The illustration above shows the exterior of the W.A.S. STARGATE observatory, located on Camp Rotary property off North Ave. on 29 mile road. The building contains a 12" cassagrain telescope of 200" focal length. The use of this observatory is the privilege of all members & guests of members. The equipment within the building will allow observational astronomy to be conducted at all times, weather permitting.
The W.A.S.P. is the official publication of the Warren Astronomical Society and is available free to all club members. Requests by other clubs to receive the W.A.S.P. and all other correspondence should be addressed to the editor at the above address. Articles should be submitted at least one week prior to the general meeting.

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Stargate Observatory is owned and operated by the Warren Astronomical Society in conjunction with Rotary International. Located on the grounds of Camp Rotary, Stargate features a 12½” club-built Cassegrainian telescope under an aluminum dome. The observatory is open to all club members in accordance with the “Stargate Observatory Code of Conduct”.

Lectures are given at Stargate Observatory each weekend. The lecture will be either Friday or Saturday night, depending on the weather and the lecturer’s personal schedule. If you cannot lecture on your scheduled weekend, please call the Chairman as early as possible or contact an alternative lecturer. Those wishing to use Stargate must call by 7:00 p.m. on the evening of the observing session. The lecturers for the coming month are:

June 4/5 .... Lou Faix .................... 781-3338
June 11/12 ... Dave Harrington........ 879-6765
June 18/19 ... Frank McCullough .... 254-1786
June 25/26 ... Ron Vogt ................. 545-7309

July 2/3....... Alan Rothenberg ........... 355-5844
July 9/10..... Doug Bock .................. 533-0898
July 16/17.... Ken Strom .................. 977-9489
July 23/24... John Root .................... 464-7908
Dear President: and Fellow Readers

On behalf of the members of the Warren Astronomical Society, I would like to extend our warmest invitation to the members of your local astronomical society to attend and participate in the 1982 Astronomical league’s Great lakes Regional Convention, which will be held July 16, 17, and 18, 1982. This year, we are returning to the magnificent Cranbrook Institute of Science where the League was founded in 1938. The Institute has one of the region’s finest museums of physics, mathematics, and natural sciences, as well as an outstanding planetarium and observatory; all of which will be at our disposal. Conveniently located north of Detroit, the square mile of grounds includes the Cranbrook Art Gallery, private lakes, extensive cultivated gardens, and natural reserve areas.

Our convention will convene Friday evening, July 16th, with a specially prepared program and demonstration in the Robert McMath Planetarium. Saturday’s events will include papers and discussions by our Great lakes Region’s amateur astronomers and telescope builders, telescope judging, workshops, and a flea market. The afternoon’s agenda will also include our Regional business meeting and election of officers. The evening’s activities will begin with a banquet featuring Dr. Robert T. Kirshner of the University of Michigan as our invited professional speaker. Professor Kirshner is well known for his cosmological and supernova remnant studies and is the discoverer of “the void in the universe.” The banquet will conclude with the awarding of our region’s Hans Baldauf Award to an outstanding member of the Great Lakes Region and the presentation of prizes for the best papers and telescopes. Following the formalities, we will visit the Hulbert Observatory with the Feckel Refractor Telescope, and, weather permitting, enjoy a star party on the Institute’s grounds. Sunday afternoon, the Warren Society will host a barbecue outing at their “Star Gate” Observatory with solar observing, outdoor activities, and general comradeship.
To make this convention really a high point of regional activity, we are inviting all our member societies to present a paper featuring some noteworthy astronomical work one or more of their members has performed. It may cover any aspect of telescopes and optics, astrophotography or sketching, observational work, theoretical or historical research. To stimulate your members’ interest, prizes will be awarded to the individual and society with the best amateur presentations. Our program chairman is anxious to receive an indication of any presentation your membership would like to offer. Please contact:

David Harrington  
Program-Chairman  
2876 Quartz  
Troy, Michigan 48098

For our out-of-town friends, we have arranged for accommodations at Cranbrook’s Kingswood Hall where individual rooms share a semi-private bath. Public accommodations are also available and a list is provided for those wishing to make their own reservations. Enclosed is a copy of the advanced registration form. Additional forms may be acquired by writing:

Great Lakes Astronomical Convention  
6088 Robin Hill Road  
Washington, Michigan 48094

We sincerely hope many of your society’s members will plan to attend the 1982 Astronomical League’s Great Lakes Regional Convention. The Warren Society’s membership is endeavoring to prepare an event that will be remembered.

