

*** THE PRAIRIE ASTRONOMER ***

THIS MONTH OUR MEETING WILL BE HELD AS USUAL ON FEB. 25 AT 7:30 IN THE OLIN HALL OF SCIENCE ON THE NEBRASKA WESLYEAN CAMPUS. AND, OF COURSE, THERE WILL BE A DRAWING FOR A DOOR PRIZE AND REFRESHMENTS AFTER THE MEETING. LARRY STEPP WILL GIVE A SHORT PRESENTATION ON THE DESIGN AND MAKING OF TELESCOPE MOUNTINGS. DON'T MISS THIS ONE.

----THE PRESIDENTS REPORT----

ONE THING IN ASTRONOMY THAT IS PROBABLY THE HARDEST TO CONCEIVE IS DISTANCES AND NUMBERS, AND THE FOLLOWING ARTICLE GIVES YOU A IDEA OF THE VASTNESS OF SPACE AND HOW INSIGNIFICANT OUR SOLAR SYSTEM IS IN VEIN OF THE ENTIRETY OF SPACE.

HOW BIG IS A MILLION-OR A BILLION? A MILLION ONE DOLLAR BILLS WOULD FORM A PILE NEARLY AS HIGH AS THE GREAT PYRAMID. BUT A BILLION [ONE THOUSAND MILLION] GREENBACKS WOULD MAKE A STACK THAT WOULD SOAR 10 TIMES HIGHER THAN MT. EVEREST. AND A TRILLION ONE DOLLAR BILLS? [ONE TRILLION IS A MILLION BILLION, OR ONE THOUSAND BILLION] THE TRILLION PILE WOULD REACH OVER ONE FOURTH THE WAY TO THE MOON.

OR YOU CAN THINK OF IT THIS WAY: A MILLION SECONDS IS 12 DAYS, BUT A BILLION SECONDS ADDS UP TO OVER 31 YEARS. AND A TRILLION SECONDS IS 300 CENTURIES-LONGER THAN THE HISTORY OF CIVILIZED MAN.

LIKE NOTHING ELSE IN HUMAN EXPERIENCE, ASTRONOMY ENCOMPASSES DISTANCES, AGES AND SIZES SO ENORMOUS THAT IT IS NEARLY IMPOSSIBLE TO GET EVEN AN APPROXIMATE MENTAL IMAGE OF THEM.

EXCEPT FOR THE QUASARS, GALAXIES ARE BELIEVED TO BE THE MOST DISTANT OBJECTS KNOWN. SINCE OUR MAIN ARTICLE DEALS EXCLUSIVELY WITH THESE HUGE AND REMOTE SYSTEMS IT MAY BE HELPFUL IF WE DEVISE MODELS TO BRING SOME OF THESE MONSTROUS NUMBERS INTO PERSPECTIVE.

WE'LL START NEAR HOME. IMAGINE THE SUN AS A ONE INCH SPHERE, SOMEWHAT SMALLER THAN A GOLF BALL-ABOUT THE SIZE OF A WALNUT. EARTH THEN BECOMES A SPECK OF DUST ABOUT EIGHT FEET AWAY WITH A SMALLER SPECK-THE MOON-ONE FOURTH OF AN INCH AWAY. JUPITER IS A SMALL PEA JUST UNDER FORTY FEET FROM THE ONE INCH SUN. A MICROSCOPIC SPECK OF DUST 300 FEET FROM THE SUN IS PLUTO, OUTER MOST PLANET OF THE SUN'S FAMILY. THE NEAREST STAR, ALPHA CENTAURI [A TRIPLE STAR SYSTEM], IS NOW TWO WALNUTS AND A MARBLE-40 MILES AWAY. YOU COULDN'T CONVENIENTLY WALK TO THE NEAREST STAR IVEN IF THE UNIVERSE WERE REDUCED TO THIS MICROSCOPIC SCALE.

BUT THE MILKY WAY GALAXY CONTAINS A FEW HUNDRED BILLION STARS AND IS 100,000 LIGHT YEARS WIDE. ON OUR SCALE THE GALACTIC WIDTH WOULD BE ABOUT NINE MILLION MILES-ABOUT 40 TIMES THE ACTUAL DISTANCE TO THE MOON.

