be upped $700 million, to a total of $19 billion.

PSB Chemists measure up

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Today in Science

In 1974, the U.S. space probe Mariner 10 returned the first close-up photos of the cloud structure of Venus at a closest range of 5,768 km.

It also was the first time a spacecraft used a gravity assist from one planet to help it reach another planet, helping Mariner 10 reach Mercury in March 1974.

Carbon dioxide and sulphuric acid make up the Venusian atmosphere and clouds, having a greenhouse effect that heats the surface to 485°C, that obscures any view of the planet's surface, where the atmospheric pressure is 90 times greater than at sea level on Earth.

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According to a list from the American Chemical Society (ACS), Penn State Behrend has a fairly large number of ACS certified graduates from the 2006-2007 school year.

According to the ACS: "Approved programs offer their students a broad-based and rigorous chemistry education that provides them with the intellectual, experimental, and communication skills to participate effectively as scientific professionals."

In 2007, Behrend graduated a total of 11 chemistry majors, 10 of which were certified by the ACS. That same year, Allegheny graduated a total of 14 with only one being ACS certified. Harvard University had a total of 24 chemistry majors, of which one met ACS standards.

The results from the table are a testament to Behrend's adherence to top academic standards in chemistry, particularly when compared to renowned colleges. It must be mentioned that the numbers fluctuate, but nonetheless, they remain impressive.

Students graduating with a chemistry major are sure to have many options, and a diploma certified by the ACS is an added bonus.

Institution	ACS Certified	
	Yes	No
Allegheny College	1	13
California Institute of Technology	10	0
Canisius College	3	12
Case Western Reserve	17	43
Dartmouth College	0	21
Duquesne University	2	11
Harvard University	1	23
John Carrol University	0	20
Niagara University	1	3
Penn State Erie, the Behrend College	10	1
Penn State University, University Park	11	25
University of Pittsburgh	11	54
University of Rochester	8	12
SUNY Buffalo	14	74
SUNY Stony Brook	3	23
SUNY Fredonia	1	4
SUNY Geneseo	8	38

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