See you in July,

Louis J. Faix  
Convention Chairman
LIST OF LOCAL HOTELS & MOTELS
(Advise of Astronomical League Affiliation for Rates Listed)

SAGAMORE MOTOR LODGE (313) 549-1600
3220 North Woodward Avenue
Royal Oak, Michigan 48072
Provides complimentary continental breakfast
AAA rated
One double bed - $24.68 single, $28.88 double
Two double beds - $26.78 single, $30.98 double

VILLAGE MOTOR INN (313) 642-6200
300 North Hunter Boulevard
Birmingham, Michigan 48011
AAA rated
Two double beds - $39 single, $43-46 double

HOLIDAY MOTEL (313) 549-1800
2712 North Woodward Avenue
Royal Oak, Michigan 48073
Pool - T- - family movies
Complimentary coffee
One bed - $18.90 single
Two double beds - $21.00

BARCLAY INN (313) 646-7300
45 South Hunter Boulevard
Birmingham, Michigan 48011
AAA rated - complimentary continental breakfast
One double bed - $30 single, $33 double
Two double beds - $35.

KINGSLEY INN (313) 644-1400
1475 Woodward Avenue
Bloomfield Hills, Michigan 48013
AAA rated
Two double beds - $46 single, $53 double
ADVANCED REGISTRATION

1982 GREAT LAKES ASTRONOMICAL LEAGUE CONVENTION

Cranbrook Institute of Science
July 16, 17, 18

NAME ______________________________
ADDRESS ______________________________

____________________________________

Advance Individual Registration $9

Advance Family Registration $17
(Door registration will be $10)

Buffet luncheon ______ @ $5.50 each

Banquet & Awards ______ @ $12 each

Outdoor Barbeque ______ @ $2 each

Lodging at Kingswood Hall
($17 per night per person
linens & towels provided
not blankets)

TOTAL __________________

Please make checks or money orders payable to:

THE WARREN ASTRONOMICAL SOCIETY

Mail to:

GREAT LAKES ASTRONOMICAL CONVENTION
6088 Robin Hill Road
Washington, Michigan 48094
INCORRECT STAR BOWL QUESTIONS

by KEN KELLY

In the last Star Bowl, there were at least three times when the moderator was provided with the wrong answer to a Star Bowl question. In previous Star Bowls, I can remember at least two other times when the moderator had the wrong answer. I shall try to correct these wrong answers in this paper.

In one of the questions in this last Star Bowl, the question was asked, “What is the largest crater on the visible face of the Moon?” The answer given and accepted by the moderator was ‘Clavius’. The correct answer was ‘Bailly’. According to the Guinness Book of World Records (1978 edition), “the largest wholly visible crater is the walled plain Bailly, which is 183 miles across.” Astronomy Data Book (Rev J. Hedley Robinson) agrees, and says that Clavius is 145 miles in diameter (see pages 103 - 105).

In another question, it was asked, “What was the world’s largest telescope in the world 100 years ago?” The answer which was accepted by the moderator was an 18½ inch refractor. This is obviously wrong because the satellites of Mars were discovered with the 26 inch refractor at the U.S. Naval Observatory in 1877. As far as I can tell, the largest refractor in the world in 1882 was the 27 inch one in Vienna, which was completed in 1878. See Astronomy Data Book, page 76.

The third question with a wrong answer was “What planet has the greatest inclination of equator to its orbit?” The answer the moderator had was ‘Uranus’. Reference to the Astronomical Almanac For 1982, page E6, shows that the correct answer was ‘Venus’ with an inclination of 177.3°. Pluto is second with an inclination of 118°. Uranus is third with 97.96°.

In a Star Bowl which took place two years ago, the question was asked, “what is the farthest minor planet from the sun?” The answer the moderator had was ‘Hidalgo’. Reference to ‘Sky and Telescope’ for March, 1979, page 249. Shows that the correct answer should have been ‘Chiron’.

In a Star Bowl four years ago the question was asked, “Who built Stonehenge?” The answer the moderator had was ‘the Druids’. A reading of the first chapter of Gerald Hawkins’ book, Stonehenge Decoded should dispel any further belief in this myth. The correct answer to the question can be found (in page 38 of this book) and is ‘The Wessex People’.

