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Vol. 9 No. 3

Autumn, 1980
The President’s Message

Dear Member:

The Biennial International Planetarium Society Convention was a success! This was due to the great efforts and tireless work of the Adler Planetarium staff, Dr. Joe Chamberlain, President, and a host of speakers including fellow planetarians that presented papers on every subject matter relating to the planetarium profession.

It was at this 1980 convention that I read a letter addressed to you from the President of the United States of America, President Jimmy Carter, and it is also included in this journal. As I have stated before, Planetarians are unique. There is probably more diversified knowledge among planetarians than any other society and it is our goal to promote and increase the students’ and the public’s understanding of Astronomy, the Sciences and the Related Arts of Literature and Music and to give insight into the future of this, our fragile earth on which we live.

It was during this convention that your President met great old friends and met an astonishing number of great new ones.

If you felt that your President was tired and exhausted at times—then you saw it as it really was. Yet, at no time did he try to skip his obligated duties. He actually looked forward to them and he continues to do so.

It was during this 1980 convention that your executive council received Dr. Henry King into Honorary membership into our society. There was also a constitutional change approved by the council concerning article II of our Constitution. You, the membership, will vote on this in the near future.

There will be in the mail as this goes to press, an International Planetarium Society Special Survey conducted by Mr. Charles Hagar and Mr. Lee Simon. I urge you to fill out the form as completely as possible. Mr. Lee Simon has indicated this survey will further our professional status and give us vital information on a large scale.

If you are not getting the International Planetarium Society Newsletter, please let me know. It has much material that you may need or use. This is a very useful newsletter and it gets bigger and better as time and events continue on the increase. This is produced by the fruitful efforts of Mr. Dave Batch. We thank you, Dave!

Your President had a golden opportunity to visit Monterey, Mexico, and it was an opportunity to see the high degree of professionalism among the Planetaria in Monterey, not only in Monterey at the Alfa Cultural Center, but also in Mexico City. Your President met again with Mr. Guillermo Aguilar of Monterey. He was shown hotels, civic centers, restaurants, and a planetarium cultural center that is unprecedented for its type and purpose. Mr. Gerardo Primo Villereal gave a tour of audio-visual production that would make Kodak proud.

It was from the planetarium and cultural center that he was flown to Mexico City to meet with fellow planetarians, and they too, are great friends. There was Fernando Oviedo, Director of the Mexico City Planetarium a very fine facility with a painted mural never to be forgotten.

The nation of Mexico has a lot going for it and a lot to be proud of. The Mexican people are unique in their greeting “Buenos Dias!” (Good Morning!) and I always reply “Bueno pais!” (Good Country!).

How can an individual be honored so much? And again, Mr. Juan Escayeda of the Mexico City Planetarium with his beautiful family (his wife, two sons ages ten and eleven, and a daughter nine years old) escorted us out of Mexico City the Pyramids of Teotihuacan. We visited the Street of the Dead, The Citadal, Temple of Quetzalcatl, and climbed to the top of the Pyramid of the Sun, Pyramid of the Moon, and a host of other temples. It was a most unforgettable experience, not only to visit at first hand astronomical places of the past, but also to visit with a family that you will never forget for their friendliness and kind manner. I only hope that some day I may do the same for them. How else could you repay?! If you did not read thoroughly the last Planetarian issue, you may have missed a great article by Dr. Georgia Grey Hooks Shurr, guess who this is?! Thanks, Grey—do it again.

