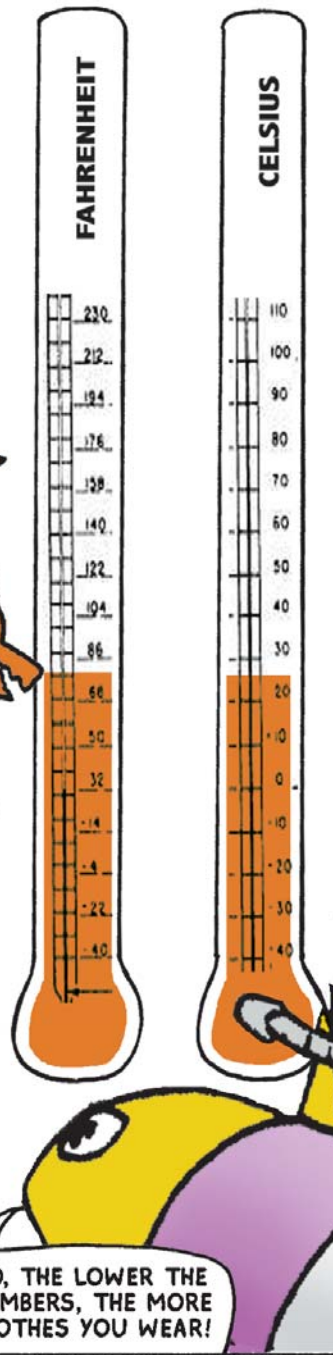


THE WEATHER REPORT IS IMPORTANT NO MATTER WHAT THE WEATHER IS, SCORPY. IT HELPS US PLAN OUR DAY AND DECIDE WHAT TO WEAR. THIS THERMOMETER TELLS US WHAT THE TEMPERATURE OF THE AIR IS. THE HIGHER THE NUMBERS, THE WARMER THE AIR!



SO, THE LOWER THE NUMBERS, THE MORE CLOTHES YOU WEAR!



BOY, IS IT WINDY OUTSIDE, IT BLOWS ME AWAY!

EXACTLY, SCORPY, THE WEATHER REPORT MENTIONED THAT IT WOULD BE WINDY TODAY.

WHAT CAUSES WIND?

WIND IS SIMPLY AIR IN MOTION. IT IS MADE BY THE UNEVEN HEATING OF THE EARTH'S SURFACE BY THE SUN.

LET'S PRETEND THIS FLASHLIGHT IS THE SUN SHINING DOWN ONTO THE EARTH. PLACES THAT GET DIRECT RAYS FROM THE SUN STAY WARMER THAN PLACES THAT GET INDIRECT RAYS. THE WARM AIR RISES AND COOL AIR MOVES IN TO REPLACE IT. THIS MOVEMENT OF AIR MAKES THE WIND BLOW!

WOW, AND I THOUGHT MOVING AIR AROUND WOULD BE A BREEZE!

NORTH POLE

NORTHERN HEMISPHERE

EQUATOR
SOUTHERN HEMISPHERE

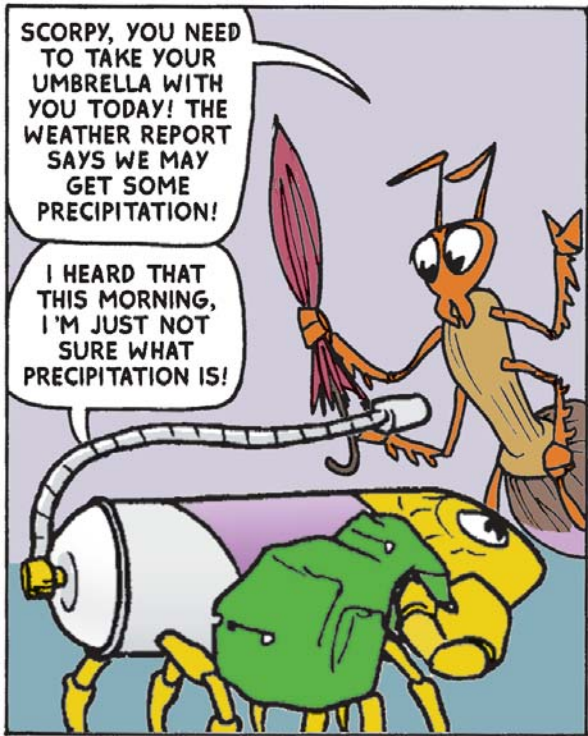
WESTERN HEMISPHERE

EASTERN HEMISPHERE
PRIME MERIDIAN

IN ORDER TO DESCRIBE WIND, WE NEED TO KNOW ITS SPEED AND DIRECTION. THIS INSTRUMENT IS CALLED A WEATHER VANE. IT IS USED TO TELL US FROM WHICH DIRECTION THE WIND IS BLOWING.

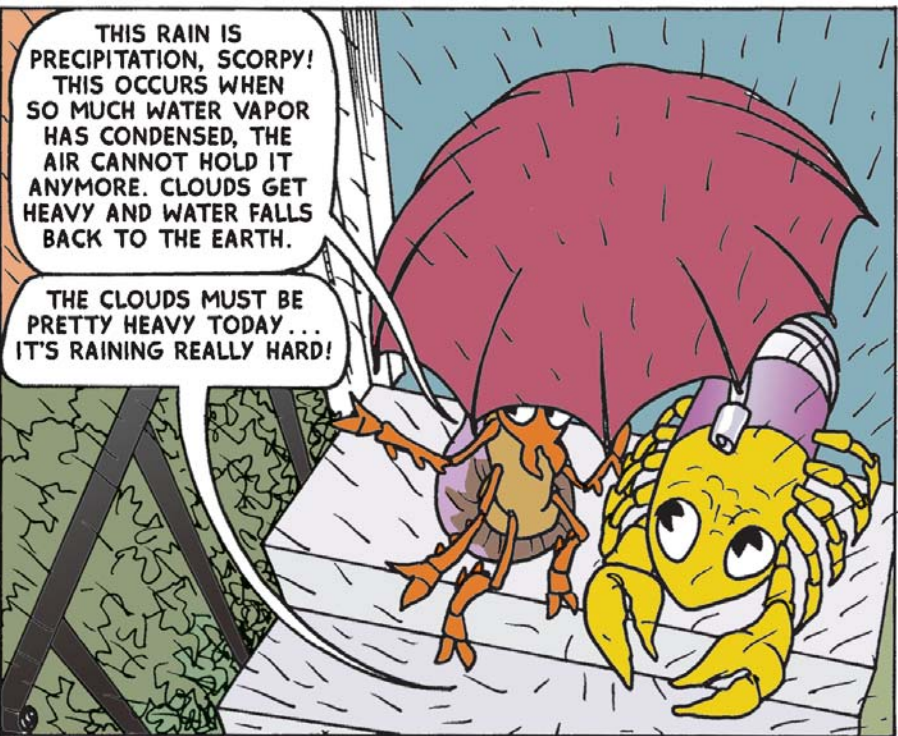
THIS IS AN "ANEMOMETER," IT IS USED TO MEASURE THE WIND'S SPEED.

THESE ARE IMPORTANT INSTRUMENTS! OTHERWISE, YOU MAY NEVER KNOW WHICH WAY THE WIND WILL BLOW!



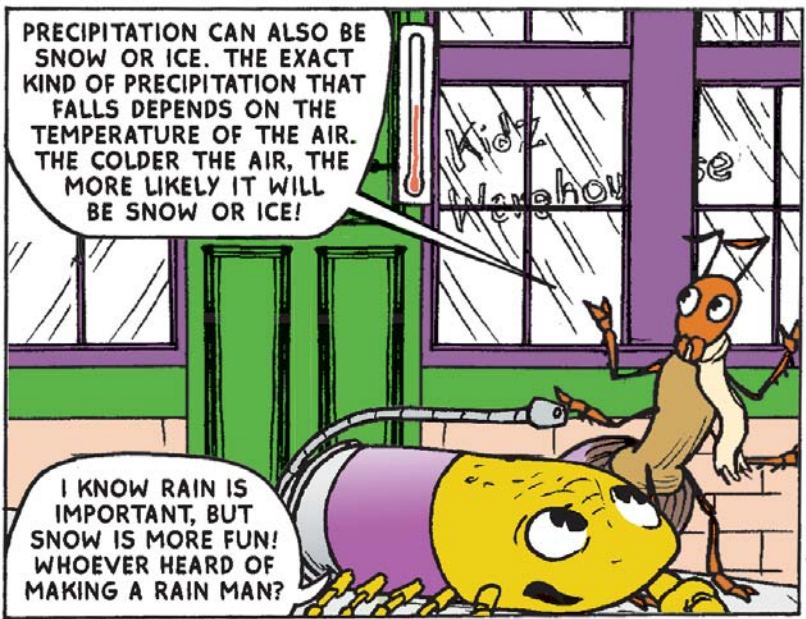
SCORPY, YOU NEED TO TAKE YOUR UMBRELLA WITH YOU TODAY! THE WEATHER REPORT SAYS WE MAY GET SOME PRECIPITATION!