Some initiative should be taken to improve this situation. Astronomy is a growing science, and answers to questions do change when new information is obtained. Astrophysical Quantities by C.W. Allen (1973) does say that the inclination of equator to orbit of Uranus is greatest. But that was before this quantity was known for Pluto and Venus. Hidalgo was, indeed, the minor planet with the greatest distance from the sun before Chiron was discovered in October, 1977 by Charles Kowal. There is really no excuse for repetition of the myth that the Druids built Stonehenge. I can find no references to this.

Between now and the next Star Bowl, there is no doubt that new information will be obtained which will make more of these questions obsolete. Either new questions should be made up, or answers to the existing questions should be verified by an astronomer at M.S.U. Before the next Star Bowl. Sky and Telescope magazine is an excellent, up-to-date source for obtaining good questions. Old astronomy textbooks are the worst, because the information they contain is often obsolete.
PRESSING KEYS

by

Larry F. Kalinowski

A PROGRAM FOR POSITIVE PROJECTION PHOTOGRAPHY

Determining the correct exposure time for the eyepiece projection method of photography is the toughest of all the methods. The main problem is the setup. You must be completely setup, with eyepiece and camera in position and focused, before calculating the exposure time. The distance A and B (see diagram) must be measured before running the program. A is the distance between the film and the optical center of all elements within the eyepiece. B is the distance between the first image formed by your objective and the same optical center of eyepiece elements as mentioned previously.

Here’s the program for the positive projection method: LRN, RCL 1, +, RCL 2, X, RCL 4, +, RCL 5, +, RCL 3, =, X^2, +, (, RCL 6, X, RCL 7,), =, R/S, RST, LRN and RST.

Before running the program, registers 1 through 7 should contain the following information: 1) the objective focal length. If you’re using a Cassegrainian or Maksutov system, use the total focal length created after amplification by the secondary mirror. 2) The eyepiece focal length, 3) the objective diameter 4) distance A, 5) distance B, 6) the A.S.A. rating of your film and 7) the subject’s brightness factor as given on page 54 of the June ’81 issue of ASTRONOMY. The first five registers should all contain information measured with the same units such as inches, millimeters, etc. If you’re using a Barlow lens, multiply the focal length of the objective by the magnification of the Barlow before entering the value in register number one.

The following values, stored in registers 1 through 7, will check out the program: 48, 1, 6, 3, 1, 126, and 15. Pressing R/S will produce the answer 0.3072 in about two seconds running time. Your answer will always be in seconds.

This is the seventh program in a series that began early in ’81. If you are just getting started with programmable calculators, call me at (313)-776-9720 for copies of the previous programs published. If you have one to publish, mail it to yours truly at 15674 Flanagan, Roseville, Michigan, 48066.
DETERMINING THE TRUE FIELD OF YOUR EYEPieces

One of the most important qualities that you need to know in using any eyepiece is its true field of view -- that is, the diameter of the tiny circle on the celestial sphere which you can actually see in your eyepiece. The usual way of finding this out is to find out the apparent field of view from the manufacturer and divide it by the magnification. For example, if the manufacturer states that the apparent field of his eyepiece is 50° and the magnification is 50, then the true field is 1° or 60'.

After hearing about many phony ads in the past, however, I find it difficult to believe most advertising claims. So I want to be able to measure these quantities for my own self satisfaction. I can see no easy way of measuring the apparent field of view: all I can do is guess. However, there is an easy way of determining the true field of view directly and that is to time a star as it crosses the field of the eyepiece when the drive motor is disconnected. All it takes is a good stopwatch and a partially clear night. Any first magnitude star will do. I got good results using Spica.

The logic is as follows: for a star on the equator.

\[
\frac{360°}{24 \text{ hours}} = \frac{15°}{1 \text{ hour}} = \frac{15'}{1 \text{ minute}} = \frac{15''}{1 \text{ second}}
\]

In other words, if your true field of view is 15" then an equatorial star will take one minute, or 60 seconds to cross your eyepiece. Conversely, if it takes a star 60 seconds to cross, divide this by 4 and you will get the true field of .15' of arc. Therefore, for an equatorial star, TF (in minutes of arc) = t (sec) / 4. However, this is not exactly true because the rotation of the earth with respect to the stars is 23 hours, 56 minutes, 4 seconds, which means that the stars are moving slightly faster than the sun. Therefore we have to multiply the above T by 1.002738, which is the ratio between sidereal and solar time. In order to get the time it would take if the sun were moving across the field instead of the star, to simplify, we divide this number out, and our equation becomes: TF' = T (sec) / 3.989138.

