1-1988

'sNo Mystery

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```
TO STARTUP
  SET.SCALE 1
END

TO SET.SCALE :NUMBER
  MAKE "SCALE :NUMBER
END

TO DOT :POS
  PU
  SETPOS :POS
  PD
  FORWARD 0
END

TO XCOR
  OUTPUT FIRST POS
END
```

SET.SCALE creates a variable, SCALE, which specifies the vertical scale of the graph. Also, recall that the name PITCHLIST refers to the list of notes in your melody, as explained in last month's column.

HAVE FUN!!!

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ICCE and MMI Develop Independent Study Courses

The Internatioanl Council for Computers in Education and Media MicroWorlds are cooperating in the development of independent study courses for educators. ICCE is developing the course guides and credit arrangements, and MMI is producing videotapes and accompanying materials.

The first course to take advantage of the combined expertise of ICCE and MMI is Introduction to Logo Using *LogoWriter*. Sharon Burrowes Yoder designed the course lesson guide and materials. MMI developed a series of videotapes, called ON LOGO, which features Seymour Papert. In the ON LOGO tapes Papert shows how to use *LogoWriters* or traditional Logo to teach problem solving and thinking skills. In this course educators view the ON LOGO videotapes, do Logo programming, read and report on course materials, design lessons for their students, and correspond with the instructor by mail.

Student can take the course from virtually anywhere and start at any time. It is approved by the University of Oregon and it carries four quarter-hours of graduate credit. Additional course information is available from ICCE, Unversity of Oregon, 1787 Agate St., Eugene, OR 97403-9905; ph. 503/686-4414.

Information regarding ON LOGO videotapes is available from Media Microworlds, Inc., 12 Clayton Terrace, St. Louis, MO 63131.

"Logo LinX"

'sNo Mystery

by Judi Harris

No doubt many of you have seen the first (last?) snowfall of the school year by now. The luckiest among you have even had an unexpected vacation day due to this natural wonder. For some, the inexplicable peace and beauty of snow outweigh the inconvenience that it can cause. But did you ever suspect that a snowflake could both postpone AND inspire math. lessons?

The substance of each snowflake is ice; frozen H_2O that is born in the clouds.

"Ah! From mountaintop!" said the King of Siam.
"From SKY, Your Majesty," corrected Anna.
"From sky TO mountaintop," revised the King.
"That's right, Your Majesty."
— Rogers and Hammerstein,
"The King and I"

Snow is a unique example of a single chemical compound that crystallizes with great variation. The ancient Greeks first used the word "crystal" to mean "ice." Now, the word crystal refers to the ways that molecules pile up in regular patterns to form solid matter.

There are seven types of snow crystals: six-rayed stars, hexagonal plates, columns, bullets, needles, and irregular forms. Snow crystals clump together on their journey down from the clouds, forming snow-flakes. Snow crystals can range in diameter from diamond dust size to 3/16 inch.

Frozen Solids

Although there is an infinite variety of snow types, all are based upon a pyramidal molecular structure in which atoms bond to form hexagonal molecule clusters. The water molecule is comprised of two atoms of hydrogen and one atom of oxygen. The oxygen atom is positioned at the center, with the

hydrogen atoms arranged away from it at 120-degree angles. Two positive electrical charges are released in the directions of the hydrogen atoms, and a negative charge is exerted at the third 120-degree angle of the sphere:
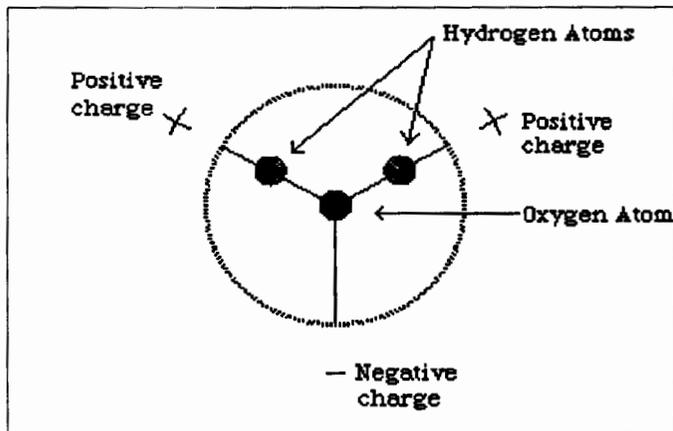
When molecule activity is slowed down by freezing temperatures, the weak electrical charges attract one another. Then the water molecules behave like magnets, as the negative poles are drawn to the positive poles of neighboring molecules. Ice thereby forms a pyramidal structure. Since the atoms are always separated by angles of 120 degrees, snow crystal components must form in threes (the ice pyramids) and sixes. The simplest possible ice crystal would be a collection of 60 water molecules, but this would be far too small to see with the unaided eye. A snow crystal of average size contains 100 million or more ice molecules.

Not-So-Softly Falling

Snow crystal structures reflect the air temperature and water saturation level in the clouds where they form. Warm water vapor has a greater concentration of water molecules, which are more active than cold water vapor molecules. Increased molecule activity speeds up the crystallization process; colder temperatures slow down molecule activity, and therefore ice crystal production.

Needle crystals form in clouds heavy with water vapor, ranging in temperature from 25 to 28 degrees

Fahrenheit. Plate crystals form in air temperatures of 14 to -4 degrees. Column crystals are manufactured in clouds with few water molecules, 13-14 degrees Fahrenheit. The familiar dendritic shapes (stars and ferns) develop in clouds with moderate amounts of water vapor, where the temperatures vary between 0 to 7 degrees.

The snow crystal comes into the world as a microscopic ice germ. Water vapor molecules attach themselves to a speck of dust, and condense and multiply for about 15 minutes. For the next 15-30 minutes, the snow crystal has a rocky ride as it falls through the storm cloud. Passing temperature and humidity conditions help to form the crystal's unique size, shape and design. Soon the ice crystal becomes too heavy to be supported by the cloud, and it joins the other acrobats as they tumble to the earth.

Snowgo

Snow crystals take their forms from their environments. How often have you seen paper snowflakes blanketing the windows of elementary classrooms? These special crystals owe their structure to the scissors and imaginations of their young creators. Logo environments can yield snow crystals, also.

Dendritic (stellar) snow crystals are formed with six branches, spaced at 60-degree angles, radiating out from the center point. Different branches:
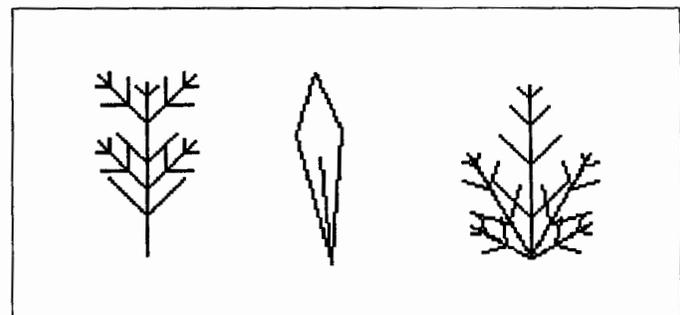
can be combined to make representations of different snow crystals:
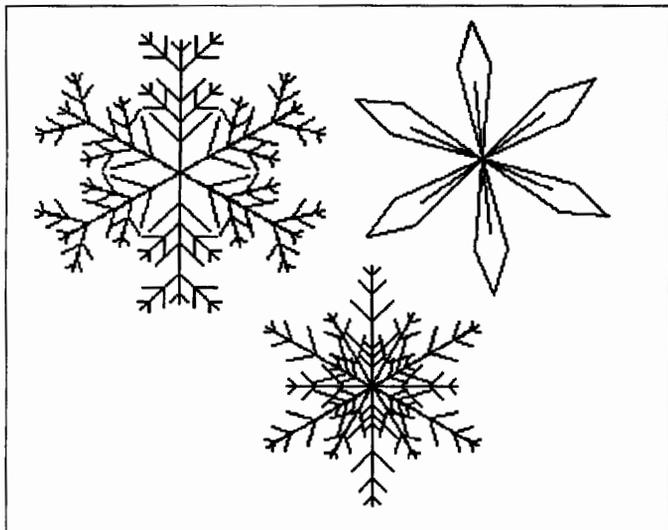
All of these stellar crystals were formed with the STELLAR superprocedure:

```
TO STELLAR
 MAKE "BRANCH.CHOICE PICK BRANCHLIST
 REPEAT 6[RUN (LIST:BRANCH.CHOICE)->
      RIGHT 60]
END
TO PICK :LIST
 OUTPUT ITEM (1 + RANDOM (COUNT :LIST))->
      :LIST
END
TO BRANCHLIST
 OUTPUT [BRANCH1 BRANCH2 BRANCH3]
END
```

The PLATE superprocedure is similarly structured.

```
TO PLATE
 MAKE "SECTION.CHOICE PICK SECTLIST
 REPEAT 6 [RUN :SECTION.CHOICE RIGHT 60]
END

TO SECTLIST
 OUTPUT [[SECTION1 20] [SECTION2 40]->
      [SECTION3]]
END
```
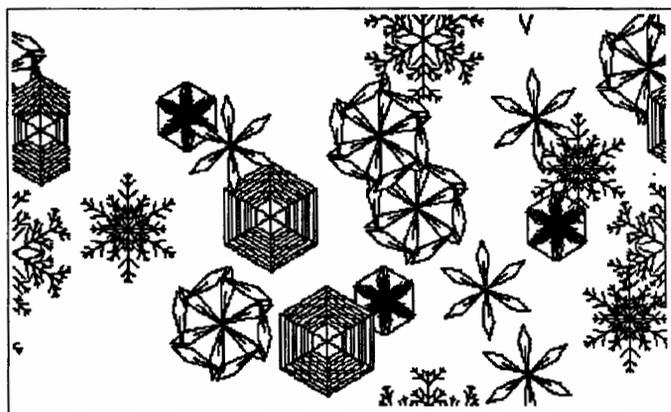
Pictures of hexagonal plate snow crystals can be built from triangular sections that are embellished in a variety of ways.

When combined, six equilateral triangles arranged around a common point can produce a variety of frosty effects.
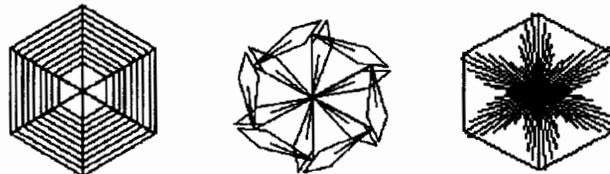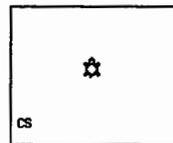
One might even want to create blizzard conditions on the CRT.

```
TO SNOWSTORM
 IF KEYP [STOP]
 RUN PICK [[STELLAR] [PLATE]]
 PU
 RIGHT RANDOM 360
 FORWARD RANDOM 200
 PD
 SNOWSTORM
 CT
 PRINT [BLIZZARD CONDITIONS]
END
```

And unlike the "real stuff," this snow can be cleared with one swift CS (computer shovel).

"A snowdrift is a beautiful thing—
if it doesn't lie across the path you have to shovel
or block the road that leads to your destination."
—Hal Borland, 1964

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