I HEARD THAT THIS MORNING, I'M JUST NOT SURE WHAT PRECIPITATION IS!



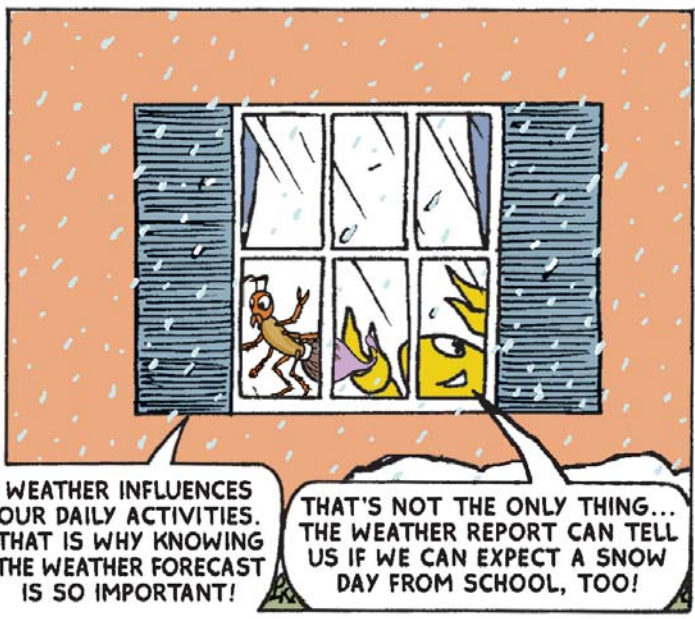
THIS RAIN IS PRECIPITATION, SCORPY! THIS OCCURS WHEN SO MUCH WATER VAPOR HAS CONDENSED, THE AIR CANNOT HOLD IT ANYMORE. CLOUDS GET HEAVY AND WATER FALLS BACK TO THE EARTH.

THE CLOUDS MUST BE PRETTY HEAVY TODAY... IT'S RAINING REALLY HARD!



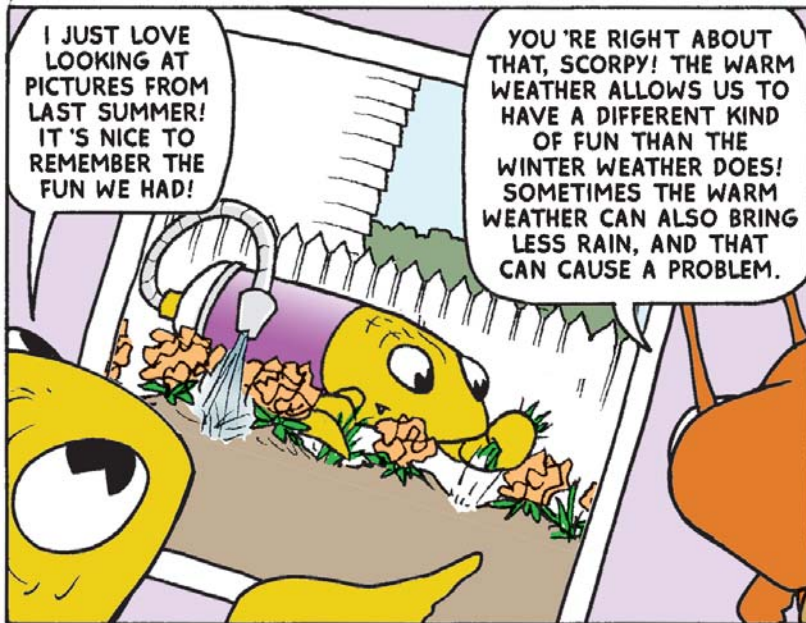
PRECIPITATION CAN ALSO BE SNOW OR ICE. THE EXACT KIND OF PRECIPITATION THAT FALLS DEPENDS ON THE TEMPERATURE OF THE AIR. THE COLDER THE AIR, THE MORE LIKELY IT WILL BE SNOW OR ICE!

I KNOW RAIN IS IMPORTANT, BUT SNOW IS MORE FUN! WHOEVER HEARD OF MAKING A RAIN MAN?



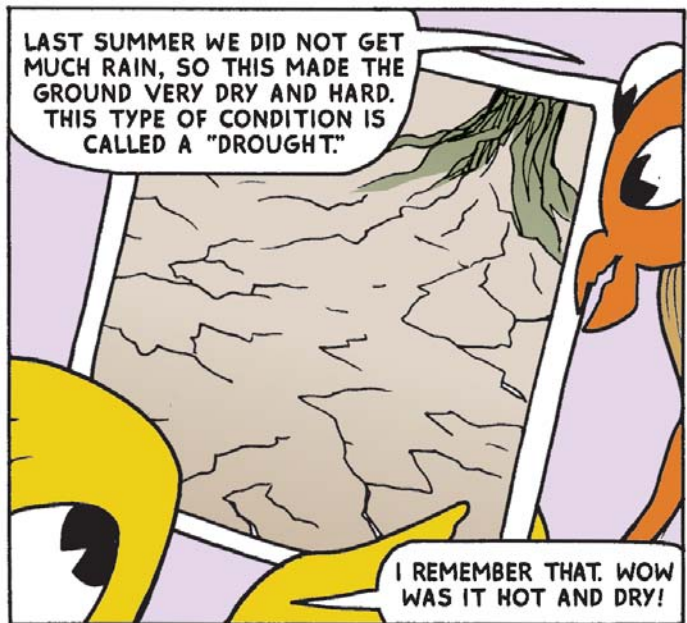
WEATHER INFLUENCES OUR DAILY ACTIVITIES. THAT IS WHY KNOWING THE WEATHER FORECAST IS SO IMPORTANT!

THAT'S NOT THE ONLY THING... THE WEATHER REPORT CAN TELL US IF WE CAN EXPECT A SNOW DAY FROM SCHOOL, TOO!



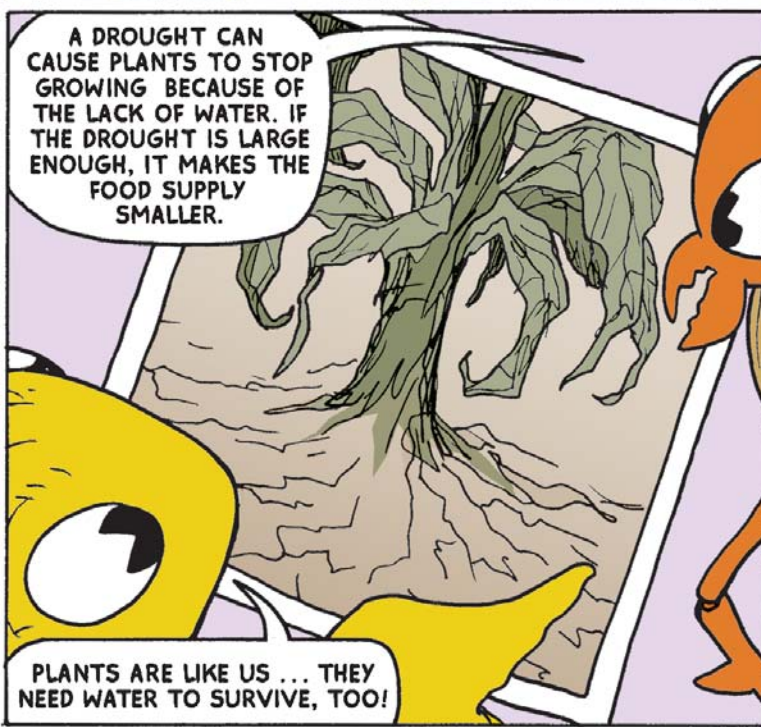
I JUST LOVE LOOKING AT PICTURES FROM LAST SUMMER! IT'S NICE TO REMEMBER THE FUN WE HAD!

YOU'RE RIGHT ABOUT THAT, SCORPY! THE WARM WEATHER ALLOWS US TO HAVE A DIFFERENT KIND OF FUN THAN THE WINTER WEATHER DOES! SOMETIMES THE WARM WEATHER CAN ALSO BRING LESS RAIN, AND THAT CAN CAUSE A PROBLEM.



LAST SUMMER WE DID NOT GET MUCH RAIN, SO THIS MADE THE GROUND VERY DRY AND HARD. THIS TYPE OF CONDITION IS CALLED A "DROUGHT."

I REMEMBER THAT. WOW WAS IT HOT AND DRY!