ALREADY THINGS ARE GETTING UNMANAGEABLE, SO LET'S REDUCE OUR SCALE EVEN MORE. IF THE STARS COULD BE SHRUNK TO MICROSCOPIC SPECKS SO TINY THAT EVEN GIGANTIC BETELGEUSE [800 TIMES THE SUN'S DIAMETER] WAS LESS THAN ONE INCH ACROSS, THE SPACE BETWEEN THEM SHRIVEL TO AN AVERAGE OF 1/2 MILE OR SO. NOW THE MILKY WAY GALAXY BECOMES ABOUT AS WIDE AS THE TRUE SIZE OF EARTH [8,000 MILES]. OUR NEAREST MAJOR NEIGHBOR, THE ANDROMEDA GALAXY, IS NOW ONLY A LITTLE OVER 1/2 THE TRUE EARTH MOON

FEB 75

SOMEWHAT SMALLER THAN A GOLF BALL-ABOUT THE SIZE OF THE EARTH THEN BECOMES A SPECK OF DUST ABOUT EIGHT FEET AWAY WITH A SMALLER SPECK-THE MOON-ONE FOURTH OF AN INCH AWAY. JUPITER IS A SMALL PEA JUST UNDER FORTY FEET FROM THE ONE INCH SUN. A MICROSCOPIC SPECK OF DUST 300 FEET FROM THE SUN IS PLUTO, OUTER MOST PLANET OF THE SUN'S FAMILY. THE NEAREST STAR, ALPHA CENTAURI (A TRIPLE STAR SYSTEM), IS NOW TWO WALNUTS AND A MARBLE-400 MILES AWAY. YOU COULDN'T CONVENIENTLY WALK TO THE NEAREST STAR EVEN IF THE UNIVERSE WERE REDUCED TO THIS MICROSCOPIC SCALE.

BUT THE MILKY WAY GALAXY CONTAINS A FEW HUNDRED BILLION STARS AND IS 100,000 LIGHT YEARS WIDE. ON OUR SCALE THE GALACTIC WIDTH WOULD BE ABOUT NINE MILLION MILES-ABOUT 40 TIMES THE ACTUAL DISTANCE TO THE MOON.

ALREADY THINGS ARE GETTING UNMANAGEABLE, SO LET'S REDUCE OUR SCALE EVEN MORE. IF THE STARS COULD BE SHRUNK TO MICROSCOPIC SPECKS SO TINY THAT EVEN GIGANTIC BETELGEUSE (800 TIMES THE SUN'S DIAMETER) WAS LESS THAN ONE INCH ACROSS, THE SPACE BETWEEN THEM SHRIVEL TO AN AVERAGE OF 1/2 MILE OR SO. NOW THE MILKY WAY GALAXY BECOMES ABOUT AS WIDE AS THE TRUE SIZE OF EARTH (8,000 MILES). OUR NEAREST MAJOR NEIGHBOR, THE ANDROMEDA GALAXY, IS NOW ONLY A LITTLE OVER 1/2 THE TRUE EARTH MOON DISTANCE FROM US.

IF LIKE SOME GOD, WE COULD STROLL THROUGH THIS MINIATURE UNIVERSE WE COULD WALK FROM ONE STAR TO ANOTHER IN ONLY A FEW MINUTES. BUT EVEN HERE IT WOULD TAKE A LIFE TIME TO WALK BETWEEN GALAXIES.

LET'S MAKE ONE FINAL REDUCTION: THE MILKY WAY GALAXY IS NOW SMALL ENOUGH TO HOLD IN YOUR HAND-A DELICATE DISC OF SUBATOMIC SIZED STARS. THE ANDROMEDA GALAXY IS ONLY SLIGHTLY LARGER, NOT QUITE WITHIN REACH AT IT'S SCALED DOWN DISTANCE OF 7 FEET. IN ALL DIRECTIONS YOU PERCEIVE THE UNIVERSE OF GALAXIES RANGING FROM BASKETBALL SIZED ELLIPTICALS DOWN TO NEARLY INVISIBLE IRREGULARS AND BABY ELLIPTICALS. HERE WITH ONLY A FEW STEPS BETWEEN GALAXIES, THERE ARE SO MANY THAT THEY WOULD FILL A VOLUME 10,000 TIMES THAT OF THE HOUSTON ASTRODOME.

