

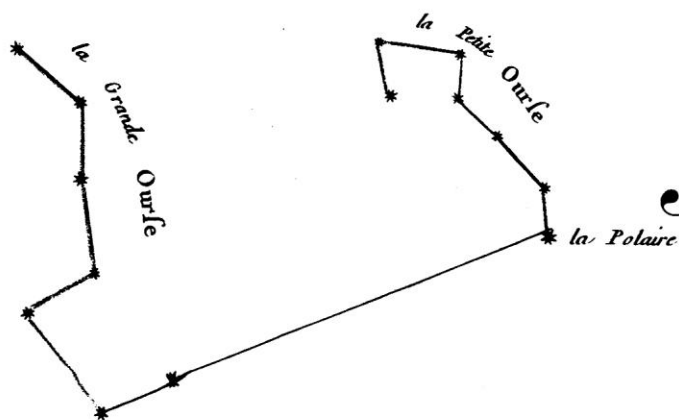
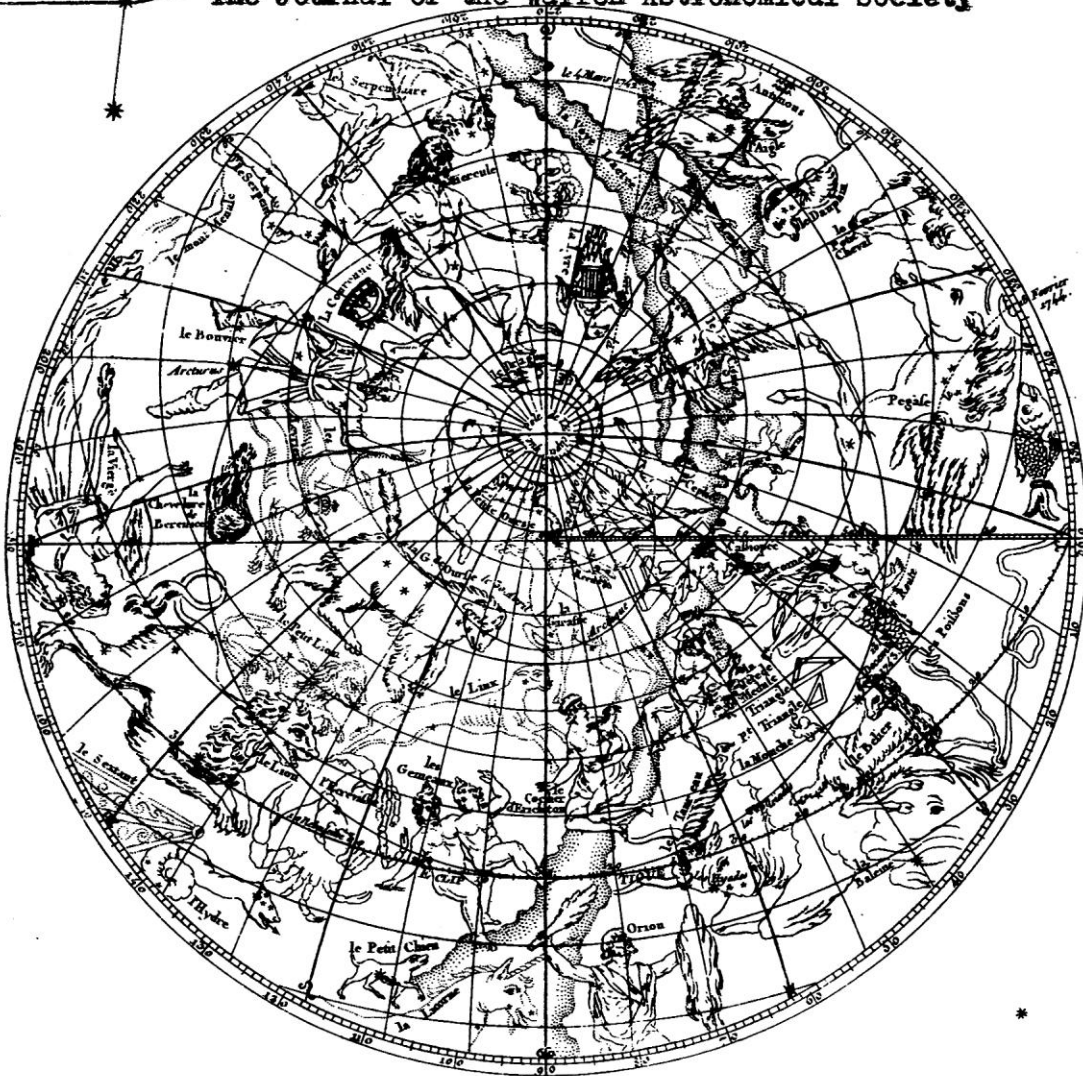
*Étoiles du Cygne qui forment une grande Croix, dans la voie Lactée.*