James A. Hooks
President
International Planetarium Society
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PLANETARIAN STAFF
David Hoffman, Executive Editor
Godwin Heights Public Schools
Planetarium, 15 36th Street
S. W., Wyoming, MI 49508

Ronald N. Hartman, Publishing Director, Department of Mathematics and Astronomy, Mt. San Antonio College
Walnut, CA 91789

Associate Editors:
Terence Murtagh (British Isles)
Jacques Dumas, Sig Wieser
(Canada)

Dennis Simopoulos (Europe)
Maximo Lacro, (Canada)

Dennis Simopoulos (Europe)

Jeanne E. Bishop, James Brown
Jack Dunn, Jane P. Goehagen
Ronald N. Hartman, George
Reed, Herbert Schwartz
(United States)

OFFICERS OF THE SOCIETY
James A. Hooks, President
Robeson County Planetarium,
Lumberton, NC 28358

Donald S. Hall, Past President
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D. David Batch, Executive Secretary, Abrams Planetarium,
Michigan State University,
East Lansing, MI 48824

Walt Tenschert, Treasurer and Membership Chairman.

For missed numbers, circulation information, membership, and library subscriptions, write to:
Walt Tenschert, I.P.S., Membership Chairman, Thomas Jefferson High School, 6560 Braddock Road, Alexandria, VA 22312

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ANNOUNCEMENTS

The 1980 Survey of the World's Planetariums is now being conducted by the Planetarium Institute. All planetarium directors are invited to participate in this comprehensive undertaking. For a free copy of the Questionnaire form as well as a copy of the previous survey (1974), send a large (4" x 9½") self-addressed, stamped envelope to:

C. F. Hagar, Director
Planetarium Institute
Department of Astronomy and Physics
San Francisco State University
San Francisco, CA 94132

We hope to receive all completed questionnaires by September 30, 1980 for evaluation and analysis this fall. The results of the survey will be sent to all participants near the end of 1980.

Charles F. Hagar, Director
Planetarium Institute
San Francisco State University
San Francisco, CA 94132

LETTERS TO THE EDITOR

I was happy to see the appearance of my two resource lists in the Spring 1980 Planetarian, which reached us recently. You did a nice job of laying out the text. I hope planetarium educators will find the lists useful.

I was rather disturbed, however, to find that you had deleted the copyright references in both lists and had neglected to include the customary credit line to the original journal of publication (in this case Mercury). I was also sorry that my address is not given anywhere in the articles so that people with suggestions and additions have no way of contacting me.

I would appreciate a belated copyright notice so that I can retain legal claim to these bibliographies:

The Interdisciplinary Approaches list is © 1977 Andrew Fraknoi, while the pseudoscience bibliography is © 1979 Andrew Fraknoi. Both are reprinted from Mercury, the journal of the Astronomical Society of the Pacific. Suggestions and additions should be sent to Andrew Fraknoi, A. S. P., 1290 24th Avenue, San Francisco, California 94122.

I hope you understand that I'm not just nitpicking but that I am justifiably worried about the copyright question and just sorry that the lack of a way to communicate with me on the articles themselves will make further input from your readers a lot more difficult. I'm still happy you used the lists, however.

Andrew Fraknoi
Executive Officer
The Astronomical Society of the Pacific
1290 24th Avenue
San Francisco, CA 94122

A handy guide to national amateur astronomy organizations is now available free of charge from the Astronomical Society of the Pacific. According to a survey just published in the Society's popular-level journal Mercury, approximately 15,000 individuals are members of nationally organized groups whose main aim is to promote and enjoy astronomy as a hobby.

Several of these groups have local chapters which hold star parties, conduct workshops about telescope building or observing, and meet regularly to hear lectures and share information about astronomy. Other groups make contact with their members by mail and hold annual conventions in various areas of the U. S. A few organizations sponsor active programs of amateur research, observing variable stars and other objects which professional astronomers do not have time to monitor on a regular basis.

As part of its work to inform the public about astronomy, the Astronomical Society of the Pacific (an international, non-profit educational organization) is making copies of its survey and directory available to interested individuals. Addresses, main activities, and publications are listed for each group.

To obtain a free copy, please send a legal-size, stamped, self-addressed envelope to:

Amateur Guide
A. S. P.
1290 24th Avenue
San Francisco, CA 94122

Andrew Fraknoi
Astronomical Society of the Pacific

Continued on page 4
I am glad to see the suggestion in the summer issue that the traditional Christmas show might be modified, but I think that a basic point is still being overlooked. Basically, planetariums should be of interest to all the people all the year, while only Christians are interested in the details of the star of Bethlehem. Jews, in particular, feel barred from the planetarium for the month of December.