JOHN BRUCE
PRESIDENT

WHAT CAUSED THE ICE AGES?

BY

DAVID KURICEK

CONTINENTAL GLACIATION, WHEN MASSIVE ICE SHEETS UP TO A MILE THICK SHEEP DOWN FROM THE NORTH TO COVER LARGE PORTIONS OF LAND AREA, IS A RARE EVENT IN EARTH'S HISTORY. THE MAJOR GLACIATIONS OF THE PAST OCCURED DURING THE PLEISTOCENE EPOCH [3,000,000 TO 10,000 YEARS AGO], DURING THE LATE PALEOZOIC [200 TO 300 MILLION YEARS AGO] WHEN THERE WAS WIDESPREAD GLACIATION OF THE SOUTHERN CONTINENTS, AND IN THE EOCAMERIAN PERIOD [ABOUT 700 MILLION YEARS AGO]. GLACIATION IS IRREGULAR-- OCCURRING ANYWHERE FROM 200 TO 1,000 MILLION YEARS APART-- AND HAS HAD TREMENDOUS EFFECTS ON THE EARTH. LAND WAS BRUTALLY SCARRED [FOR INSTANCE, THE LAST GLACIAL ADVANCE CARVED THE MISSOURI RIVER AND FORCED THE OHIO RIVER SOUTHWARD TO DRAIN INTO THE MISSISSIPPI, AND IT IS THOUGHT TO HAVE SCOOPED OUT THE GREAT LAKES], AND CONTINENTS ARE STILL REFOUNDING FROM BEING COVERED BY GLACIAL ICE. THE ICE AGE ALSO HAD ITS EFFECTS ON LIFE, SUCH AS THE LOWERING OF SEA LEVEL SEVERAL HUNDRED FEET TO EXPOSE LAND BRIDGES TO ISLANDS AND CONNECTING CONTINENTS. ANIMALS CROSSED THESE BRIDGES AND, WHEN THE SEA LEVEL ROSE, WERE ISOLATED. EVOLUTION THEN WENT TO WORK AND, AS THE ANIMALS MULTIPLIED TO FILL THEIR NEW HOMES, MANY NEW VARIATIONS OF THE SPECIES AROSE. THOUGH THERE IS STILL MUCH SPECULATION ABOUT CAUSES OF GLACIATION, SCIENTISTS HAVE ADVANCED SEVERAL GEO-ASTRONOMICAL HYPOTHESES TO EXPLAIN THE ICE AGES.

THERE ARE TWO QUESTIONS THAT ANY HYPOTHESIS ABOUT THE CAUSES OF THE ICE AGES MUST ANSWER: 1. WHAT WAS RESPONSIBLE FOR THE DROP IN TEMPERATURE THAT CAUSED THE ICE TO ADVANCE? 2. WHAT WAS RESPONSIBLE FOR THE PERIODIC OSCILLATIONS DURING THE ICE AGE IN WHICH THE GLACIERS WITHDREW PARTIALLY OR ENTIRELY TO LEAVE A CLIMATE AS WARM AS TODAY'S? HYPOTHESES FALL INTO FOUR MAIN GROUPS: CHANGES IN SOLAR RADIATION, ASTRONOMICAL HYPOTHESES, TERRESTRIAL CHANGES, AND HEAT DISTRIBUTION OVER THE EARTH FROM THE EQUATOR TO THE POLES.