*Étoiles de Cassiopée, qui forment une espèce de Chaire renversée, dans la voie Lactée.*

# The WASP

*Hémisphère Boréal.*

The Journal of the Warren Astronomical Society



*November,*  
**1971**

*la Tête  
d'Andromède \**

*Étoiles de Pégase, qui composent un quadrilatère, avec la tête d'Andromède*

## TABLE OF CONTENTS

	Page
News Items .....	2
Some Notes on Winter Observing .....	3,4,5
Some Winter Messier Objects .....	6,7
Some Useful and Inexpensive Amateur Periodicals .....	8,9,10,11
A Compilation of Very Important but Little Known Scientific Principles .....	12,13
Aurora and Heart Disease .....	14,15,16
Astro-Almanac .....	17
Warren Astronomical Society Christmas Banquet .....	18

COVER BY KEN WILSON

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## NEWS ITEMS

by

Kenneth Wilson

### The Search for Trans-plutonian Planets

Both Neptune and Pluto were discovered through observation of the motions of known planets. When certain perturbations in the orbits of the outermost planets could not be explained by the gravitational forces of the sun or other planets; another, more distant planet was hypothesized. From the perturbations, the positions and mass of these hypothesized planets were calculated and searches begun. In this manner Neptune and Pluto were discovered.

When Pluto was discovered, in 1930, its position was predicted for a planet with 100 times the mass that has been recently calculated for Pluto. This missing mass raises the suspicion of the existence of a new trans-plutonian planet or planets.

P. K. Seidelmann of the U.S. Naval Observatory has made a theoretical search for such a planet(s). He calculated orbits for the known outer planets including the influence of three different hypothetical trans-plutonian planets. In the October "Astrophysical Journal", he reported that the results were so nearly identical to the observed orbit of the known planets, that if there are any trans-plutonian planets, their effects on known planets are so small that their presence or absence cannot be detected through his method of calculation.

\*\*\*\*\*

### Extra Solar Planets?

Even if there are no more undiscovered planets to our Solar System, other star systems should not be ruled out. Gregory Natloff of Queens College and "Physics Today" says that if large optical telescopes are ever built in space (which is being planned), planets revolving around other stars may be directly visible. The light will probably be too weak to permit spectral lines to be studied in great detail. But, Natloff suggests that something may be inferred from their overall color. Earthlike planets will probably be bluer in appearance than their stars. Those planets resembling Venus, Mars, and Jupiter will be redder than their stars.

\*\*\*\*\*

### New companion of M31

In the November 3rd "Event Card" of the Smithsonian Astrophysical Observatory, it was reported that Sidney van den Bergh, 42, of the David Dunlap Observatory had discovered a new companion galaxy to M31. It is a spheroidal galaxy 2.5 minutes of arc in diameter, -11 absolute magnitude, at a distance of 700 kilo-parsecs. Its coordinates are: R.A. -0h 43m, Dec. - 37° 44'. The Dutch-born astronomer theorizes that the galaxy was not discovered before due to its low surface brightness.

Curiously enough, "The Detroit News" in reporting this discovery says that van den Bergh discovered three new galaxies at an equivalent distance of two million light years; whereas, the Smithsonian says that only one galaxy was found.

(If you read the news, you know??)

## SOME NOTES ON WINTER OBSERVING

by Timothy Skonieczny

The coming winter is eagerly looked upon for its dark and crisp nights~ its absence of insects~ and its possession of some of the most noted constellations, especially Orion. But who would stop to think that such fine and splendid nights are actually the scraps left over from the bottom of the bowl of the southwestern states who will enjoy over 30 clear nights this winter, while we are stuck with only about 15! Though difficult to believe, only about 1 out of every 6 nights this winter will probably be clear enough to use all night long. Eleven or so of these nights will, in some way, be affected by a quarter, gibbous, or full moon. That leaves an infinitesimal 4 nights of ideal observing conditions. Four or so nights is not much to do serious observing, so you'll have to get every second you can out of them.