There are plenty of fascinating subjects that are of interest to visitors—black holes, life in the universe, our sun, etc. I think that planetariums should stick to those astronomical topics, and not have a special Christmas show devoted to a sectarian topic.

Jay M. Paschhoff, Director
Hopkins Observatory
Williams College
Williamsport, Mass. 01267

In the Creative Corner of Vol. 9, No. 1, Gary Finley states that “conventional zoom projectors” do not have intensity compensation and variable speed drives.” In the interest of historical and technical accuracy, I wish to point out that the AZP zoom projectors—to the original design of which I made a few minor contributions many years ago—have always provided both of these features. Brightness compensation in the AZP is achieved by means of coupling the iris to the zoom function instead of controlling the lamp.

When the lamp power is modulated, as described in the article, there is an unavoidable and quite large shift in the color of the projected image. Ideally, a 6 to 1 zoom requires a 36:1 power ratio (light power—not electrical power) and an incandescent or quartz-halogen lamp running at 1/36 of its design power is very orange indeed. Fortunately, this condition occurs when the image is smallest, and may not be too objectionable.

With the 10:1 zoom ratio of the original AZP, the required power ratio was 100:1, and so made lamp power control out of the question. However the f2.2 to f22 range of the iris of the lens originally used, conveniently provided the ratio required. Unfortunately, as with most lenses, the f ratio did not vary precisely with the square of the angular rotation, so there was as with Mr. Finley’s design a slight non-linearity at mid-travel—measurable, but scarcely noticeable with a slide in the galaxy.

Readers may be amused to learn that the very first “zoom projector” used in a planetarium (if there are any readers even older than myself, please correct me if I am mistaken) corrected for both effects mentioned by Mr. Finley—though the resolution of the “optics” left a bit to be desired. The device, built at Fels presumably before even I was born, consisted of a carbon arc lamp (smoke and all) mounted on a little 4-wheeled cart lowered by a Goldbergian electric winch down an inclined plane toward a large format transparency. As I recall, the entire improbable (though effective for those days) arrangement was 3 or 4 meters long. The zoom ratio was fabulous. Assuming the cart travelled 3 meters and ultimately stopped say 100 mm from the slide, a zoom ratio of 30:1 was achieved.

Before you all rush out to duplicate this design, I should warn you that—apart from the illegality of operating a carbon arc in such circumstances, and the very real probability of setting yourself and your building afire—sometimes the winch cable would become ensnared with the power cord and derail the light source, which fell to the projection room floor with a resounding crash and a terrifying shower of electrical pyrotechnics. The audience was usually bemused by the spectacle of an ominously-approaching moon—or whatever—suddenly and inexplicably falling out of the sky, accompanied by the inevitable sotto voce profanities of the lecturer (it was a live show, of course) followed by his heroic efforts to regain sufficient composure to provide a reasonably coherent, if strained, rationalization of the bizarre astronomical event just witnessed. Ah, for the good (?) old days!

James H. Sharp
Resident Production Consultant
Hong Kong Space Museum
Salisbury Road
Kowloon, Hong Kong

Although Gary Finley’s description of “A Perspective-Corrected Zoom Projector” in the Spring 1980 Planetarian is an elegant solution to light variation while zooming a slide, I would like to point out two errors.

First it is not true that conventional zoom projectors do not correct the light output as the image gets larger. For several years AZP has manufactured a patented zoom projector in which the iris of the zoom lens is automatically opened to brighten the image during zoom up.

This technique allows the projector lamp to stay at constant brightness and eliminates the need for Finley’s complicated lamp controller. Furthermore, this is crucial, THE COLOR TEMPERATURE of the lamp will vary with his technique resulting in a reddening of the image as it grows smaller whereas if the AZP technique is used the color temperature remains constant wherever the zoom.