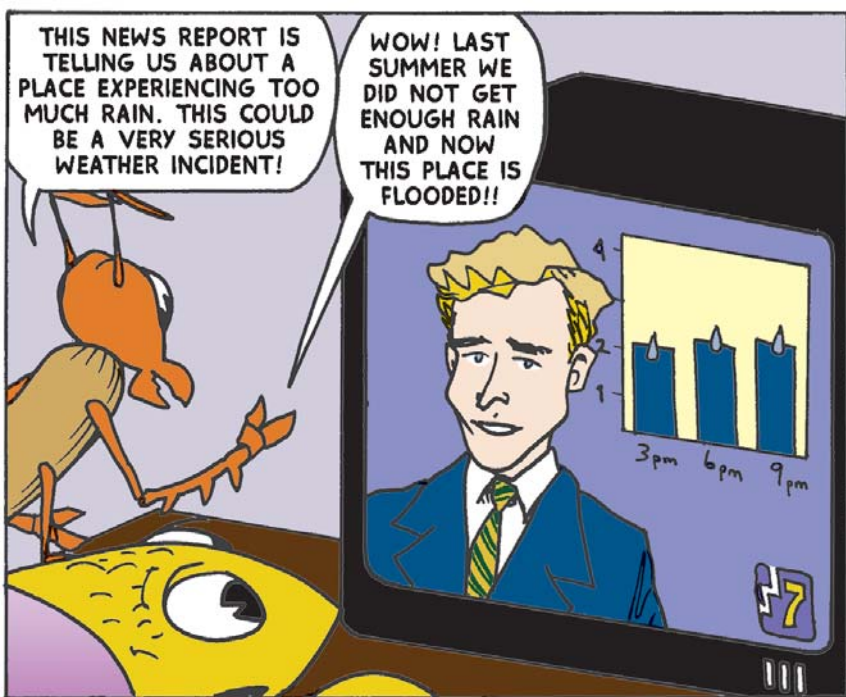
A DROUGHT CAN CAUSE PLANTS TO STOP GROWING BECAUSE OF THE LACK OF WATER. IF THE DROUGHT IS LARGE ENOUGH, IT MAKES THE FOOD SUPPLY SMALLER.

PLANTS ARE LIKE US ... THEY NEED WATER TO SURVIVE, TOO!



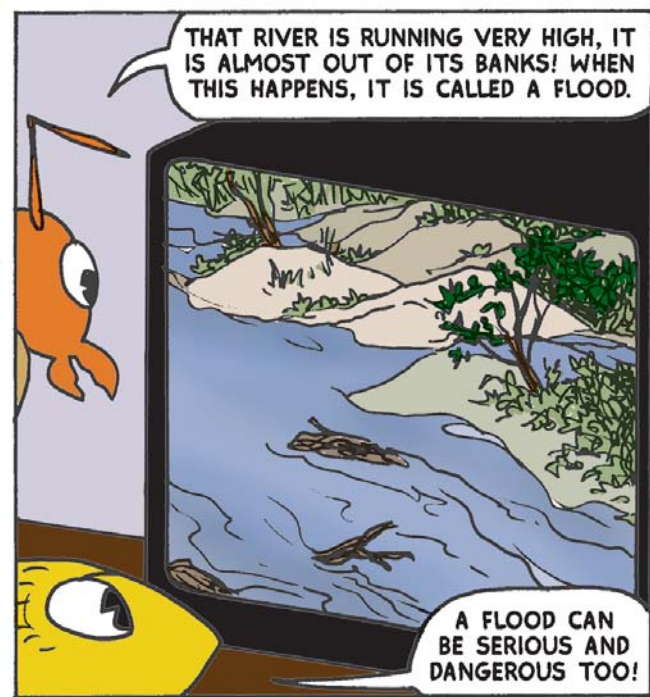
THIS SNOWFALL HELPS TO PREVENT A DROUGHT. WHEN THIS SNOW MELTS, MUCH OF THE WATER WILL ABSORB INTO THE GROUND KEEPING IT MOIST. THIS MOISTURE WILL HELP PLANTS TO GROW NEXT SPRING AND SUMMER!

IT CAN BE SNOW, SLEET, RAIN OR HAIL; BUT IT'S STILL WATER AND WATER PREVENTS A DROUGHT!



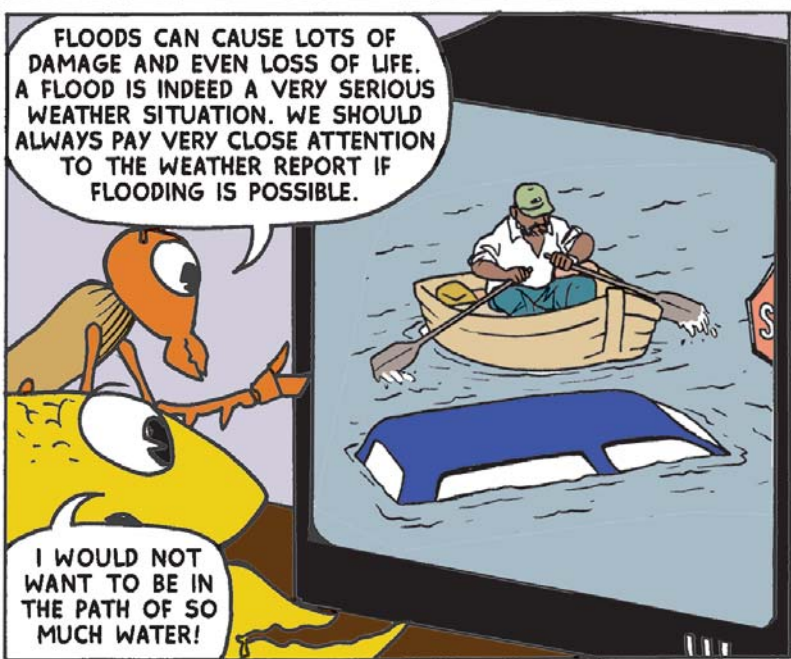
THIS NEWS REPORT IS TELLING US ABOUT A PLACE EXPERIENCING TOO MUCH RAIN. THIS COULD BE A VERY SERIOUS WEATHER INCIDENT!

WOW! LAST SUMMER WE DID NOT GET ENOUGH RAIN AND NOW THIS PLACE IS FLOODED!!



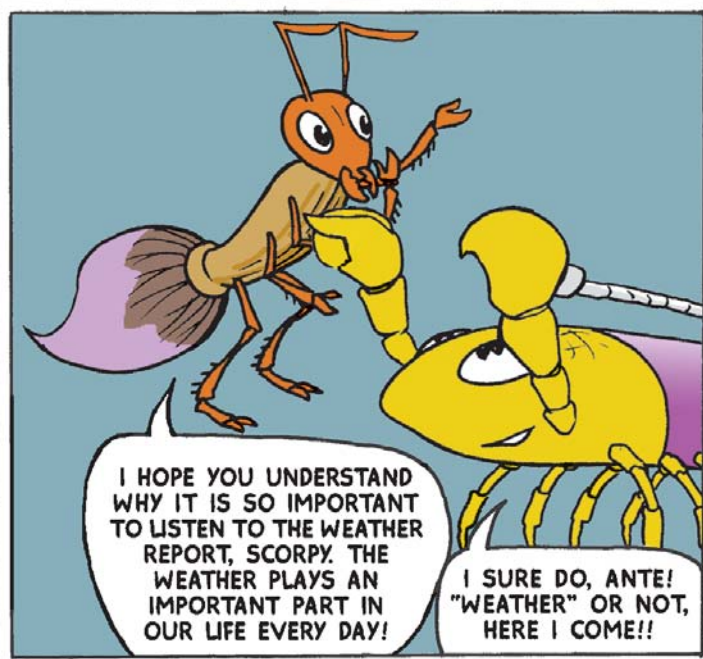
THAT RIVER IS RUNNING VERY HIGH, IT IS ALMOST OUT OF ITS BANKS! WHEN THIS HAPPENS, IT IS CALLED A FLOOD.

A FLOOD CAN BE SERIOUS AND DANGEROUS TOO!



FLOODS CAN CAUSE LOTS OF DAMAGE AND EVEN LOSS OF LIFE. A FLOOD IS INDEED A VERY SERIOUS WEATHER SITUATION. WE SHOULD ALWAYS PAY VERY CLOSE ATTENTION TO THE WEATHER REPORT IF FLOODING IS POSSIBLE.

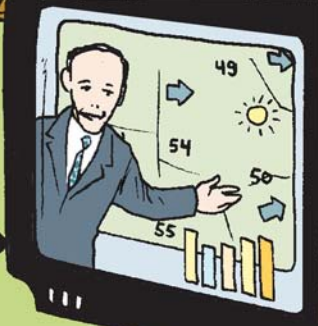
I WOULD NOT WANT TO BE IN THE PATH OF SO MUCH WATER!



I HOPE YOU UNDERSTAND WHY IT IS SO IMPORTANT TO LISTEN TO THE WEATHER REPORT, SCORPY. THE WEATHER PLAYS AN IMPORTANT PART IN OUR LIFE EVERY DAY!

I SURE DO, ANTE! "WEATHER" OR NOT, HERE I COME!!