Clear winter nights often come as a complete surprise, giving only a days notice at best. By predicting such nights, more time can go into preparing for them rather than watching them pass by. The following points can help you make short term weather predictions so that you may prepare for clear nights in advance:

1) The weather will usually clear when

- a) the base of the clouds show a steady rise to higher types
- b) the wind shifts to a westerly direction
- c) the barometer rises steadily and rapidly

2) The weather will usually stay clear when

- a) the wind steadily comes from a "westerly direction
- b) the barometer rises or remains steady above or at sea level.

Predicting the weather a day or so in advance can be your best help for planning a night's work. A good general rule to follow is that if the weather report says cloudy, and you say clear it will probably be clear.

If you know in advance when a clear night will occur, give serious thought to what you'll do for those few precious hours. Will I search for Messier or N.G.C. objects and add them to my collection? Will I do some guided photography? Or will I just sit back and enjoy the sky in all its splendors? Knowing what you will do will help you spend those nights much better than if you are completely unprepared.

If you plan to search for Messier objects, jot down some notes on where the objects you plan to look for are, some quick references to them and how difficult they may be to find. Always carry at least two different atlases at all times. This way, you'll be sure to have at your fingers any information you may need.

If you plan to shoot any part of the Sky, prepare in advance what you want to shoot, where in the sky it is, and what type of film you want to use. Guided photography always requires comfort for the observer, so dress warmly. It is always good practice to carry a roll or two of film more than what

you plan to use, at least 1 color and 1 black and white. Some astronomical phenomena may use all of the film that you may have, especially when you least expect it.

Several observers, perhaps the lucky ones, are content with just lying on their back and watching whatever happens to occur. Few meteors streak by without their knowing it, and they often take the credit for first spotting aurora. If you don't plan anything for an evening, or if you are caught by surprise by a sweeping cold front, consider this way of spending an evening. The only things you need are a blanket to lie on, a pair of binoculars, and some hot coffee to prevent you from falling asleep.

Winter nights, though few and often unpredictable, can be just as useful as five times their number in summer nights. If you should go to sleep knowing the night is perfectly clear and the moon will not show its presence for 1 minute, remember, you have only 3 such nights until spring!

## SOME WINTER MESSIER OBJECTS

by

Kenneth Wilson

I have found that observing in Warren is best done in the early morning hours before sunrise. At this time there seems to be considerably less light and air pollution. The air also seems to be steadier and more transparent.

Due to this fact, I did some Messier hunting on several early mornings about a month ago. At that time the Orion area (Orion, Canis Major, Monoceros, Puppis and Lepus) was rising just shortly before the sun. There are some fine Messier objects in this area well worth looking for. And as this area is rising earlier and earlier, these objects will be well placed for observation this winter.

Below are descriptions of these objects end, on the page following" a chart showing their locations. As Frank McCullough may choose some of these objects for the next Messier contest, you might want to look at them.

- 1.) M42 – NGC: 1976, in Orion, coordinates:  $05^{\text{h}}33^{\text{m}} -05^{\circ}25'$ , 6<sup>th</sup> magnitude, size: 66'x60', type diffuse nebula. This magnificent nebula has probably been seen by most amateur astronomers. It is extremely large and bright and can easily be seen in binoculars. It is best seen at low power-60x at most. With 60x or more, you should be able to split Theta Orionis, which lies in the middle of the nebula, into a trapezoid of four stars. This group of stars is called The Trapezium.
- 2.) M43 – NGC: 1982, in Orion~ coordinates;  $05^{\text{h}}33^{\text{m}} -05^{\circ}18'$ , 9<sup>th</sup> magnitude, size: small, type: diffuse nebula. This is a detached portion of M42. It is quite vague and small, but can easily be seen in a 6".
- 3.) M78 – NGC: 2068, in Orion, coordinates:  $05^{\text{h}}44^{\text{m}} +00^{\circ}02'$ , 10<sup>th</sup> magnitude, size: 8'x6', type: diffuse nebula. This is a vague, small, fuzzy spot of nebulosity. Despite its apparent difficulty, I have found it with little trouble from Warren in my 6" reflector.
- 4.) M79 - NGC: 1904, in Lepus, coordinates:  $05^{\text{h}}22^{\text{m}}, -24^{\circ}34'$ , 8<sup>th</sup> magnitude, size: 8', type: globular cluster. Nice, bright, and fairly large. I couldn't resolve it in my 6".
- 5.) M41 - NGC: 2287, in Canis Major, coordinates:  $06^{\text{h}}45^{\text{m}} -20^{\circ} 42'$ , 5<sup>th</sup> magnitude, size: 32', type: open cluster. Large, bright (naked eye), cluster with a bright central red star.
- 6.) M50 – NGC: 2323, in Monoceros, coordinates:  $07^{\text{h}}00^{\text{m}} -08^{\circ} 16'$ , 6<sup>th</sup> mag., Size: 16' type: open cluster. Large and irregular with some bright and many dim stars.
- 7.) M46 – NGC: 2437, in Puppis, coordinates:  $07^{\text{h}}40^{\text{m}} -14^{\circ} 42'$ , 6<sup>th</sup> magnitude, size: 27', type: open cluster. A large, bright cluster, with many bright stars in it.
- 8.) M47 – NGC: 2422, in Puppis~ coordinates:  $07^{\text{h}}34^{\text{m}} -14^{\circ} 22'$ , 5th magnitude, size: 28', type: open cluster. Bright, large, coarse cluster with many bright blue stars. This cluster is listed as missing by many sources, but Messier probably recorded it incorrectly.