For a star not on the equator, we have the following diagram:

![Diagram](image)

The diagram represents a star ‘S’ which is moving across the field of view in the same time that a star ‘R’ on the equator is moving a somewhat greater distance. star ‘S’ takes a longer time to cross the eyepiece than does star ‘R’. Therefore, we must multiply the time of ‘S’ by a number less than 1 in order to measure the same time as star ‘R’, on the equator. From the diagram, we can see that the ratio of ‘S’ to ‘R’ is the cosine of the declination of star ‘S’, this means that for a star not on the equator, our equation becomes:

\[ TF' = T \text{ (SEC)} \times \cos (\text{DEC}) / 3.98908 \]
I have written the following program on my computer to calculate true field, magnification and apparent field:

```
10 PI=3.14159
20 RAD= 190/ PI
30 INPUT"DEC OF STAR DEG";DD
40 INPUT" MIN";DM
50 INPUT" SEC";DS
60 DG=SGN(DD):DE=ABS(DO)
70 D=DG*(DE+DM/60+DS/3600)/RAD
80 CC=COS(D)
90 INPUT"OBJECTIVE FOCAL LENGTH MM";FO
100 INPUT"TIME, MIN ";TM
110 INPUT" SEC ";T5
120 T=TM*60+T5
130 TF=T*CD/3.98908
140 PRINT"TRUE FIELD IS ";TF;" MINUTES
150 INPUT"EYEPiece FOCAL LENGTH MM ";FE
160 M=FO/FE
170 PRINT"MAGNIFICATION IS ";M
180 AF=M*TF/60
190 PRINT"APPARENT FIELD IS ";AF DEGREES
200 GOTO100
```

My observing procedure was as follows:

I first dug up all the eyepieces I could find, then set up my telescope and put it on Spica. I centered it, focused it, and then rotated the finder scope so that the star remains on one of the cross-hairs as it moves across the field of view. I also disconnected the drive motor at this point. Whenever I put in a new eyepiece, I would always first focus the star in the center of the field of view, then move the image to just beyond the eastern edge. I then picked up my stopwatch (being careful to reset it each time and making sure it was wound), waited until the image was on the edge and of about one-half brightness, then clicked the stopwatch. I generally watched the star as it crossed, because this gives one some idea of how the image changes from one part of the field to another. When the star reached the other edge, and of about half brightness, I clicked the stopwatch again. I used a red light and a magnifying glass to read it, and recorded my readings. I made four readings for the first eyepiece in order to get the hang of it, three for the second, and two for each of the other eyepieces.

The following are my results:

<table>
<thead>
<tr>
<th>EYEPiece</th>
<th>TIMINGS</th>
<th>TRUE FIELD</th>
<th>MAGNIFICATION</th>
<th>APPARENT FIELD</th>
</tr>
</thead>
<tbody>
<tr>
<td>40 K</td>
<td>3M 10.0S</td>
<td>47.4'</td>
<td>50</td>
<td>39.5°</td>
</tr>
<tr>
<td>40 K</td>
<td>3M 11.4S</td>
<td>47.8'</td>
<td>50</td>
<td>39.8°</td>
</tr>
<tr>
<td>30 P</td>
<td>3M 26.0S</td>
<td>51.4'</td>
<td>67</td>
<td>57.1°</td>
</tr>
<tr>
<td>28.7 RKE</td>
<td>2M 59.6S</td>
<td>44.8'</td>
<td>70</td>
<td>52.1°</td>
</tr>
<tr>
<td>25 K</td>
<td>2M 29.5S</td>
<td>37.3'</td>
<td>80</td>
<td>49.8°</td>
</tr>
<tr>
<td>25 K</td>
<td>2M 29.0S</td>
<td>37.2'</td>
<td>80</td>
<td>49.6°</td>
</tr>
<tr>
<td>20 P</td>
<td>2M 24.6S</td>
<td>36.1'</td>
<td>100</td>
<td>60.2°</td>
</tr>
<tr>
<td>16.3 E</td>
<td>2M 37.5S</td>
<td>39.3'</td>
<td>123</td>
<td>80.4°</td>
</tr>
<tr>
<td>15 RKE</td>
<td>1M 32.3S</td>
<td>23.0'</td>
<td>133</td>
<td>51.2°</td>
</tr>
<tr>
<td>12.5 IRO</td>
<td>1M 6.1S</td>
<td>16.5'</td>
<td>160</td>
<td>44.0°</td>
</tr>
<tr>
<td>12 K</td>
<td>1M 5.7S</td>
<td>16.4'</td>
<td>167</td>
<td>45.6°</td>
</tr>
<tr>
<td>10 P</td>
<td>1M 9.5S</td>
<td>17.3'</td>
<td>200</td>
<td>57.8°</td>
</tr>
<tr>
<td>EYEPIECE</td>
<td>TIMINGS</td>
<td>TRUE FIELD</td>
<td>MAGNIFICATION</td>
<td>APPARENT FIELD</td>
</tr>
<tr>
<td>----------</td>
<td>---------</td>
<td>------------</td>
<td>--------------</td>
<td>----------------</td>
</tr>
<tr>
<td>6</td>
<td>K</td>
<td>33.2S</td>
<td>8.3'</td>
<td>333</td>
</tr>
<tr>
<td>5</td>
<td>P</td>
<td>35.2S</td>
<td>8.8'</td>
<td>400</td>
</tr>
<tr>
<td>4</td>
<td>O</td>
<td>19.8S</td>
<td>4.9'</td>
<td>500</td>
</tr>
</tbody>
</table>