Second most conventional zoom projectors that I am aware of do not use constant speed motors. Instead they use just the type of geared DC motor that Finley uses, the speed of which is controlled manually by the operator, who can at any time in the zoom range vary the speed to suit the effect he wants.

His automatic speed controller DOES add a sophistication to the presentation, I admit, and would be the first to compliment him on his electronic design, particularly in the use of a closed loop feedback system.

Why is it we planetarians are forever re-inventing the wheel? I refer Finley and your readers to such “conventional” zoom manufacturers as AZP, Commercial Electronics, Sky-Skan, and Spitz for their approaches to the problems of zooming 35 mm slides.

Henry Blake, President
AZP Inc.
128 Crooked Hill Road
Huntington, NY 11743

I write in regard to the Wenning-Hunt letter in the Winter 1979 issue, which criticized the handling of astrology in planetarium Christmas shows. I certainly agree with the authors that we should not encourage belief in astrology, but while I consider myself a good soldier in the Crusade Against Same, I do occasionally use my carbine at home under the bed. Perhaps this gives me a slightly more moderate viewpoint; in any case, at the risk of blasphemy, I offer some few additional remarks on the subject.

First, where Messrs. Wenning and Hunt give the impression of finding only one proper treatment of
astrology in the planetarium (i.e., to judge it), I find two:
1) to judge it, and 2) to deal with it in a historical context, especially as relates to its early entwinement with astronomy (which may or may not be overtly judgmental). It is this second category that allows the topic to be acceptably broached in other than "debunking" programs.

This latter category of treatment makes the consideration of astrological interpretation a valid element in Star of Bethlehem programs, where one engages in speculation about what the Magi saw and why they sought out the Christ because of it. In such a speculation, one cannot assign 20th century judgments to the players and do a decent job of it; one must consider the possible motives of the Magi in keeping with their times. And few will, I suspect, seriously dispute the fact that astrology was alive and well in their times.

Consistency in our battle with astrology aside, it is hardly consistent with the principles of historical (if not scientific) investigation to say, for example, that because astrology is bunk, the Magi could not have been influenced by it. (Today we also say that "bleeding" people to cure fever is bunk, but that didn't stop doctors of several hundred years ago from bleeding people to death with what they considered an acceptable surgical technique.) In my opinion, to talk about unusual events in the heavens 2,000 years ago and ignore the potential influence of astrological interpretation is to fail to give a complete treatment of the subject.

Just as we need not ignore them, the inclusion of planetary conjunction possibilities and their possible astrological interpretation by the Magi need not imply support for astrology nor reliance on astrology for "THE answer." (Indeed, I find it improper to presume any definite answer, given the speculative nature of the topic and lack of concrete proof for all theories.)

For example, the Magi need not have simply "knew" a king was born in Judea at the sight of a planetary conjunction. One is, after all, speculating; it is not possible (and more consistent with a scientific and historical approach) to speculate that if the Magi were scholars and lived within riding distance (and especially if they were of Babylonian extract), that they may have been aware of ancient Jewish scriptures and thus Messianic prophecy? In such a line of speculation, a planetary conjunction would then be merely a catalyst, an event among many to be interpreted by superstitious men.

I might add that I am also aware of recent thought and theory concerning the Star of Bethlehem, notably the new nova theory. And while it does not require astrological interpretation to be an unusual event, I find the theory essentially no less speculative. I might further add that any celestial event short of skywriting would have required a mystical interpretation by the Magi. So is the planetary conjunction theory really much different from the nova theory, the comet theory, or any other theory? Is it any better to say that by seeing a nova, the Magi "knew" a king was born in Judea? If we must be careful with one theory, must we not be careful with all? Indeed we must.

With proper handling of astrology as a superstition of potential influence, by maintaining the reasoned and realistic approach we use in other speculative subject areas, by refraining from making definite conclusions, one should be able to make an appropriate presentation of an intriguing mystery that provides an opportunity to teach some basic astronomy and an appreciation of the heavens. However, as Wenning and Hunt suggest—and which should be extended to include all current theories—it may well be the case that some of us are not so careful in our treatments. And this we must guard against.