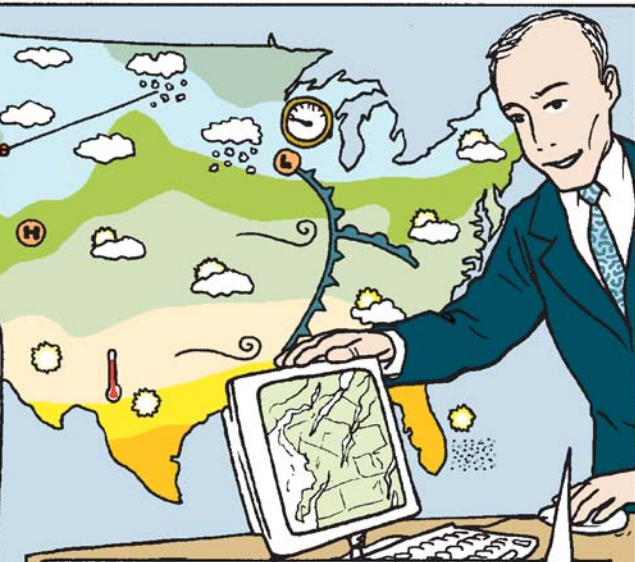
HEY, ANTE, I WANT THE SPORTS REPORT. WHO CARES ABOUT WEATHER!!



WEATHER IS VERY IMPORTANT, SCORPY. IT AFFECTS US ALL!

WEATHER IS THE STATE OF THE ATMOSPHERE AT A PARTICULAR TIME OR PLACE. THERE ARE FIVE ELEMENTS OF WEATHER:

- TEMPERATURE 
- HUMIDITY 
- PRECIPITATION 
- WIND 
- AIR PRESSURE 



THOSE ELEMENTS ARE ORGANIZED INTO WEATHER SYSTEMS WITH WELL-DEFINED CYCLES AND FEATURES. THE STUDY OF THOSE FEATURES IS **METEOROLOGY**. I STUDY THOSE PATTERNS, SO I AM A **METEOROLOGIST**.



WHOOOPS. YOU SAID WE WERE VISITING SANTA THIS WINTER...

WEATHER IS DIFFERENT FROM PLACE TO PLACE. **CLIMATE** IS THE WEATHER AN AREA HAS OVER A LONG PERIOD OF TIME. IT INCLUDES AVERAGES AND VARIATIONS OF ALL WEATHER ELEMENTS. VIRGINIA HAS HOT WEATHER IN SUMMER AND COLD IN WINTER, BUT HERE IN PANAMA, IT IS HOT ALL YEAR!



OK, ANTE, I KNOW ENOUGH TO BE A WEATHERMAN! TURN ON THE CAMERAS, THIS IS MY BIG BREAK!

YOU STILL HAVE A LOT TO LEARN. CALL THIS A WRAP AND LET'S KEEP MOVING ...

WHEW - IT'S REALLY COLD IN HERE!

I'LL ADJUST THE THERMOSTAT. WE'LL MAKE SURE IT'S WARMER IN HERE THAN OUT THERE.

IT WOULD BE COOL IF WE COULD ADJUST THE TEMPERATURE OUTSIDE.

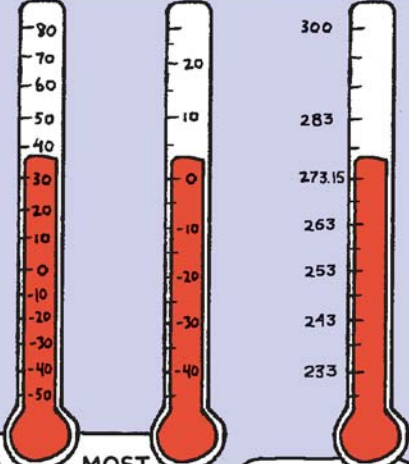
NO SUCH LUCK, SCORPY. TEMPERATURE IS THE MEASURE OF THE DEGREE OF HEAT IN THE AIR.

WE CHECK TEMPERATURE WITH A THERMOMETER. THERE ARE THREE SCALES:

AMERICANS USE THE **FAHRENHEIT** SCALE.

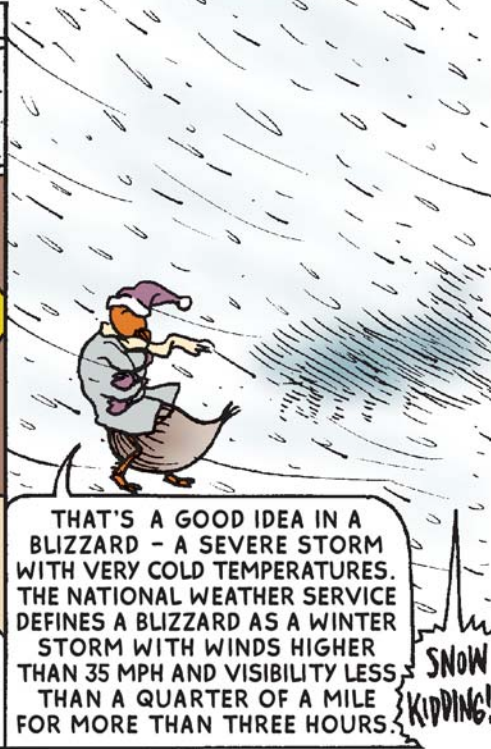
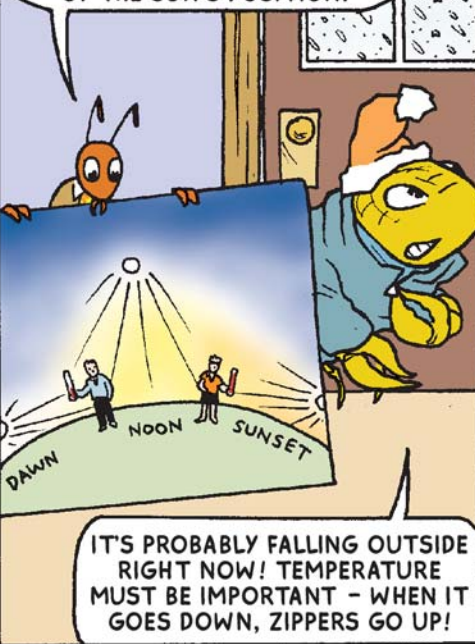
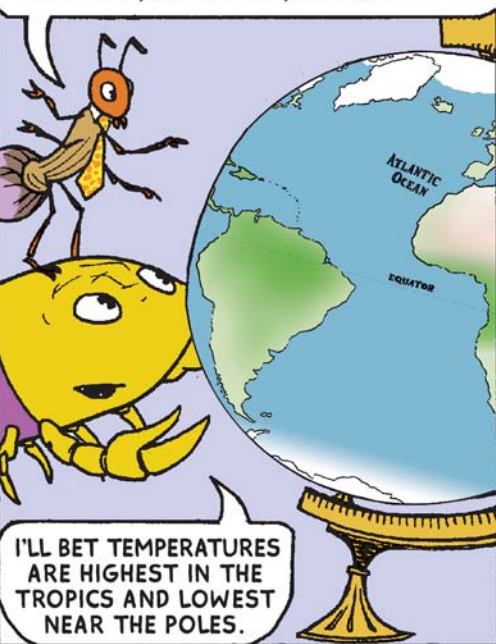
MOST NATIONS USE THE **CELSIUS** SCALE.

SCIENTISTS USE THE **KELVIN** SCALE.

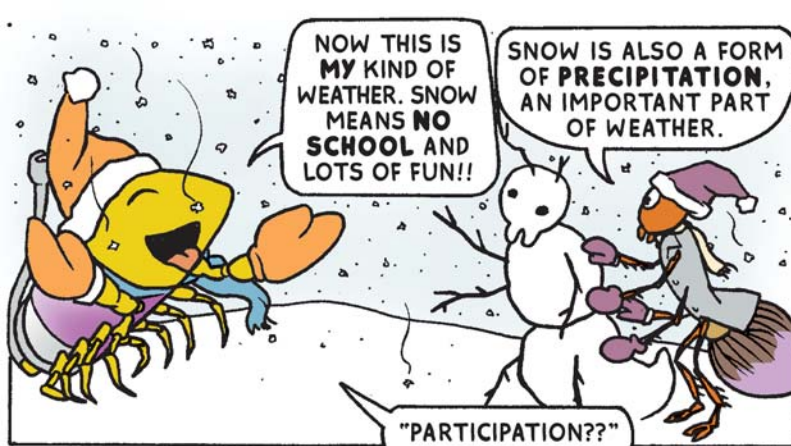


THE TEMPERATURE ON EARTH AVERAGES 59 DEGREES FAHRENHEIT (59° F) AT SEA LEVEL, BUT IT VARIES ACCORDING TO LATITUDE, ELEVATION, SEASON ...

TEMPERATURE IS USUALLY WARMEST IN THE MID-AFTERNOON AND COLDEST AT DAWN BECAUSE OF THE SUN'S POSITION.



SNOW KIDDING!