In comparing similar types of eyepieces together, we get the following results:

**KELLNER EYEPIECES**

<table>
<thead>
<tr>
<th>EYEPIECE</th>
<th>APPARENT FIELD</th>
<th>TRUE FIELD</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>EXPECTED</td>
<td>MEASURED</td>
</tr>
<tr>
<td>40</td>
<td>36</td>
<td>39.5</td>
</tr>
<tr>
<td>40</td>
<td>36</td>
<td>39.8</td>
</tr>
<tr>
<td>25</td>
<td>42</td>
<td>49.8</td>
</tr>
<tr>
<td>25</td>
<td>42</td>
<td>49.6</td>
</tr>
<tr>
<td>12</td>
<td>--</td>
<td>45.6</td>
</tr>
<tr>
<td>6</td>
<td>--</td>
<td>46.2</td>
</tr>
</tbody>
</table>

**PLOSSL EYEPIECES**

<table>
<thead>
<tr>
<th>EYEPIECE</th>
<th>APPARENT FIELD</th>
<th>TRUE FIELD</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>EXPECTED</td>
<td>MEASURED</td>
</tr>
<tr>
<td>30</td>
<td>51</td>
<td>57.1</td>
</tr>
<tr>
<td>20</td>
<td>51</td>
<td>60.2</td>
</tr>
<tr>
<td>10</td>
<td>50</td>
<td>51.8</td>
</tr>
<tr>
<td>5</td>
<td>50</td>
<td>58.6</td>
</tr>
</tbody>
</table>

**RKE EYEPIECES**

<table>
<thead>
<tr>
<th>EYEPIECE</th>
<th>APPARENT FIELD</th>
<th>TRUE FIELD</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>EXPECTED</td>
<td>MEASURED</td>
</tr>
<tr>
<td>28.7</td>
<td>60</td>
<td>52.4</td>
</tr>
<tr>
<td>15</td>
<td>60</td>
<td>51.2</td>
</tr>
</tbody>
</table>

My conclusions are as follows:

1. In most cases, both the apparent and the true fields of view are greater than expected.
2. Only the RKE (Edmond) eyepieces have smaller fields than expected.
3. The differences in all cases were substantial.
4. The eyepiece with the greatest true field turns out to be the 30mm Plossl.
5. The eyepiece with the greatest apparent field of view is the 16.3mm Erfle, as expected.
6. In order of apparent field, the eyepieces rank as follows:

   - Erfle 80"
   - Plossl 60"
   - RKE 50"
   - Kellner 46 – 50"
   - Orthoscopic 40"
7. Preliminary examination shows that the worst eyepieces are the two 40 mm Kellner and the Orthoscopic ones. However the two Orthoscopic are not of top quality, and the illuminated reticule ocular has an extra element which causes problems -- it is not a good viewing eyepiece.

8. All of the poorer quality eyepieces were obtained with purchased telescopes and all of the better quality eyepieces were purchased separately. This means that telescope manufacturers generally supply poor eyepieces with their equipment. So it is a good idea to obtain good eyepieces elsewhere in order to get good viewing.