# SOME WINTER MESSIER OBJECTS

(CONT.)

ORION

Betelgeuse

Rigel

M43  
M42

MONOCEROS

M50

Sirius

M41

CANIS MAJOR

CANIS MINOR

Procyon

PUPPIS

M79

LEPUS



As the organization of amateur astronomy has developed in recent years, there has been an equally fascinating growth of an encouraging (but often appalling) phenomenon: the amateur astronomical society newspaper. The development of the club newsletter into an article of respectable scientific and creative journalism is, in the broadest sense, encouraging to those who look to its generally youthful publisher for future leadership and constructive creative activity. For it is here that the young amateur can obtain a respectable and sincere respect for his interests by attempting to communicate his ideas to others; but perhaps most importantly, gain a respect and working knowledge of the artistic and aesthetic criteria and responsibility the author or editor of the publication must welcome to most effectively communicate the degree of hope and respect he has for his endeavors.

The results are, as I have said, often appalling; particularly with those papers whose editors feel they have no overwhelming mandate or responsibility to publish, and also with those whose editors simply lack what it takes to produce a paper not in want of the merits of creative expression. But that's the way it goes.

To attempt to indicate what can be and what has been done in the development of amateur communications, I have selected to review six of the currently published papers that have appeared to be of greatest working value to the amateur and of least expense.

METEOR NEWS published 5 times/yr. by the Astra-Gator Astronomy Club, Jacksonville Children's Museum, 1025 Gulf Life Dr., Jacksonville, Fla. 322070 \$1.00/yr.

This mimeographed sheaf that has been published for about a year contains notes and ephemerides on all major and minor showers, news on meteor observing programs, detailed accounts of shower observations, and news on the activities and observations of other meteor organizations. Even if your prime interest is not meteor observing, this comprehensive and well-edited newsletter may be a useful reference beyond what is listed in the popular journals.

AAVSO CIRCULAR monthly by editor John E. Bortle, Gold Road, Stormville, N.Y. 12582. \$2.00/yr.

This is a tightly edited and brief one to two-page listing of magnitude estimates made of currently interesting variable stars by AAVSO observers for variable star faithful. The August issue contains listings of observations of eruptive variables, novae, irregulars and other unusual stars. Following the discovery of every new nova, an official chart is published in the circular. Anyone contributing observations of pertinent stars will be included in the monthly listing.

This paper's primary concern is keeping its observers up to date with accurate estimates or magnitude fluctuations of popular stars.

THE STROLLING ASTRONOMER published 6 times/yr. by the ALPO, BOX AZ,  
University Park, New Mexico 88070. \$4/yr.

Despite the efforts of clever and earnest amateurs to divulge the significance of its extraordinary title, the Strolling Astronomer appears at irregular intervals as a neatly edited magazine readily filled with interesting articles, reports, and notes. Looking back through past issues I find (in order of abundance), cumulative reports by section reporters of observing programs, articles reporting usually a recent series of observations of short-lived phenomena, aspects of general planetological investigations, and generally rewarding descriptions of new or useful amateur instrumentation for lunar and planetary observation and photography. Occasional articles on astrophotography techniques and equipment are included as are papers of a more specialized nature concerning a variety of technical subjects.