Finally, not all of us are tired of dealing with the Christmas show, and planetarians Wenning and Hunt may not count me among those who wish to put it "out of its misery." Properly done, it can be a very lovely and very astronomical show, with strong, intrinsic human interest. Our planetarium's periodically revised version has consistently been one of our most popular programs, season after season, for some thirty years of operation. And as long as our public does not tire of it, neither will I.

Jim Manning
Morehead Planetarium
The University of North Carolina
Chapel Hill, NC 27514

Patterns in the Sky by Julius D. W. Staal
Fourth English Edition
Abbe Custom Graphics, June, 1980
Atlanta, Georgia 30307

This is not actually a new book review. It is a review of a book which has been around for many years, on the shelves of many planetarium types.

The author, Julius Staal, wrote the book while a lecturer at the London Planetarium in 1961, as an easy reference to the stories about the constellations. For the last few years, it has been available in too little supply—the demand outstripping the supply. A Norwegian edition, written in that language, is available but difficult to obtain in North America.

Divided into the four seasonal groups of constellations, with separate headings for each constellation and accompanying star charts, Patterns in the Sky is a handy and quick reference book for the planetarium lecturer, student, or the amateur star gazer who wishes to impress his friends.

Mr. Staal retired from Fernbank Science Center Planetarium in 1977, but has remained active in the planetarium field—operating his own planetarium at Agnes Scott College in Decatur, Georgia, and writing a new book, Stars of Jude, to be published in the near future, will be about Chinese constellations and related mythology.

Patterns in the Sky (paperback) is available from the author at 1154 Rogers Street, Clarkson, Georgia 30021, for $7.50 (and discounts for quantity orders).

John Burgess
Astronomer
Fernbank Science Center
Atlanta, GA 30307
In this golden year of the discovery of the planet Pluto, as I look back over the fifty years and see the immense things that have happened, it occurs to me that for an object its size, Pluto has caused more controversy. To this day it presents an enigma. Let me touch some of the highlights of this rather complex story.

During the first few years of the present century, Percival Lowell became interested in the search for a planet outside the orbit of Neptune. His inspiration was the presence of very small perturbations in the motion of Uranus. Lowell realized that such a planet would present an image one hundred times fainter than Neptune. In actuality, it worked out to be more than that. Lowell realized that the search for this object could not be accomplished visually. It could only be made by making wide angle photographs of sections of sky which, when rephotographed at a later date, could be used for comparison. Therefore, the first photographic search at the Lowell Observatory for the planet was made between 1905 and 1907 using the 5" Sky Camera. The plates were compared by superimposing one upon the other and studied under a hand magnifying lens. From 1914 to 1916, an intensive search was made with the wide angle camera borrowed from the Sproul Observatory of Swarthmore, Pennsylvania. Approximately 1,000 plates were taken with this instrument. At this time the Lowell Observatory acquired a blink microscope comparator from Germany. Such an instrument was a prime necessity for the search. As a matter of fact two plates taken in 1915 recorded the image of Pluto, but it was missed. Lowell died suddenly in November of 1916 and the planet search was taken up at Harvard. It was a bitter disappointment to Lowell that his unknown planet had not been found. A few sporadic searches were also made elsewhere, but they, too, failed. Before he died, Lowell charged his young assistants never to give up the search. They felt that a more powerful sky camera was needed. The Lowell Observatory lacked the means to obtain such an instrument until 1928 when Percival Lowell's brother Lawrence, President of Harvard University, provided $10,000 to build a larger telescope. This can be translated into our present day inflated value as more than $50,000. This more powerful sky camera was completed in 1929. In fact, it had not been fully completed when I arrived in Flagstaff in January of 1929.