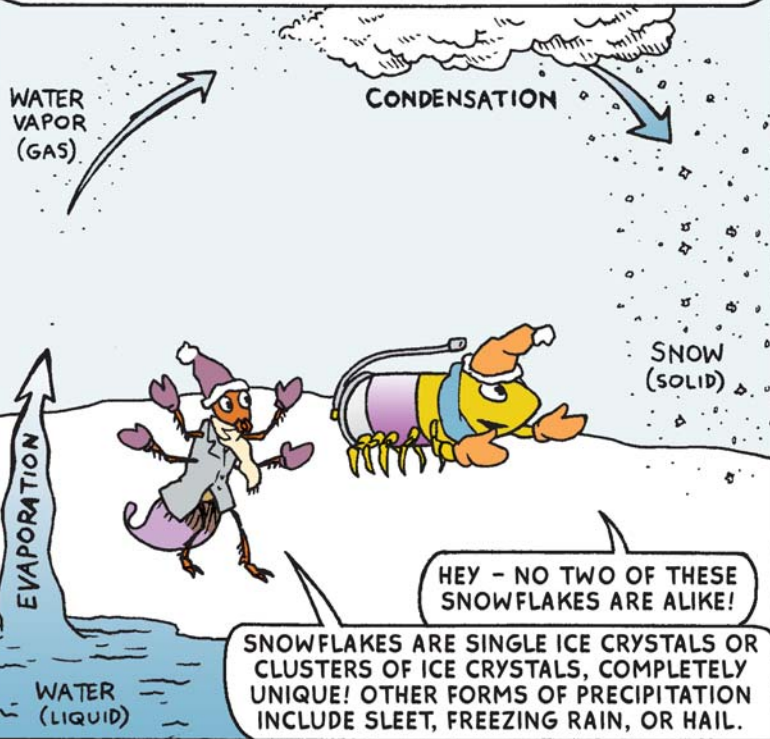


NOW THIS IS MY KIND OF WEATHER. SNOW MEANS **NO SCHOOL** AND LOTS OF FUN!!

SNOW IS ALSO A FORM OF **PRECIPITATION**, AN IMPORTANT PART OF WEATHER.

"PARTICIPATION???"

NO, PRECIPITATION! FALLING WATER!! IT OCCURS WHEN WATER EVAPORATES FROM THE GROUND AND CHANGES INTO CONDENSATION. THAT MEANS WATER GOES FROM GAS FORM INTO A SOLID FORM, SUCH AS SNOW, OR A LIQUID FORM, SUCH AS RAIN. WE GET SNOW WHEN THE AIR TEMPERATURE IS BELOW FREEZING.



SNOWFLAKES ARE SINGLE ICE CRYSTALS OR CLUSTERS OF ICE CRYSTALS, COMPLETELY UNIQUE! OTHER FORMS OF PRECIPITATION INCLUDE SLEET, FREEZING RAIN, OR HAIL.




THE EXTREME WEATHER OF TOO LITTLE PRECIPITATION CAN CAUSE **DROUGHT**.

TOO MUCH PRECIPITATION CAN CAUSE **FLOODS**. BOTH CAN BE SEVERE NATURAL DISASTERS.



I'M GLAD WE LEARNED ABOUT PRECIPITATION, BUT I'M STILL GOING TO CALL THIS A SNOWBALL. CALLING IT A "PRECIPITATION BALL" JUST IS NOT THE SAME!



ANTE, ARE THERE EVER THUNDERSTORMS IN A BLIZZARD?


NOT USUALLY - THUNDERSTORMS ARE THE SEVERE STORMS OF WARMER WEATHER, WHEN THE AIR HAS MORE HUMIDITY.

HUMIDITY IS A MEASUREMENT OF EVAPORATED WATER DISSOLVED IN THE AIR. THE WARMER THE AIR, THE MORE WATER VAPOR IT CAN HOLD.



THUNDERSTORMS HAPPEN IN VERY WARM AND VERY HUMID AIR. THE RISING FLOW OF EVAPORATING AIR GETS STRONG AND FORMS TALL THUNDERSTORM CLOUDS.

THE RISE OF WATER VAPOR IS SO FAST AND INTENSE THAT WHEN THE WATER CONDENSATES AGAIN IT FORMS NOT LITTLE DROPLETS BUT **BIG** RAINDROPS.



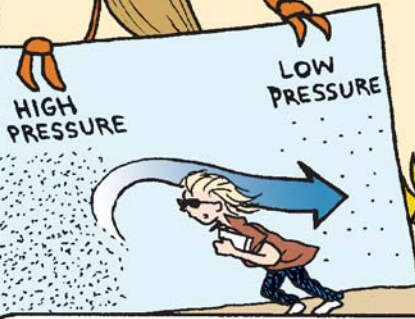
THE WATER DROPLETS WHIP AROUND THE WINDY STORM CLOUDS AND BUMP INTO EACH OTHER. THIS CREATES **ELECTRICITY**. WHEN THAT CHARGE BUILDS UP ENOUGH, IT DISCHARGES AS LIGHTNING!



WHEN THE SUPERHEATED AIR FROM THE LIGHTNING MEETS COLDER AIR - **BOOM!** - YOU GET **THUNDER!**

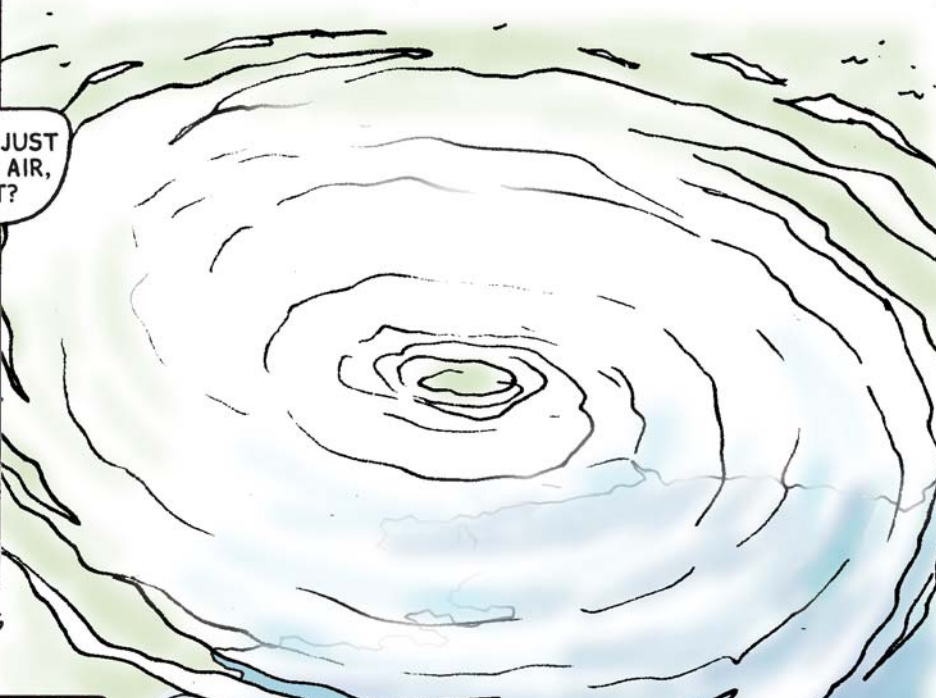
YOW! WHY CAN'T WARM AIR AND COLD AIR JUST GET ALONG?!

OUR LAST TWO ELEMENTS OF WEATHER ARE WIND AND AIR PRESSURE.

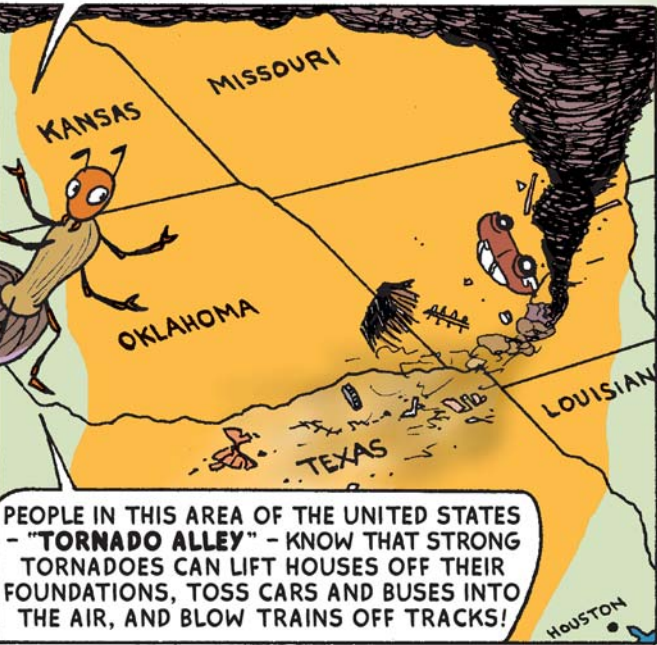


WIND IS JUST MOVING AIR, RIGHT?

YES - AIR MOVING FROM AN AREA OF HIGH AIR PRESSURE TO THE MORE SPACIOUS LOW PRESSURE AREAS (PLACES WHERE AIR IS RISING AND FEELS LIGHTER TO US ON THE GROUND).



LARGE STORM SYSTEMS CAN CREATE DAMAGING WINDS. A STRING OF THUNDERSTORMS CAN ROTATE COLUMNS OF AIR INTO **TORNADOES**.



PEOPLE IN THIS AREA OF THE UNITED STATES - "**TORNADO ALLEY**" - KNOW THAT STRONG TORNADOES CAN LIFT HOUSES OFF THEIR FOUNDATIONS, TOSS CARS AND BUSES INTO THE AIR, AND BLOW TRAINS OFF TRACKS!