9. Resolution tests for these eyepieces are on my schedule for the next clearing.

10. I am eager to find out how the konig oculars stand up against the Plossls and I will be happy to discuss this article with anyone.
SOME ASTRONOMICAL REFLECTIONS
PART V

My first encounter with chemistry was at Cass Tech High, a number of years ago. Our chemistry teacher, the mother of Charles Lindberg, the first aviator to fly across the ocean, taught us that the smallest divisible particle of matter was the atom. We learned that, based on a projected atomic weight scale, possibly 92 elements existed but since only 81 were known at that time, 11 atomic numbers were left open. As I mention the atomic weight scale, I cannot help but think of its similarity to Bode’s law, which offered a means of determining the approximate relative positions of the Planets and their approximate distances from the Sun. Bode’s Law stimulated a search for Planets to fill the open position numbers.

Bode took a series of numbers, in steps of 3, beginning with zero, then 3, doubled the 3 for 6, doubled the 6 for 12 and so on. He then added a 4 to each number, and produced a series of numbers serving as multipliers for determining the approximate distance of each Planet, based on the distance of the Earth from the Sun.

Bode’s Law

(Recognized by Wolf (1741), encouraged by Titius (1772) and finally formulated mathematically by Bode (1778)

<table>
<thead>
<tr>
<th>Development of Numerical Series</th>
<th>Mean Distance (Mil Mi) Calculated vs. Actual</th>
<th>Position</th>
<th>Planet</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 + 4 = 4 * 9,290,000</td>
<td>37.160</td>
<td>36.000</td>
<td>1 Mercury</td>
</tr>
<tr>
<td>3 + 4 = 7 * 65.030</td>
<td>67.200</td>
<td>2</td>
<td>Venus</td>
</tr>
<tr>
<td>6 + 4 = 10 * 92.900</td>
<td>92.900</td>
<td>3</td>
<td>Earth</td>
</tr>
<tr>
<td>12 + 4 = 16 148.640</td>
<td>141.600</td>
<td>4</td>
<td>Mars</td>
</tr>
<tr>
<td>24 + 4 = 28 260.120</td>
<td>256.400</td>
<td>5</td>
<td>Ceres</td>
</tr>
<tr>
<td>48 + 4 = 52 483.080</td>
<td>483.300</td>
<td>6</td>
<td>Jupiter</td>
</tr>
<tr>
<td>96 + 4 =100 929.000</td>
<td>886.200</td>
<td>7</td>
<td>Saturn</td>
</tr>
<tr>
<td>192 + 4 =196 1,820.840</td>
<td>1,783.000</td>
<td>8</td>
<td>Uranus</td>
</tr>
<tr>
<td>384 + 4 =388 3,604.520</td>
<td>2,794.000</td>
<td>9</td>
<td>Neptune</td>
</tr>
<tr>
<td>768 + 4 =772 7,171.880</td>
<td>3,670.000</td>
<td>10</td>
<td>Pluto</td>
</tr>
</tbody>
</table>

Note: Formula for above, Calc. Dist = Numerical Series # * (1AU/10)

We can see, from the above, that neither Neptune nor Pluto fit into Bode’s Numerical Series and so Bode’s Law was discredited, but not before it had performed a significant service in stimulating the search, and eventual discovery of Neptune. Oddly enough, the subsequent discovery of Ceres filled yet another open number in Bode’s Numerical Series.

Today, as science continues to hypothesize, explore, analyze, test, and accept or reject, newly gained bits of knowledge continue to fall into place. With the discovery of additional elements, some of our open numbers in the atomic weight scale were tilled and new numbers added, bringing the total numbers up to 104. Now, only one of the numbers remain unassigned. While we have gained considerable knowledge about the various atoms, to this day, no one has ever seen an atom, not even with the World’s most sophisticated electron microscope providing a magnification of 230,000 diameters or more.
During my second year at the University of Detroit, we learned that the atom consisted of a nucleus and one or more electrons in orbit around the nucleus. This atomic system is frequently compared to our solar system, the nucleus representing our Sun and the electrons representing the Planets. To extend this comparison, let’s think of the orbit path of Mercury as being on the surface of an invisible sphere with the Sun at its center. The orbit path of Venus would be on the surface of a larger second sphere and the Earth on the surface of a still larger third sphere. This concept will help us as we continue to examine the structure of the atoms.