I joined the staff of the Lowell Observatory under very unusual circumstances. In 1928, I built my first telescope, a 9" reflector with a focal length of 79 inches. For six weeks I struggled to get an accurate parabolic figure. It proved to be an excellent telescope yielding sharp images of the moon and planets with a magnifying power of 400 diameters. In the late Fall of 1928, I made drawings of the markings on Mars and Jupiter, and sent them to Dr. Slipher, who at the time was the Director of the Lowell Observatory. He was in a position to check their accuracy against photographs taken on those dates. Evidently, Slipher was impressed.

In the meantime, Slipher was having some problems. The observatory was on a very frugal budget. The staff consisted of three aging astronomers with no assistants. They could not afford to hire another highly trained astronomer. Even if he could have done so, Slipher still would have been hard put to find one who would be willing to take on the tedious task of looking for a planet, which by this time was not a very promising proposition judging from the failures of the other searches. Slipher was looking for some eager young amateur, so he took a gamble on me. After an exchange of a few letters in December of 1928, he invited me to come to the Lowell Observatory on a few months trial basis as an observer to take plates with the new camera telescope. I stayed fourteen years! I had been a farmer. I was used to hard work, harsh conditions and discouragement. I came to the observatory armed with a high school diploma, a lot of self-taught astronomy, and a great deal of perseverance. My move was also a propitious one, since I was anxious to leave the farm. There had been a violent hail storm in June of 1928 which just about ruined all our crops. I can still vividly remember that storm. I was also going to work with professional astronomers whom I admired, and was willing to work for next to nothing to do so. When I boarded the Santa Fe train for Flagstaff, I did not have enough money left in my wallet for a return ticket.

Not until I arrived in Flagstaff did I learn that the main purpose of the new camera telescope was to search for the unknown planet. During most of 1929, Dr. Slipher and his staff were involved in completing and testing the new 30" telescope, and I worked closely with them. I learned to use the telescope and to take and develop its 14 by 17 inch plates. One day Slipher said to me, "From now on, you're on your own!" He no longer accompanied me to the dome. I had to work out all the problems that cropped up myself. The testing and completion of the telescope had required a great deal of Slipher's time. He had been working on his spectrographic project and was very anxious to get back to it.

I started my photographic search later in 1929, my plan being to start in the constellation of Gemini and then work my way eastward along the ecliptic. Slipher originally told me that my job was to take the photographs and to develop them. Someone else on the staff more experienced was to examine the plates I took under the blink microscope comparator. After the first few plates I took of the Gemini region, Slipher had his secretary count the stars on one small area on a plate to get an estimate of how many stars would be included on a plate. Three hundred thousand stars would be included on each plate! Slipher was overwhelmed! Apparently he had not expected so many stars. I foolishly made the remark, "I'm glad I don't have to wade through that starry night!"

Gemini was the most probable position for Planet X. A hurried examination of the plates I took of the Gemini region did not reveal anything unusual. Slipher and his staff were disappointed in not finding any trace of Planet X. They did no more blinking. Dr. Slipher was getting desperate. One day he told me to start blinking the plates. I was astonished! Why should Dr. Slipher have dumped the responsibility of finding Planet X on me? Slipher knew that the search would take a formidable amount of time (which he did not have), and would be a boring and laborious task. For a few weeks I blinked some of the plates. I encountered many asteroids. How was I to tell the difference between them and Planet X? I thought to myself, "Surely there must be some systematic way to make the search, and to give it worthwhile meaning if the discovery was made." My morale fell to its lowest point. Slipher had never told me about the proper procedure.
I began to compare photographs of the daily positions of the planets to their positions listed in "The American Ephemeris and Nautical Almanac" for the previous two years. Soon I saw that the best time to photograph a planet's position eastward along the zodiac was when it was in opposition. In this way the apparent nearly stationary situations for the asteroids would be avoided, for at this time they would imitate the characteristic small shift of a more distant planet. The more distant the planet, the smaller the shift to the west. This apparent motion at opposition is due to the tangential vector of the Earth's orbital motion and more than cancels out the planet's steady motion eastward in its orbit. This provided a means of parallax with which the distance to any distant planet can be readily determined. I quickly realized that several of the plates that I had studied in 1929 had violated this principle. I would have to rephotograph these regions at opposition times. Slipher listened to me, thought for a moment, then agreed.