WOW-THAT'S A HUGE TORNADO!!

NO, THAT'S A **HURRICANE**. IT'S A VIOLENT WIND STORM THAT PICKS UP SPEED, POWER, AND MOISTURE OVER WARM WATERS SUCH AS THE GULF OF MEXICO. AS WARM AIR RISES FROM THE WATER, IT COOLS AND FALLS AGAIN, CREATING WIND. HURRICANES HAVE WINDS HIGHER THAN 75 MILES PER HOUR!



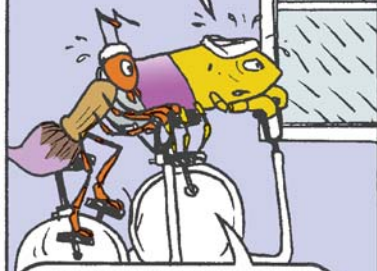
PEOPLE LIVING IN COASTAL REGIONS KNOW THAT A SUDDEN DROP IN BAROMETRIC AIR PRESSURE MEANS A HURRICANE IS COMING ASHORE!



THEY ALSO KNOW THESE STORMS CAN CAUSE GREAT LOSS OF LIFE AND DAMAGE TO PROPERTY.

WOW, WEATHER IS IMPORTANT! I'M GOING TO KEEP MY EYES OUT FOR THE WINDS OF CHANGE!

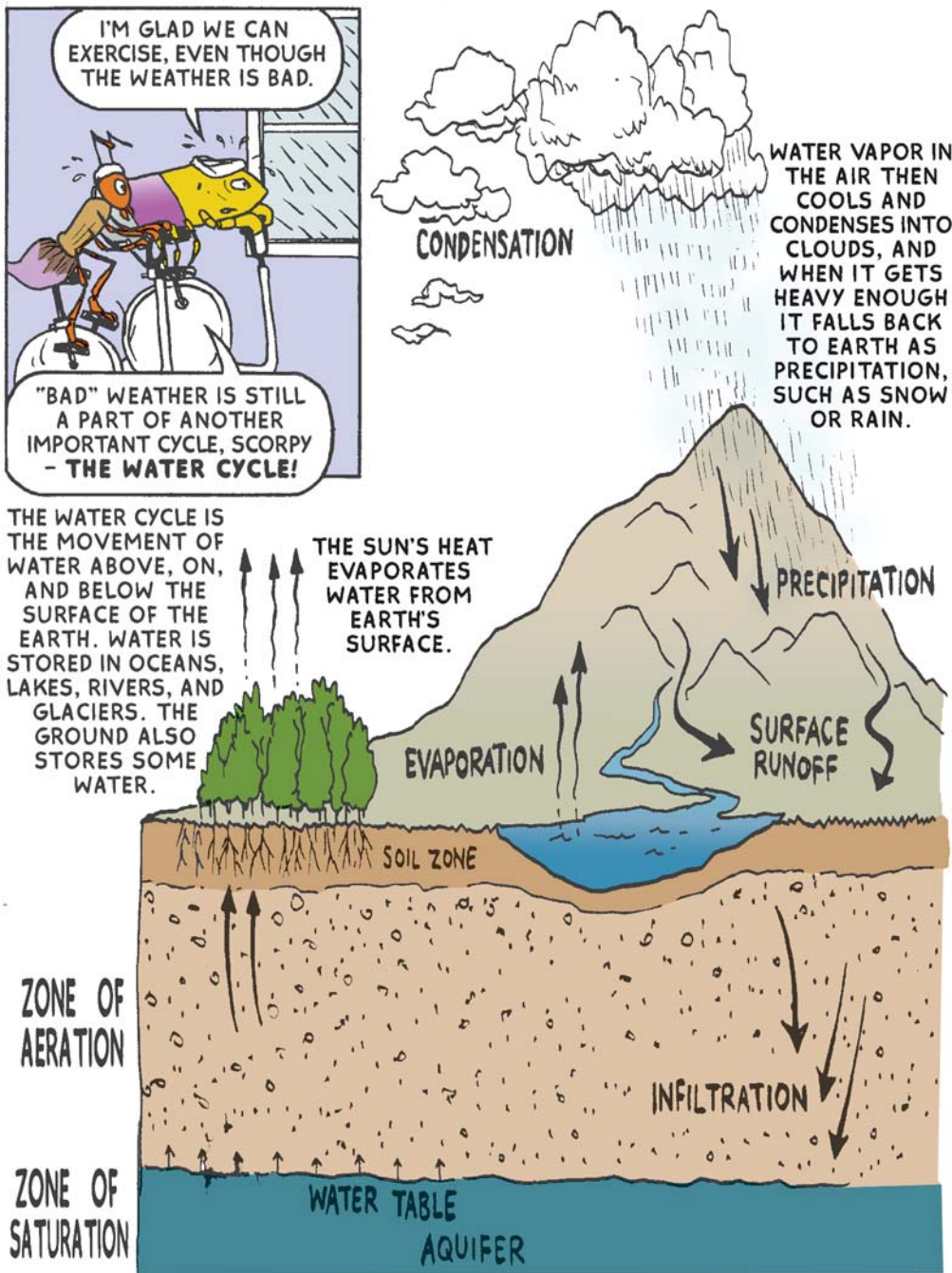
I'M GLAD WE CAN EXERCISE, EVEN THOUGH THE WEATHER IS BAD.



"BAD" WEATHER IS STILL A PART OF ANOTHER IMPORTANT CYCLE, SCORPY - **THE WATER CYCLE!**

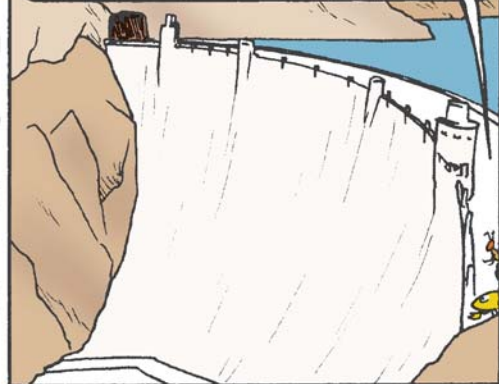
THE WATER CYCLE IS THE MOVEMENT OF WATER ABOVE, ON, AND BELOW THE SURFACE OF THE EARTH. WATER IS STORED IN OCEANS, LAKES, RIVERS, AND GLACIERS. THE GROUND ALSO STORES SOME WATER.

THE SUN'S HEAT EVAPORATES WATER FROM EARTH'S SURFACE.

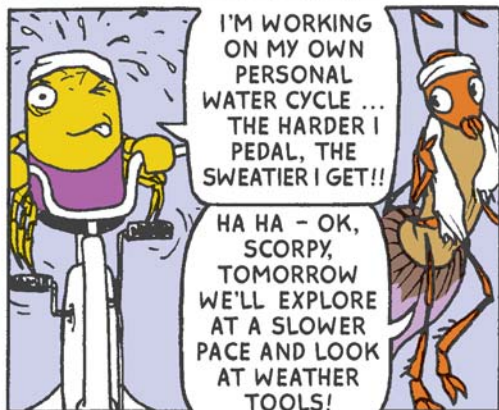


WATER VAPOR IN THE AIR THEN COOLS AND CONDENSES INTO CLOUDS, AND WHEN IT GETS HEAVY ENOUGH IT FALLS BACK TO EARTH AS PRECIPITATION, SUCH AS SNOW OR RAIN.

PEOPLE HAVE BEEN ALTERING THE WATER CYCLE FOR THOUSANDS OF YEARS. DAMS STORE WATER AND GENERATE ELECTRICITY.



IRRIGATION ALSO ALTERS THE WATER CYCLE. WATER IS CHANNLED TO DRY LAND TO HELP FARMERS GROW CROPS THERE.



I'M WORKING ON MY OWN PERSONAL WATER CYCLE ... THE HARDER I PEDAL, THE SWEATIER I GET!!

HA HA - OK, SCORPY, TOMORROW WE'LL EXPLORE AT A SLOWER PACE AND LOOK AT WEATHER TOOLS!

BRRRRR, IT'S COLD OUT HERE!



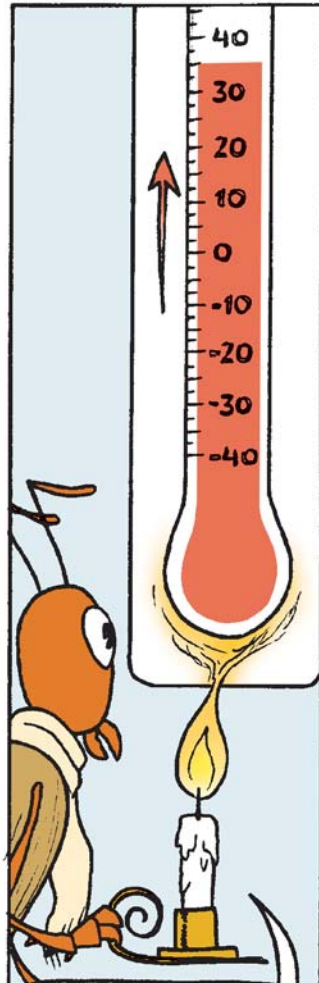
YES, SCORPY. LET'S SEE JUST HOW COLD THE AIR IS.