THE FIRST GROUP PROPOSES THAT THE AMOUNT OF SOLAR RADIATION REACHING EARTH DECREASED FOR SOME REASON AND TERRESTRIAL TEMPERATURE FELL. ONE HYPOTHESIS SAYS THAT, DURING THE PLEISTOCENE [THE MOST RECENT ICE AGE], OUR SOLAR SYSTEM PASSED THROUGH A LARGE COSMIC DUST CLOUD WHICH DIMINISHED THE AMOUNT OF SOLAR RADIATION EARTH RECEIVED. THIS EXPLAINS HOW THE TEMPERATURE COULD HAVE DROPPED ENOUGH TO CAUSE THE ACCUMULATION OF ICE, AND IT MIGHT EVEN EXPLAIN THE PERIODIC OSCILLATIONS OF THE ICE SHEETS. FOR INSTANCE, THE CLOUD MAY HAVE BEEN OF VARYING DENSITY, AND ICE ADVANCED WHEN THE EARTH PASSED THROUGH THE DENSEST PARTS AND RETREATED AS EARTH PASSED THROUGH THE THINEST PARTS. FOR REASONS KNOWN ONLY TO ITSELF, THE SUN MIGHT ALSO HAVE VARIED ITS OUTPUT OF RADIATION. THIS WOULD, AGAIN, NOT ONLY EXPLAIN THE LOWERING OF TEMPERATURES TO GLACIAL CLIMATE, BUT ALSO THE PERIODIC OSCILLATIONS. UNFORTUNATELY, THIS HYPOTHESIS IS UNTESTABLE AT THE PRESENT TIME BECAUSE NO ABSOLUTELY ACCURATE MEASUREMENTS OF SOLAR RADIATION HAVE BEEN MADE. AND IF SUCH MEASUREMENTS COULD BE MADE, THEY WOULD HAVE TO BE TAKEN OVER A LONG PERIOD OF TIME.

THERE IS ONE ASTRONOMICAL HYPOTHESIS THAT HAS GARNERED MUCH INTEREST IN THE LAST FEW YEARS. IT WAS PROPOSED IN 1920 BY

THE FIRST GROUP PROPOSES THAT THE AMOUNT OF SOLAR RADIATION REACHING EARTH DECREASED FOR SOME REASON AND TERRESTRIAL TEMPERATURE FELL. ONE HYPOTHESIS SAYS THAT, DURING THE PLEISTOCENE [THE MOST RECENT ICE AGE], OUR SOLAR SYSTEM PASSED THROUGH A LARGE COSMIC DUST CLOUD WHICH DIMINISHED THE AMOUNT OF SOLAR RADIATION EARTH RECEIVED. THIS EXPLAINS HOW THE TEMPERATURE COULD HAVE DROPPED ENOUGH TO CAUSE THE ACCUMULATION OF ICE, AND IT MIGHT EVEN EXPLAIN THE PERIODIC OSCILLATIONS OF THE ICE SHEETS. FOR INSTANCE, THE CLOUD MAY HAVE BEEN OF VARYING DENSITY, AND ICE ADVANCED WHEN THE EARTH PASSED THROUGH THE DENSEST PARTS AND RETREATED AS EARTH PASSED THROUGH THE THINEST PARTS. FOR REASONS KNOWN ONLY TO ITSELF, THE SUN MIGHT ALSO HAVE VARIED ITS OUTPUT OF RADIATION. THIS WOULD, AGAIN, NOT ONLY EXPLAIN THE LOWERING OF TEMPERATURES TO GLACIAL CLIMATE, BUT ALSO THE PERIODIC OSCILLATIONS. UNFORTUNATELY, THIS HYPOTHESIS IS UNTESTABLE AT THE PRESENT TIME BECAUSE NO ABSOLUTELY ACCURATE MEASUREMENTS OF SOLAR RADIATION HAVE BEEN MADE. AND IF SUCH MEASUREMENTS COULD BE MADE, THEY WOULD HAVE TO BE TAKEN OVER A LONG PERIOD OF TIME.

THERE IS ONE ASTRONOMICAL HYPOTHESIS THAT HAS GARNERED MUCH INTEREST IN THE LAST FEW YEARS. IT WAS PROPOSED IN 1920 BY A YUGOSLAVIAN METEOROLOGIST, M. MILANKOVITCH. MILANKOVITCH MADE CALCULATIONS OF SOLAR RADIATION VARIATIONS DUE TO THREE FACTORS: THE INCLINATION OF THE EARTH'S AXIS, THE ELLIPTICITY OF THE EARTH'S ORBIT AROUND THE SUN, AND THE PRECESSION OF THE EQUINOXES [THE WOBBLE OF THE EARTH'S AXIS]. THE DATA ON THESE FACTORS, AND THE LENGTH OF TIME IT TAKES FOR THESE VARIATIONS, IS AS FOLLOWS:

ELLIPTICITY OF ORBIT	0.017 TO 0.053	EVERY 92,000 YRS.
INCLINATION OF AXIS	21 1/2 TO 24 1/2	40,000 YRS.
PRECESSION OF EQUINOXES	0 TO 360	21,000 YRS.