It has been suggested that Tucson, Arizona contains more astronomers and telescopes than any city on this side of the earth, by which definition astronomical research center of the nation. Although the core of its active membership is centered here and among the clubs and universities of the American southwest, much of the ALPO's support comes from close corresponding relationships between observers and the lunar and planetary recorders distributed throughout the United States and Canada.

The primary considerations and results of the work done by the ALPO have been the establishment of an efficient network of amateur observers trained in the techniques of lunar and planetary observing to usefully supplement the research of the large observatories, thereby providing concurrently, reliable observational data resulting in the elucidation of planetary phenomena and passing on to the individual observer a tradition of skillful and self-rewarding observational experience established by the great astronomers of the past for four dollars a year.

ALPO COMETS SERVICE published during comet appearances by Dennis Milon,  
378 Broadway, Cambridge, Mass., 02139. FREE (almost)

Here is how it works: (1) Get a manila (or the color of your choice) mailing envelope and send Mr. Milon, the ALPO Comets Recorder a bunch of stamped (8¢), self-addressed envelopes; (2) Wait for a comet == it's that simple.

Immediately after the discovery of a new comet or prior to the appearance of a periodic one you will receive in the mail one of your stamped (8¢) self-addressed envelopes from Mr. Milon. Enclosed find a couple of sheets containing (1) information about the discovery; (2) data on recent or first observations; (3) the comet's orbit and complete ephemerides computed for at least several weeks, usually longer; or (4) all of the above. Mr. Milon's mailing service is amazingly fast and reliable. His comet announcements generally are printed well in advance of either the IAU or Smithsonian bulletins; and always before the wire services releases.

If you forget to keep a record of how many envelopes you've sent and how many have been used, Mr. Milon will send you a note when they have run out.

Although you may receive no notices for many months, that is because new comets have a strange proclivity for missing publication deadlines. The announcement frequency increases considerably however when one does appear and is observable from the northern hemisphere. During Comet Bennett's display I received at times as many as two a week, free (almost).

THE AMATEUR ASTRONOMER 4 times/yr. at 18 Fairhaven Drive,

Buffalo, N.Y. 14225. \$2.50/yr.

There used to be an interesting journal, called The Review of Popular Astronomy published by a few amateur astro-journalists in St. Louis. It was a very good amateur magazine and, for a time, rivaled Sky and Telescope in popularity among amateur clubs. Unfortunately its editors eventually ran out of time, money, support, and probably luck and is now defunct.

To fill the gap (assuming one exists) left by RPA's untimely demise, a group of amateurs in Buffalo have risen to the occasion with a renewed supply of time, money, support, and (probably) luck. Hence, The Amateur Astronomer.

As it has developed and increased in format, thickness and price its content has been uniformly excellent. With important contributions from amateurs 'round the world, The Amateur Astronomer's editorship has compiled a tasteful and useful series of articles covering well, every important topic of astronomical endeavor, practical and theoretical. I envy them.

PUBLICATIONS OF THE ASTRONOMICAL SOCIETY OF THE PACIFIC monthly by the California Academy of Sciences, Golden Gate Park, San Francisco, 94118. \$6.50/yr., students \$4/yr.

In many respects, the Publications of the Astronomical Society of the Pacific are superior to any of the journals listed here. They are always superior in many respects to any or the journals listed here. That's what makes them so superior, in many respects, to any of the journals listed here.

Each month is printed an 8-page leaflet on 2½ X 5" glossy paper concerning any single topic of astronomical endeavor one might care to speculate upon. Often the leaflets deal with the more esoteric and exotic realms of the History of Astrophysics and Cosmology, Popular Astronomy, Astronomy in the Humanities, the Philosophy of Science, Historical Astronomy and the Destiny of the Aesthetic Pursuit. More often, fortunately, a variety of semi-technical subjects dealing with observational and practical astronomy are presented in a clear, tasteful manner.

Due to their small size and ease of storing on a bookshelf, a stack of the last three year's leaflets bound securely by a couple rubber bands makes a handy weapon for tossing at your kid sister, dog, mirror, or favorite object retribution.

\_In addition, the Society prints a bi-monthly journal similar in size (200 pages) and quality of many professional publications. Its content, however is clearly and tastefully for the amateur.