HMM. THE THERMOMETER SAYS IT'S ONLY 35 DEGREES.

WHAT DO DEGREES MEAN?



DEGREES ARE A WAY TO MEASURE. THE ITALIAN INVENTOR GALILEO MADE THE FIRST THERMOMETER. THE MODERN THERMOMETER AND TEMPERATURE SCALE WERE INVENTED BY THE GERMAN PHYSICIST **GABRIEL FAHRENHEIT**. THAT'S WHY WE SAY A TEMPERATURE IS "35 DEGREES FAHRENHEIT."



THE MOST COMMON THERMOMETER IS THE MERCURY-IN-GLASS TYPE. THIS GLASS TUBE HAS LIQUID MERCURY AT ONE END. AS TEMPERATURE INCREASES, THE MERCURY EXPANDS UP THE TUBE. AS TEMPERATURE DECREASES, THE MERCURY CONTRACTS AND FALLS DOWN IN THE TUBE. (MERCURY DOESN'T FREEZE UNTIL -38°F .)

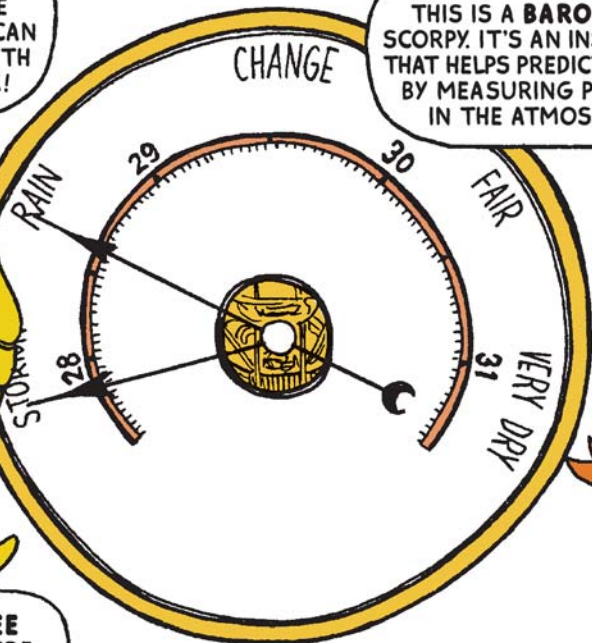
THERMOMETERS ARE JUST ONE OF THE MANY TOOLS THAT METEOROLOGISTS USE TO MONITOR WEATHER CONDITIONS.



NORMALLY I WOULD SAY THAT IS REALLY COOL - BUT LOOKING AT TODAY'S THERMOMETER I SHOULD SAY THAT'S REALLY **COLD!**

THIS IS WEIRD. I DON'T SEE HOW ANYONE CAN TELL TIME WITH THIS CLOCK!

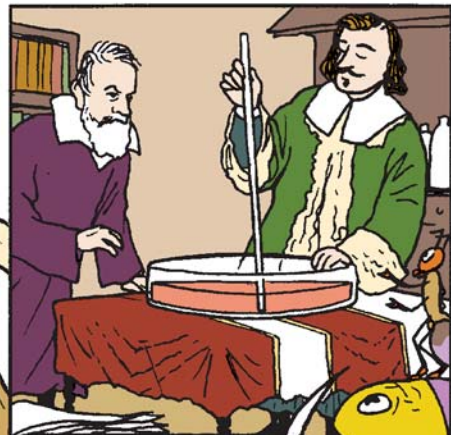
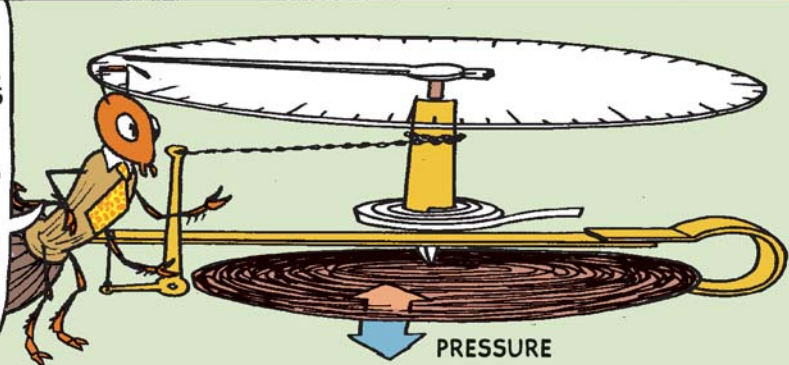
THIS IS A **BAROMETER**, SCORPY. IT'S AN INSTRUMENT THAT HELPS PREDICT WEATHER BY MEASURING PRESSURE IN THE ATMOSPHERE.



I DON'T **SEE** ANY PRESSURE UP THERE IN THE ATMOSPHERE!?

YOU CAN'T SEE ATMOSPHERIC PRESSURE, BUT IT'S THERE. AIR IS HELD TO EARTH BY GRAVITY, WHICH PULLS THE AIR DOWNWARD, GIVING AIR MOLECULES WEIGHT. THIS WEIGHT EXERTS A FORCE ON THE EARTH AND EVERYTHING ON IT. THE AMOUNT OF FORCE EXERTED IS CALLED ATMOSPHERIC - OR AIR - PRESSURE.

IF A BAROMETER SHOWS A HIGH PRESSURE READING, THIS USUALLY MEANS FAIR WEATHER. IF IT SHOWS LOW PRESSURE, STORMS ARE MORE LIKELY. THIS BAROMETER MEASURES THE AIR WITH A SPRING INSTEAD OF LIQUID MERCURY.



EVANGELISTA TORRICELLI INVENTED THE BAROMETER USING MERCURY IN 1643. HE LEARNED ABOUT THE ATMOSPHERE FROM HIS TEACHER, GALILEO.

GALILEO WAS A SMART MAN!

AND **YOU'LL** GET SMARTER WHEN WE STUDY MORE WEATHER INSTRUMENTS TOMORROW. BUT FOR NOW, YOU HAVE HOMEWORK.



UGH - THAT'S ANOTHER KIND OF PRESSURE. I THINK I LIKE AIR PRESSURE BETTER!

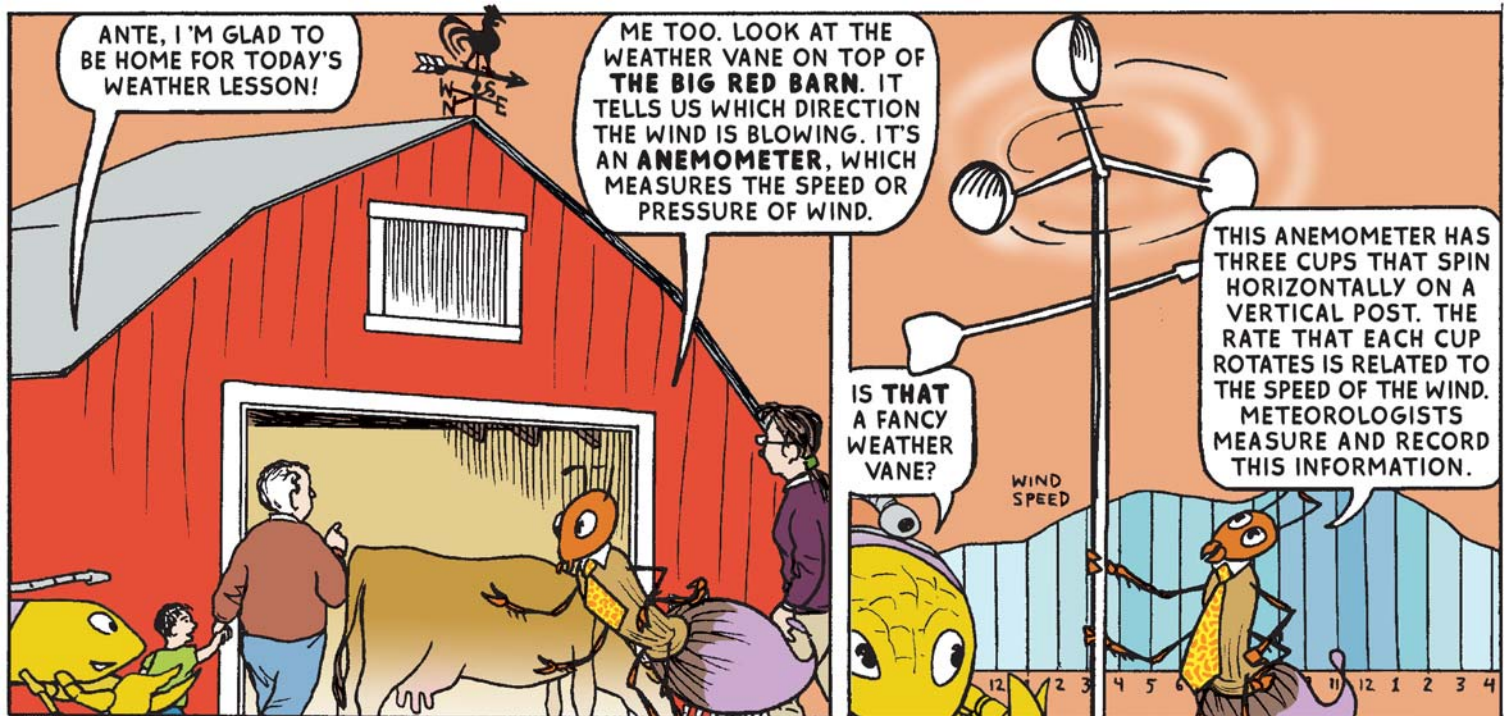
ANTE, I'M GLAD TO BE HOME FOR TODAY'S WEATHER LESSON!