BECAUSE OF SUCH LONG PERIODS, THESE RELATIONSHIPS WOULD ONLY REINFORCE EACH OTHER, OR BE IN POSITIONS PERMITTING THE LEAST AMOUNT OF SOLAR HEAT TO WARM EARTH, CAUSING A SLIGHT BUT, ACCORDING TO MILANKOVITCH, SIGNIFICANT TEMPERATURE VARIATION, ONCE EVERY SEVERAL THOUSAND YEARS [I BELIEVE THE FIGURE IS SOMETHING LIKE EVERY 40,000 YRS.]. DUE TO RECENT CALCULATIONS, HOWEVER, IT APPEARS THAT THE AMOUNT OF TEMPERATURE CHANGE WOULD FALL SHORT OF THAT REQUIRED TO CAUSE AN ICE AGE. FINALLY, THIS HYPOTHESIS DOES NOT EXPLAIN THE PERIODIC OSCILLATIONS OF THE GLACIAL CLIMATE. SINCE ELLIPTICITY, INCLINATION, AND PRECESSION REINFORCE EACH OTHER PERIODICALLY AND SO FREQUENTLY, WE COULD EXPECT GLACIATION TO BECOME A COMMON EVENT, WHICH, AS STATED EARLIER, IT IS NOT.

THE NEXT GROUP OF HYPOTHESES, TERRESTRIAL CHANGES, INCLUDES ANYTHING FROM ATMOSPHERE TRANSPARENCY TO SIZE OF LAND MASSES. AS SEEN FROM SPACE THE EARTH'S OCEANS ARE LARGE DARK MASSES WHILE THE CONTINENTS AND CLOUDS ARE LIGHT. THIS IS BECAUSE MOST OF THE SOLAR RADIATION STRIKING THE WATER IS ADSORBED AND VERY LITTLE IS REFLECTED AWAY, HENCE THE DARK COLOR. SOLAR RADIATION STRIKING THE LAND OR A CLOUD COVER, ON THE OTHER HAND, IS ALMOST ALL REFLECTED BACK INTO SPACE, CAUSING THE CLOUDS AND CONTINENTS TO APPEAR LIGHT. THE LARGER THE LAND AREA, THE MORE HEAT AND LIGHT IS REFLECTED, AND THE COOLER IS THE CLIMATE. IT IS INTERESTING TO NOTE THAT DURING EVERY MAJOR GLACIATION, THE CONTINENTS WERE LARGER THAN THEY ARE TODAY.

ALBEDO [THE AMOUNT OF LIGHT A BODY REFLECTS] ALSO WORKS WELL AS AN EXAMPLE OF AN ATMOSPHERE TRANSPARENCY THEORY. VOLCANOES, FACTORIES [WHICH WE WILL HAVE TO RULE OUT SINCE THERE WEREN'T MANY OF THEM AROUND IN THE PLEISTOCENE], AND OTHER PHENOMENA RELEASE PARTICLES OF DUST INTO THE UPPER ATMOSPHERE WHERE THEY SERVE AS NUCLEI FOR THE FORMATION OF ICE CRYSTALS; THESE ICE CRYSTALS ARE QUITE EFFICIENT REFLECTORS OF HEAT.