Being a west coast publication, its contributors issue primarily from the respected society of the "professional" amateur astronomers and "amateur" professionals known to be active in that part of the world.

This results in a fine journal that easily complements and enlarges on what can be found in Sky & Telescope in the realms of current astronomical research, radio astronomy, astrophysics, stellar/galactic evolution, new and useful amateur instrumentation, optics, and techniques for more efficient observing. All written in a decidedly professional manner for the non-professional mind.

I think you'll like it.

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"There is another form of temptation, even more fraught with danger. This is the disease of curiosity. ...it is this which drives us on to try to discover the secrets of life, those secrets which are beyond our understanding, which can avail us nothing, and which men should not wish to learn. In this immense forest, full of pitfalls and perils, I have drawn myself back, and pulled myself away from these thorns. In the midst of all these things which float unceasingly around me in everyday life, I am never surprised at any of them, and never captivated by my genuine desire to study them ... I no longer dream of the stars."

St. Augustine  
Confessions, Book 10

A COMPILATION OF VERY IMPORTANT BUT  
LITTLE KNOWN SCIENTIFIC PRINCIPLES

Compiled by Timothy Skonieczny

Murphy's Law	If anything can go wrong, it will
Skinner's Constant	That quantity which, when multiplied by, divided by, added to, or subtracted from the answer you get, gives you the answer you should have gotten (This is also known as Flannegan's Finagling Factor).
Horner's Five-Thumb Postulate	Experience varies directly with equipment ruined.
Cahn's Axiom	When all else fails, read the instructions
The Spare Parts Principle	The accessibility, during recovery of small parts which fall from the workbench, varies directly with the size of the part- and inversely with its importance to the completion of the work underway.
Gumperson's Law	The probability of a given event occurring is inversely proportional to its desirability.
The Ordering Principle	The supplies necessary for yesterday's experiment must be ordered no later than tomorrow noon.
The Transcription Square Law	The number of errors made is equal to the sum of the "squares" employed
Chisholm's Law of Human Interactions	Anytime that things appear to be going better, you have overlooked something.
Riddle's Constant	There are coexisting elements in frustration phenomena which separate expected results
Theory of International Society of Philosophic Engineering	In any calculation, any error which can creep in, will.

Rule of Accuracy	When working toward the solution of a problem, it always helps if you know the answer.
Advanced's Corollay	Provided, of course, you know there is a problem
Astronomer's Constant	The percent of effectiveness of a telescope in the city is inversely proportional to the square of the diameter of the opjective.
Skonieczny's Law	The number of times you drop an eyepiece is directly proportional to the cost of that eyepiece.

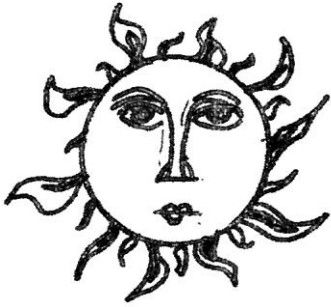
### One For The Road

Once upon a time, a knight in shining armor was appointed two tasks by the king, since he was the only one in the kingdom who could do both well. One task was to protect the kingdom from dragons; the other was to discover comets to name after the king. The weather in the kingdom was perfect. Only one day out of the year produced any clouds. This kept the knight constantly at work. During the day, he would kill dragons, often dozens at a time, and during the night, he would search for comets. The knight soon grew fatigued since he could only rest one day out of the year. A local doctor advised him to get more sleep, so he decided to do all of his work during the night. He spent his nights at the kingdom observatory, and, if he sensed dragons, he would journey to kill them.

People soon asked, "How can you kill dragons and search for comets at the same time?"

"Oh," he said, "it's all in a knight's work!"

## AURORA AND HEART DISEASE:



*reconsidered*  
*C. F. Ersall*

Printed in last month's WASP by Ken Wilson was a short item concerning recent Soviet researches on the effects on biological systems of exposure to magnetic fields similar to those occurring on earth during periods of intense solar activity and their relationship to the frequency of certain cardiovascular disorders.<sup>(5)</sup>

News that prolonged exposure to magnetic fields similar to the Aurora Borealis can be lethal may appear as a conceit of astronomical proportions. However, upon close examination of the results of disturbances of the basic life processes (magnetic or otherwise), problems central to the concerns of space bioscience are recognized.