(Soon after the discovery was announced on the 13th of March, 1930, several astronomers discovered images of Pluto on some old plates taken at the Lowell Observatory many years earlier, on the 19th of March and the 7th of April, 1915. This had been part of the 1914 to 1916 search with the Sproul instrument. I was shocked. What do these dates tell you about the procedure used? Well, Pluto had come to opposition about the 10th of December, 1914. Therefore, the plates had been taken three and a half months after opposition, just at the time it reached its most westerly stationary point. In this treacherous situation the positions were a very uncertain indication of the distance to the suspect planet. Moreover, no other plates were taken for confirmation purposes. I often wonder how many other violations of proper procedure were committed during the earlier searches.)

Getting back to my story, I decided to photograph the regions of Aquarius and Pisces as September of 1929 was drawing to a close. This had the advantage of freeing the telescope after midnight and facilitating the schedule of the night work. I developed the practice of taking three plates of each region within a week. I could then choose the best matched pair for blinking. The third plate was necessary to check the hundreds of false planet suspects encountered. Most of these were so faint that they were at the limit of the telescopic plate. I was encouraged to press the search diligently. Perhaps Planet X was fainter than Lowell had anticipated. I would go down to a lower magnitude than had been used in my previous search. I might even find some unpredicted planet! So I decided to search the entire zodiac belt. By late Fall of 1929, I was encountering the great star regions of eastern Taurus. To thoroughly examine the plates it took from three days to two weeks. The blinking schedule fell far behind. Plates taken of eastern Taurus to western Gemini contained about 400,000 stars each. I decided to stop blinking those pairs.

On the morning of the 18th of February I fixed a pair of plates centered on the star Delta Geminorum on the blink comparator. This was a less populous region, although it did contain 160,000 stars. By four o'clock in the afternoon I had completed blinking about a quarter of these two plates. I blinked them in sections 2 centimeters high, passing them across on the horizontal carriage. Each field was 1 centimeter in width. As I turned to the next 2 centimeter by 1 centimeter field, about two centimeters east from the bright star Delta Geminorum, I suddenly discovered a 15th magnitude star image appearing and disappearing as the shutter of the blink comparator alternated between one plate and the other. About three millimeters away another 15th magnitude image was doing the same thing! THAT'S IT! The deepest thrill came over me. The amount of shift was just what I was looking for which indicated that the object was a billion miles beyond the orbit of Neptune! I switched off the comparator and proceeded to examine the field with a hand knob, studying the images intently on the separate plates. Was the apparent motion retrograde as it should be? Yes, it was! The image taken on the 29 January plate was west of the 23 January plate. Then I measured the amount of the shift. After that, I replaced one of the plates with one taken the 21st of January. I knew the image would have to be one millimeter to the east of the one on the 23 January plate. There it was, exactly at the right place! I was now almost 100% certain. To make absolutely sure, I searched the 3x10 inch plates taken with the 5" camera that was strapped to the 30" telescope. With a small hand magnifier, I looked for the same little star configuration to be there. I was so excited that my hand was shaking. Although the images were very faint, almost at the limit of the camera, there were there. There was no doubt about it. For three quarters of an hour I was the only person in the world who knew exactly where Planet X was! But I couldn't keep the secret long. I walked down to Dr. Slipher's office. His door was open and he was working on some papers on his desk. I paused a moment. 'Then I entered.

'Dr. Slipher, I found your Planet X!' I said.

He was electrified! He rose from his desk with an expression that cannot be adequately described. We went back together down the hall to the comparator room. He was walking so briskly I could hardly keep up with him. I'll tell you that the air was tense with excitement. Slipher took one look through the comparator and exclaimed that it must have been fate. Pluto was three magnitudes dimmer than anyone thought it would be. He looked at his watch and saw that it was six o'clock. "Well, it's time to go to dinner. We've done all we can do for now," he said. Then he charged me not to tell anyone outside of the observatory staff. "It must be kept secret for now," he went on, "where is the object now? Rephotograph the region as soon as possible." We looked out at the sky. It was full of clouds.