ANOTHER ATMOSPHERE TRANSPARENCY THEORY HAS TO DO WITH THE CARBON DIOXIDE CONTENT OF THE ATMOSPHERE. WITNESS, FOR INSTANCE, THE GREENHOUSE EFFECT. ABOUT FOURTEEN MILES ABOVE EARTH IS A LAYER OF OZONE. BOTH SHORT AND LONG WAVELENGTH RADIATION COMING FROM THE SUN STRIKES THIS LAYER, BUT ONLY THE SHORT WAVELENGTH RADIATION PENETRATES, TRAVELS DOWN THROUGH THE ATMOSPHERE, STRIKES THE EARTH'S SURFACE, AND BOUNCES OFF. ON SUCH A REBOUND, IT IS TRANSFORMED FROM SHORT TO LONG WAVELENGTH RADIATION. INTERESTINGLY ENOUGH, THIS RADIATION IS NOW OF THE SAME WAVELENGTH AS CARBON DIOXIDE, WHICH PROMPTLY ADSORBS IT. IN THIS WAY, HEAT IS RETAINED BY THE ATMOSPHERE. LET US SAY THAT THERE WAS A POPULATION EXPLOSION OF PLANTS AT THE END OF THE MESOZOIC ERA--CREATING A GREATER DEMAND FOR CARBON DIOXIDE THAN USUAL. THE CARBON DIOXIDE CONTENT OF THE ATMOSPHERE WOULD FALL, AND THE TEMPERATURE WOULD SLIDE DOWN. AND SO WOULD THE ICE.

OUR LAST CATEGORY OF HYPOTHESES IS HEAT VARIATION AND DISTRIBUTION FROM EQUATORIAL TO POLAR REGIONS. THE MOST INTENSIVE SOLAR HEAT COMES DOWN ALONG A NARROW BAND RIGHT OVER THE EQUATOR. ALL LATITUDES NORTH AND SOUTH RECEIVE DIMINISHING AMOUNTS OF HEAT AS WE MOVE FARTHER FROM THE EQUATOR, AND THE POLES RECEIVE THE LEAST. HEAT STRIKING EQUATORIAL WATER IS ADSORBED AND MOVED NORTHWARD BY A SERIES OF OCEAN CURRENTS TO ACHIEVE A NEAR UNIFORM DISTRIBUTION OVER THE EARTH--WITH ONE EXCEPTION: THE OCEAN CURRENTS ARE BLOCKED AND CANNOT CIRCULATE INTO THE NORTHERN SEAS, THEREFORE LEAVING IT RATHER FRIGID UP THERE AT THE TOP OF THE NORTH AND ALLOWING FOR THE BUILD-UP OF AN ICE CAP.

COMING FROM THE SUN STRIKES THIS LAYER, NOT ONLY THE SHORT WAVELENGTH RADIATION PENETRATES, TRAVELS DOWN THROUGH THE ATMOSPHERE, STRIKES THE EARTH'S SURFACE, AND BOUNCES OFF. ON SUCH A REBOUND, IT IS TRANSFORMED FROM SHORT TO LONG WAVELENGTH RADIATION. INTERESTINGLY ENOUGH, THIS RADIATION IS NOW OF THE SAME WAVELENGTH AS CARBON DIOXIDE, WHICH PROMPTLY ABSORBS IT. IN THIS WAY, HEAT IS RETAINED BY THE ATMOSPHERE. LET US SAY THAT THERE WAS A POPULATION EXPLOSION OF PLANTS AT THE END OF THE MESOZOIC ERA--CREATING A GREATER DEMAND FOR CARBON DIOXIDE THAN USUAL. THE CARBON DIOXIDE CONTENT OF THE ATMOSPHERE WOULD FALL, AND THE TEMPERATURE WOULD SLIDE DOWN. AND SO WOULD THE ICE.

OUR LAST CATEGORY OF HYPOTHESES IS HEAT VARIATION AND DISTRIBUTION FROM EQUATORIAL TO POLAR REGIONS. THE MOST INTENSIVE SOLAR HEAT COMES DOWN ALONG A NARROW BAND RIGHT OVER THE EQUATOR. ALL LATITUDES NORTH AND SOUTH RECEIVE DIMINISHING AMOUNTS OF HEAT AS WE MOVE FARTHER FROM THE EQUATOR, AND THE POLES RECEIVE THE LEAST. HEAT STRIKING EQUATORIAL WATER IS ABSORBED AND MOVED NORTHWARD BY A SERIES OF OCEAN CURRENTS TO ACHIEVE A NEAR UNIFORM DISTRIBUTION OVER THE EARTH--WITH ONE EXCEPTION: THE OCEAN CURRENTS ARE BLOCKED AND CANNOT CIRCULATE INTO THE NORTHERN SEAS, THEREFORE LEAVING IT RATHER FRIGID UP THERE AT THE TOP OF THE WORLD AND ALLOWING FOR THE BUILD-UP OF AN ICE CAP.