The complex protein hemoglobin is the primary component of red blood cells, which transport oxygen from the lungs through the arteries to the tissues and transport carbon dioxide through the veins back to the lungs in the cycle of respiration. A single red blood cell contains about 280 million molecules of hemoglobin. Each molecule is composed of four chains of amino acid units that collectively constitute the protein part of the molecule, called globin. These four chains interlock and fold upon themselves in a complex three-dimensional structure and consist of two identical pairs: two alpha chains and two beta chains. In the assembled molecule the two alpha chains are inverted over the two beta chains and nested down between them. When arranged in this manner, the four chains lie at the corners of a tetrahedron. The most important parts of hemoglobin however, are four atoms of iron.

Each iron atom lies at the center of a group of atoms forming the pigment heme, giving blood its red color and its ability to combine with oxygen. Each of the four protein chains enfolds one of the four heme groups. It is the specific chemical environment of the globin that provides the binding capacity of ferrous iron with oxygen. In association with modified chemical environments however, the same heme group can exhibit very different chemical characteristics.<sup>(4)</sup> Enough molecular biology.

Under the influence of magnetic fields, iron has a definite proclivity for exhibiting characteristics to that effect. It is conceivable then, that during exposure to magnetic fields under the experimental conditions used by the Soviet researchers, the heme groups in the hemoglobin of tested organisms



could reasonably be expected to change position within the molecule. This molecular deformation might also be expected to alter significantly the chemical environment of the heme groups, at least, decreasing their effectiveness for oxygen transport, or at worst, rendering them altogether inoperable.

This view is supported by the fact that magnetic moments of the four heme groups within the molecule have been found to be essentially independent- allowing perhaps, more chemically significant deformations in abnormal paramagnetic fields. <sup>(2)</sup>

There have been other indications however, that the heme-heme relationships within the molecule effectively stabilizes the configuration of the moments of all four heme groups. <sup>(3)</sup> This suggests that functional disorders created by abnormal magnetic conditions (assuming they are real) may be due not to deformations on the molecular level, but that such conditions may affect the iron content of the red blood cells as a whole – influencing such varied maladies as decreases in pulse rate, breakdown of synthetic mechanisms in the cell, ineffective oxygen and carbon dioxide transport, and even blood coagulation capacities.

In any case, under magnetic fields, cardiovascular systems, nervous systems, tissue viability, pulse rates and enzymatic activity of test organisms should be significantly affected. The Soviet journal Earth and Universe reported these things did indeed occur under experimental conditions.

A similar argument exists for the possible effects on nervous systems and enzymatic activity of magnetic fields.

The importance of enzyme action in biological systems is increasingly regarded as profound. Almost all chemical reactions that occur in organisms (including the heme-oxygen reaction) are catalyzed by protein molecules called enzymes, each providing for a specific reaction. The reaction of an enzyme catalyzes depends on the molecular structure and shape of the enzyme, since each can attract and hold only specific molecules. An enzyme and the molecule on which it acts fit together like a lock and key. An enzyme's function, then, is determined by its structure. Changes in this structure will very likely determine whether or not the reaction will occur at all.

In many cases, the substrate acted on undergoes reaction with a non-protein part of the enzyme (the prosthetic group). Usually these prosthetic groups are permanently attached to the enzyme, having been built into it at the time it was synthesized. <sup>(1)</sup>

Just as often however, important sections of prosthetic groups will consist of inorganic ions, positively or negatively charged. Under the influence of magnetic fields, it is reasonable to assume some effect on these ions one way or another, altering the reaction potentials of the affected enzymes – perhaps preventing entire series of biosynthetic or energetic reactions from occurring. Neurons may be affected in a similar manner.

The enzymatic processes at work in biological systems evolved through time as a function of natural selection, specific to those environmental

conditions in which the organism most successfully survived. The specificity of the organism for its environment was also affected in more subtle fashion by the particular geophysical conditions of the earth; its atmosphere, climates, radiation fields, gravitation, lithosphere, and magnetic field propagation. This is as true for the chemistry of Man as for any organism.

However, when Man moves with increasing freedom among the planets, the subtle geophysical properties of the planet for which his body chemistry is specific become the subtle hazards of travel in interplanetary space he must consider.

How are the basic life processes affected by unusual and unfamiliar variations in magnetic field strength, solar radiation levels, and gravitation? These are the questions facing those who seek to understand the problems of life outside the biosphere.