It was found that some of our elements, such as hydrogen, oxygen and others, normally exist as pairs of atoms, or as diatomic molecules. Since the two atoms rotate around each other on a common axis, the system can be likened to a Binary Star system. Ozone, an unstable molecule of oxygen, is briefly made up of three oxygen atoms, rotating around a common axis. But soon, one atom loses interest and departs to combine with the third atom of another ternary and the systems are again stable diatomic molecules.

As our knowledge expanded, we found there are two kinds of nuclei, namely the proton and the neutron. A single hydrogen atom has a proton as its nucleus and one electron in orbit on the surface of an imaginary sphere with the nucleus at its center. The helium atom comes equipped with a pair of protons and a pair of neutrons as its nucleus, with two electrons in orbit on the surface of an imaginary sphere, one atom opposite the other and the nucleus at its center. The lithium atom has 3 protons and 4 neutrons as its nucleus and 2 orbital spheres with two electrons in orbit on the inner sphere and 1 electron in orbit on the outer sphere. Now let’s see why the projected atomic weight numbers brought Bode’s Law to my mind.

The atomic numbering sequence, called the Atomic Weight Scale, was developed for classifying and listing the known and expected elements which now number 104. Of these, the hydrogen atom is the simplest and most likely the first in the lifetime of our Universe. The heaviest and most complicated later developed atoms appear at the other end of the scale.

### Atomic Weight Scale

<table>
<thead>
<tr>
<th>Sphere</th>
<th>Number of Electrons</th>
<th>Hydrogen</th>
<th>Carbon</th>
<th>Copper</th>
<th>Uranium</th>
</tr>
</thead>
<tbody>
<tr>
<td>No.</td>
<td>Min.</td>
<td>Max.</td>
<td>Total</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>2</td>
<td>0</td>
<td>8</td>
<td>10</td>
<td>4</td>
<td>8</td>
</tr>
<tr>
<td>3</td>
<td>0</td>
<td>18</td>
<td>28</td>
<td>18</td>
<td>18</td>
</tr>
<tr>
<td>4</td>
<td>0</td>
<td>32</td>
<td>60</td>
<td>1</td>
<td>32</td>
</tr>
<tr>
<td>5</td>
<td>0</td>
<td>32</td>
<td>92</td>
<td></td>
<td>21</td>
</tr>
<tr>
<td>6</td>
<td>0</td>
<td>10</td>
<td>102</td>
<td></td>
<td>9</td>
</tr>
<tr>
<td>7</td>
<td>0</td>
<td>2</td>
<td>104</td>
<td></td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No. of Elements = 104</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No. of Electrons = 104</td>
<td>1</td>
<td>6</td>
<td>29</td>
<td>92</td>
<td></td>
</tr>
</tbody>
</table>
Let's examine the very complex uranium atom a little further. The uranium atom has 92 protons and 146 neutrons in its nucleus. As we can see above, it has 7 orbital spheres, and 2, 8, 18, 32, 21, 9, 2 electrons on its 7 spheres.

All of the spheres discussed to this point are normal or ground level spheres. When the atom is exited by some stimuli, its electron or electrons may be briefly forced into larger orbital paths. The normal or ground state of the orbital positions of the electrons, their absorption of energy and change in orbital positions when excited, and the emission of photons when returning to ground state, all make possible the spectroscopic analysis which is one of our most important tools in learning of what the very distant stars are made.

It is believed that the particles that make up our atoms are infinitesimally small as compared to the tiny distance separating them. We can therefore postulate that the distances from the nucleus to the various orbital spheres are very great compared to the size of the infinitesimally small particles, perhaps comparable to our solar system, or even greater. This, then, makes more plausible the compressibility of a super star in the formation of a neutron star, and, perhaps even a black hole!

Several decades ago, theoretical astronomers reasoned that just before a dying superstar explodes, it first cools reducing its internal pressures until it collapses under its own tremendous gravitational force, “crushing out” all vacant space, leaving the nuclei of its atoms at the center of the star, touching each other. In the process, individual electrons and protons, from the crushed atoms, under the tremendous pressure, are forced into the formation of more neutrons. It is estimated that during its mid-life, such a star would have been at least 1.4 times the size of our Sun. It is further estimated that at the point of total collapse, it would perhaps be only 10 miles in diameter!