ME TOO. LOOK AT THE WEATHER VANE ON TOP OF THE BIG RED BARN. IT TELLS US WHICH DIRECTION THE WIND IS BLOWING. IT'S AN **ANEMOMETER**, WHICH MEASURES THE SPEED OR PRESSURE OF WIND.

THIS ANEMOMETER HAS THREE CUPS THAT SPIN HORIZONTALLY ON A VERTICAL POST. THE RATE THAT EACH CUP ROTATES IS RELATED TO THE SPEED OF THE WIND. METEOROLOGISTS MEASURE AND RECORD THIS INFORMATION.

IS THAT A FANCY WEATHER VANE?

WIND SPEED



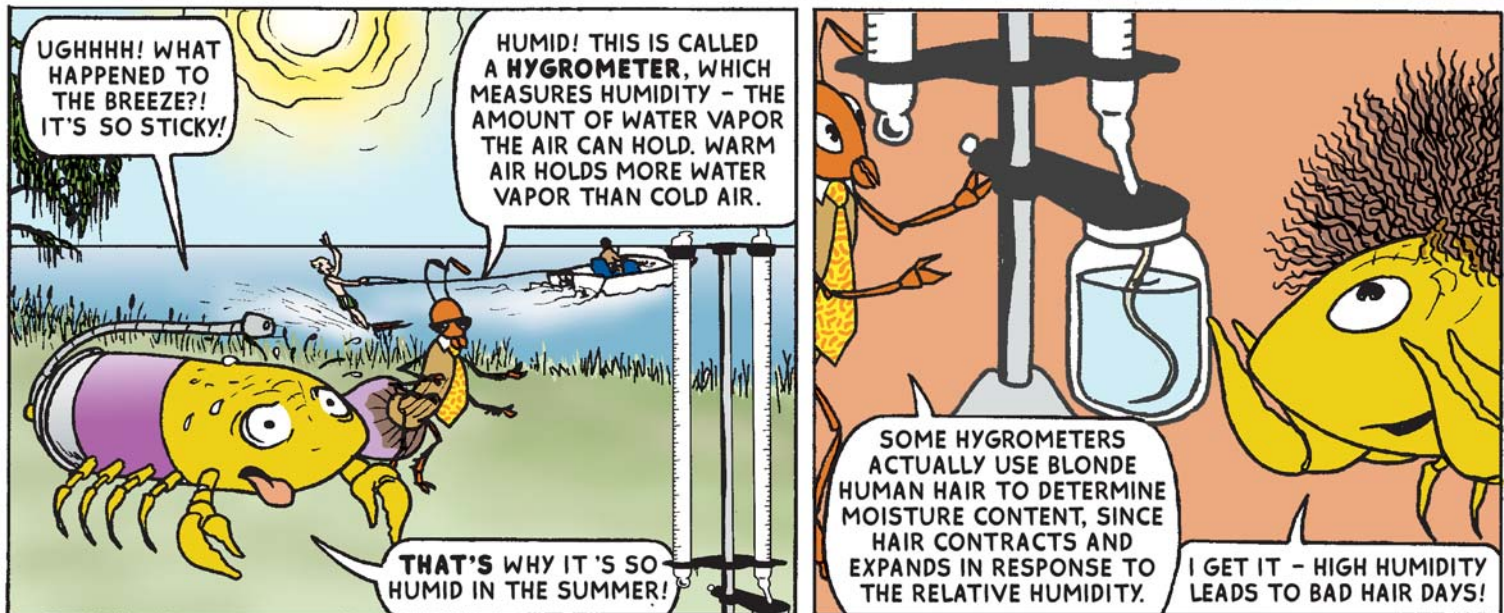
UGHHHH! WHAT HAPPENED TO THE BREEZE?! IT'S SO STICKY!

HUMID! THIS IS CALLED A **HYGROMETER**, WHICH MEASURES HUMIDITY - THE AMOUNT OF WATER VAPOR THE AIR CAN HOLD. WARM AIR HOLDS MORE WATER VAPOR THAN COLD AIR.

THAT'S WHY IT'S SO HUMID IN THE SUMMER!

SOME HYGROMETERS ACTUALLY USE BLONDE HUMAN HAIR TO DETERMINE MOISTURE CONTENT, SINCE HAIR CONTRACTS AND EXPANDS IN RESPONSE TO THE RELATIVE HUMIDITY.

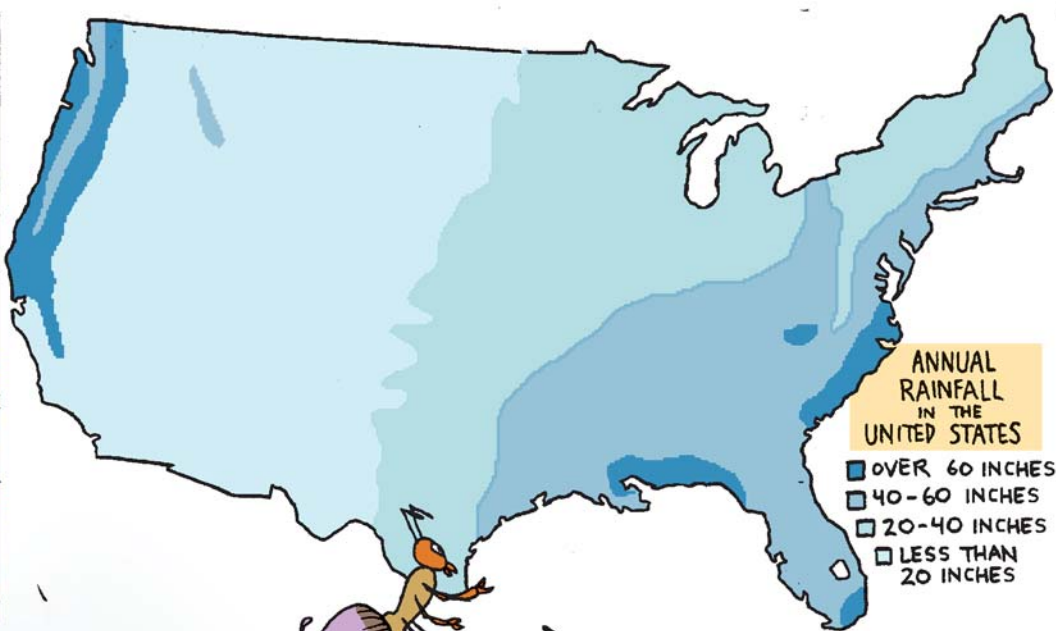
I GET IT - HIGH HUMIDITY LEADS TO BAD HAIR DAYS!



I WISH WE COULD HAVE SOME BETTER WEATHER. I AM SO TIRED OF PRECIPITATION!!



REMEMBER, SCORPY, THE EARTH NEEDS SNOW AND RAIN FOR PLANTS AND ANIMALS TO GROW. LET'S LOOK OUTSIDE AT ONE MORE WEATHER TOOL ...



THIS IS A RAIN GAUGE. IT MEASURES THE AMOUNT OF RAINFALL WE RECEIVE IN A CERTAIN TIME. IT USUALLY HAS A FUNNEL-SHAPED COLLECTOR ATTACHED TO A LONG TUBE. THE AMOUNT OF RAINFALL IS DETERMINED BY THE LEVEL OF RAIN COLLECTED IN THE TUBE.



METEOROLOGISTS USE RAIN GAUGES TO DETERMINE THE AVERAGE RAINFALL FOR VARIOUS REGIONS. FOR EXAMPLE, PARTS OF THE SOUTHEAST REGION OF THE UNITED STATES GET 70 INCHES OF RAIN EACH YEAR, BUT THE SOUTHWEST OF THE U.S. RECEIVES LESS THAN 10 INCHES EACH YEAR.

KNOWING PAST AVERAGES ALLOWS METEOROLOGISTS TO MORE ACCURATELY PREDICT WEATHER IN THE FUTURE.



WOW, THAT IS A BIG DIFFERENCE!!

OK, ANTE, I'VE GOT WHAT I NEED TO BE A WEATHERMAN! TODAY, CENTRAL VIRGINIA CAN LOOK FORWARD TO SKIES THAT WILL BE CLEAR AND SUNNY AND **FUN!!**