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Scientific genius is nourished by the recognition that the old conceptual scheme is subtly but increasingly inadequate. He rebels against the current scientific dogma upon which so many current studies are heuristically based. Though later recognized as the creative genius of science, he is first its heretic and destroyer.

How can we nurture and develop, instead of stifling, this embryonic spirit that accepts the current scientific world view only to become dissatisfied, that breaks through the trammels of scientific convention to scale new heights? To emphasize that science as a process of investigation to pursue actively by the student, rather than simply a more and more crystallized body of facts and established concepts or laws, to be comprehended and memorized – that will certainly help. The study of science as a social process, beginning in the past and sweeping impetuously and comprehensively into the future, will likewise serve to place science, man's chief tool, his noblest work of art.

Dr. Bently Glass  
Science, Education, and Society  
1970

DECEMBER  
ASTRO-ALMANAC

By

Kenneth Wilson

DEC.	EVENT
1	Saturn 7° south of the moon, Twilight begins: 5 <sup>h</sup> 25 <sup>m</sup> –ends: 6 <sup>h</sup> 12 <sup>m</sup> (L.M.T)
2	Full moon (2 <sup>h</sup> 48 <sup>m</sup> E.S.T.), Mercury stationary (22 <sup>h</sup> E.S.T.)
4	Venus at aphelion
7	Mercury at ascending node.
9	Last Quarter Moon (11 <sup>h</sup> 02 <sup>m</sup> E.S.T.), Jupiter in conjunction with the sun – 585,000,000 miles from earth (23 <sup>h</sup> E.S.T.) .
11	Twilight begins: 5 <sup>h</sup> 33 <sup>m</sup> – ends: 6 <sup>h</sup> 12 <sup>m</sup> (L.M.T.).
12	Mercury at perihelion, Lunar apogee (2 <sup>h</sup> E.S.T.), Uranus 6° north of the Moon (5 <sup>h</sup> E.S.T.), Mercury at inferior conjunction (16 <sup>h</sup> E.S.T.).
14	Maximum of Geminid meteor shower (Dec. 7-16) at radiant of: 7 <sup>h</sup> 32 <sup>m</sup> +32° This shower may reach rates of 50 per hour or more.
15	Neptune 6° north of Moon (23 <sup>h</sup> E.S.T.), Uranus at 13 <sup>h</sup> 06 <sup>m</sup> , -6°19', Neptune at 16 <sup>h</sup> 07 <sup>m</sup> , -19°17'.
16	Antares 0.3° south of the Moon (8 <sup>h</sup> E.S.T.).
17	New Moon (14 <sup>h</sup> 03 <sup>m</sup> ).
20	Venus 0.9° south of the Moon (0 <sup>h</sup> E.S.T.).
21	Twilight begins: 5 <sup>h</sup> 39 <sup>m</sup> – ends: 6 <sup>h</sup> 16 <sup>m</sup> (L.M.T.).
22	Mercury at greatest hel. latitude north, Winter Solstice (7 <sup>h</sup> 24 <sup>m</sup> E.S.T.), Mercury stationary (17 <sup>h</sup> E.S.T.)
23	Ursid meteor shower (Dec. 12-24) maximum at 3 <sup>h</sup> E.S.T. – rate: 15 per hour – radiant: 14 <sup>h</sup> 28 <sup>m</sup> +26°.
24	Mars 5° south of the Moon, First Quarter Moon (20 <sup>h</sup> 35 <sup>m</sup> E.S.T.)
26	Venus at greatest hel. latitude south.
27	Ceres stationary (15 <sup>h</sup> E.S.T.)
28	Lunar perigee (0 <sup>h</sup> E.S.T.)
29	Saturn 7° south of the Moon (0 <sup>h</sup> E.S.T.)
31	Full Moon (15 <sup>h</sup> 20 <sup>m</sup> E.S.T.), Mars -0.5 mag., 111,000,000 miles from earth.



THE WARREN ASTRONOMICAL SOCIETY  
CHRISTMAS BANQUET

will be held on December 15, 1971

at the Paradiso Cafe

(located on Woodward--  
four blocks north of Six Mile Road).

All members are welcome to bring their families and friends.

\*\* Tickets can be bought any time before December 1, 1971, from:

Diane Bargiel  
22803 Saxony  
East Detroit, Michigan

778-6022