Very recently, it has been determined that matter is much more complicated than believed earlier. New particles have been discovered. The electron, which has a negative charge, has a newly found counterpart called a positron which has the same mass as the electron. Another new particle is the neutrino which is emitted by a family of radioactive matter known as beta decay. The neutron is now considered as being a baryon, consisting of 3 more new fundamental particles called quarks. An anti-baryon consists of 3 anti-quarks. Another particle, the meson, consists of a quark and an anti-quark.

It has also been determined that many more substances and particles are subject to decay than believed previously. Both protons and neutrons are subject to decay. Hydrogen, which has a proton for its nucleus, finds its nucleus subject to decay. A free neutron, decaying, yields a proton, an electron, and an antineutrino. The electron, still thought to be a stable particle, may be the only stable particle amidst all this instability and decay.

Some comparative masses of particles have been determined. The diameter of the electron is said to be 1.0 E-29 cm. A proton is 1820 times as massive as an electron. A meson, found in cosmic rays and in high energy x-rays with a unit of positive or negative charge, has a mass 200 times that of an electron. An anti-muon, another new particle, has the same charge as proton but is 210 times as massive as the proton, or 382,200 times as massive as the electron. (For the purpose of comparison, I determined that our Sun is 1049 times as massive as Jupiter and 333,500 times as massive as our Earth.)
Earlier, in this paper, we mentioned that even with the latest, most powerful microscope, we cannot see an atom. Now that we have given it some thought, we can suggest a possible reason. We found that an atom is not some solid material but a planetary system of infinitesimally small particles, with the smaller particles in orbit around the larger particles. We have seen that the diameter of an electron is less than 1.0 E-29 cm. If the electron microscope can increase the size 230,000 diameters, an object diameter of 1.0 E-29 cm. would increase to 2.3 E-24 which is still far out of our realm of microscopic observation. Knowing the proton to be 1820 times as massive as the electron and assuming both particles to have the same unit mass, I’ve calculated the proton to have only 7.6 times the diameter of the electron and is also too small to be seen. Assuming substantial distances between particles in an atom, the x-ray could pass through without detecting any presence. (In a humorous vein, I found myself wondering whether it would be possible for an atom to pass through another atom without any of the particles touching. I would almost wager that it could be possible, providing the transient atom passes through fast enough.)

The next time we hold up our hand to examine it, we can marvel that what we behold is not what it seems to be, a solid hand. First, more than 80% of it is water. But far beyond that, yes, even far beyond the microscopic, what we behold is mostly space, space sparsely filled with a sort of lattice-work of particles, most of them in motion, and separated by very, very great comparative distances. THE ONLY REAL THING ABOUT US, AND IT HAS NO SUBSTANCE, IS OUR MIND----OUR IMAGINATION----OUR INTELLECT------ in other words, OUR SOUL!!!

John J Wetzel

Writer’s Note:
As indicated, the theory of elementary particles proposes that a most startling range of 1. E-29 Cm or .00000000000000000000000001 Centimeters would be required to isolate a single particle!

We calculated the diameter of the proton at 7.6 E-29 Cm. or .00000000000000000000000076 Cm. In our forthcoming Reflection Part VI, we will see that the hydrogen molecule has a diameter of 1.06A’ (.0013000106 cm.) We now see the atom is mostly made up of space. In fact, proportionally, there is more space in a hydrogen atom than in our own Solar System. It would take 1.06 E21 or 1,060,000,000,000,000,000,000,000 electrons, single file, to reach across the hydrogen atom, while at rest, in an unexcited state. In comparison, using the diameter of Pluto and the diameter of its orbit around the Sun, we find it would only take 1,789,474 Plutos to reach across its orbit path. How vast the proportional space in our smallest atom!!
We're Having a Party!!!

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Messier Contest * Fishing * Baseball
Solar Observing * Indoor Games (if cloudy)
* Star Gate Observatory

When: May 28th, 29th, 30th (Fri.-Sat.-Sun.)

Where: Camp Rotary (29 mile Rd. ... Between North Ave.
and Romeo Plank Rd.)

Lodging: Skorian Lodge (Northwest corner of Camp Ground)

Expenses: A mere $5.00 will give you lodging for as
many nights as you wish to stay ($6.00 non-members)
plus the all you can eat Saturday dinner.
If you do not want the package rate it will be
$2.00 for the meal. ($2.50 non-members)

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(Frank McCullough)