GLACIATION HAS BEEN A MAJOR FORCE SHAPING THE EARTH AND ITS LIFE; HOWEVER, SCIENTISTS ARE AT A LOSS TO COME UP WITH ONE REALLY SUITABLE HYPOTHESIS TO EXPLAIN IT. MOST LIKELY ONE OF THE HYPOTHESES PROPOSED IS NOT SUFFICIENT AS THE ONLY CAUSE OF GLACIATION. PERHAPS THE ICE AGES WERE TRIGGERED BY A COMBINATION OF THE THEORIES SET FORWARD. SINCE GLACIATION IS NOT PERIODIC, WE CANNOT PREDICT WHEN THE NEXT ICE AGE WILL OCCUR, BUT BECAUSE LESS THAN TEN THOUSAND YEARS HAVE PASSED SINCE THE LAST CONTINENTAL ICE SHEETS WITHDREW, SOME SCIENTISTS HAVE SUGGESTED THAT WE ARE NOW LIVING DURING AN INTERGLACIAL PERIOD. IN FACT, IF THE AVERAGE ANNUAL TEMPERATURE WERE TO DROP FIVE DEGREES, GLACIAL ICE WOULD BUILD UP AND ONCE AGAIN BEGIN ITS WEARY JOURNEY DOWN FROM THE NORTH; THIS TEMPERATURE HAS ALREADY DROPPED ONE-HALF OF A DEGREE IN THE LAST THIRTY YEARS |IT WAS A DROP OF SOMETHING LIKE ONE FOURTH DEGREE IN THE SIXTY YEARS BEFORE THAT|. IF THIS TREND CONTINUES, OUR DESCENDENTS IN THE NOT TOO DISTANT

FUTURE MAY BE IN A POSITION TO DISCOVER FIRST HAND WHAT CAUSED THE ICE AGES.

REFERENCES

1. ROBERT H. DOTT JR., ROGER L. BATTEN, EVOLUTION OF THE EARTH [MCGRAW HILL, 1971], PAGES 444 TO 473.
2. JAMES GILLULY, AARON C. MATERS, A. O. WOODFORD, PRINCIPLES OF GEOLOGY [W. H. FREEMAN AND COMPANY, 1968], PAGES 245-248.
3. SKY AND TELESCOPE, VOLUME THIRTY THREE, NUMBER FOUR, APRIL 1967, PAGES 221 TO 225.

FOR SALE: 1-PHOTOGRAPHIC ENLARGER AND DEVELOPING SUPPLIES
SEE OR CALL JESS WILLIAMS

FOR SALE 1-2.444 REFRACTING TELESCOPE WITH TRI-POD, EQUATORIAL
HEAD AND WOODEN FACTORY BOX FOR TUBE AND EYEPIECES.
↓↓↓↓↓↓↓
SOLD ALL PARTS IN VERY VERY GOOD CONDITION. FOR INFO.
SEE JESS WILLIAMS OR JOHN BRUCE.-----SOLD

NOTICE

IF YOU HAVE ANY OLD OR DUPLICATE ISSUES OF SKY AND TELESCOPE THAT YOU NO LONGER WANT, BRING THEM TO THE MEETING SO THAT WE CAN ADD THEM TO THE CLUB LIBRARY. IF YOU WOULD LIKE TO READ A ARTICLE IN A OLD SKY AND TELESCOPE THAT YOU DO NOT HAVE CHECK THE CLUB LIBRARY, AS THERE ARE MANY OLDER ISSUES IN IT.

ANY ONE WANTING TO PRESENT A PROGRAM AT ONE OF THE CLUB MEETINGS SHOULD CONTACT JOHN BRUCE, JACK DUMM, OR JESS WILLIAMS SO THAT A DATE CAN BE SET ASIDE FOR YOU. THERE ARE MANY OPENINGS FOR THE REST OF THIS YEAR AND EVEN IF YOUR PROGRAM IS SHORT IT WILL STILL ADD TO THE MEETING SO DON'T BE AFRAID TO GET UP THERE AND DO YOUR THING.