Now I was a bachelor at the time and it was my habit to drive into town, have dinner, and pick up the mail at the post office before returning each evening to the observatory; that is, if it weren't cloudy. If it were cloudy, I sometimes would take in a movie. Because this evening was clouded over, rephotographing the region would have to wait. So I took in a movie at the Orpheum. I saw, on that evening, Gary Cooper in "The Virginian." I'll never forgive it. When I got back to the observatory it was still cloudy, so I went to bed.

The next night was clear, so I made another plate of the Planet X region, developed it, and left it to dry. The next morning I compared it to the 29 January plate. The image of Pluto should be 10 or 11 millimeters further west. In a few moments I had it. Planet X was just at the right place, and I showed it to the rest of the staff. Slipher made arrangements to take a visual look at it through the refractor to see if we could make out any small disc. The telescope had been set precisely to the latest position of Planet X. There it was, a small, almost imperceptible unimportant looking star image among all the other stars, with no discernible disc - even under high magnifying power. For Slipher, this was a keen disappointment. Percival Lowell had predicted that the diameter of the yet to be discovered planet would be at least one second of arc in diameter. The object also had shifted slightly to the west of the object on the film.

For the next three months, work at the observatory was totally changed. Each time I finished taking plates of the Planet X region, I continued the project of photographing eastward along the zodiac. Meanwhile, the rest of the staff...
constantly visually observed the planet to learn as much as they could about it. They also took photographs to see if they could discover any satellites. No satellite was found and they calculated that the mass of the planet was lower than the lowest limit predicted by Lowell. However, the fact that the planet was discovered within 6' of Lowell's predicted position seemed to be a fulfillment. Since the object was ten times dimmer than expected, it led to the belief that the object was small and very dense. Lowell had expected a planet similar to Neptune.

Preparations proceeded at the observatory to receive the expected avalanche of press and demands when the discovery was to be announced. We made up a full page observation circular. The secretary made copies of it, placed them in envelopes, and addressed them to all the observatories in the world. Everything was made ready to take down to the post office. We decided to mail them out on March 13th. We chose this date because it was the 75th Anniversary of the birth of Percival Lowell and the 149th Anniversary of the discovery of the planet Uranus by Herschel. We made up a full page observation circular. The secretary made copies of it, placed them in envelopes, and addressed them to all the observatories in the world. Everything was made ready to take down to the post office. We decided to mail them out on March 13th. We chose this date because it was the 75th Anniversary of the birth of Percival Lowell and the 149th Anniversary of the discovery of the planet Uranus by Herschel.

The news spread like wildfire. The next day Slipher was deluged by newspaper reporters and telephone calls. Indeed, the next three months were filled with excitement. The discovery not only caused a sensation among the general public, but among professional astronomers as well. Could it be that, even though the newly discovered planet was three magnitudes fainter than predicted, and much less in mass, too, that this was indeed the planet that Lowell had predicted?

Everyone rushed to compute the orbit. Several astronomers wanted to be first. At Harvard Observatory, the center for the dissemination of astronomical news, its Director, Harlow Shapley, was swamped with requests for the planet's reported positions by which the orbit could be computed. Shapley had no positions to give. Only the Lowell Observatory had this information from the discovery plates and those others taken up to March 12th, a span of only forty nine days. Shapley pleaded with Slipher for the positions to relieve some of the pressure. Slipher, though, wanted to keep the prestige for the Lowell Observatory.

One of the first telegrams coming into the Lowell Observatory for the positions was from the observatory of the University of California at Berkeley. They were especially into the computation of the orbits of asteroids and comets. Slipher was well aware of their experience in this field. But, they had not sent one word of congratulations. Slipher was annoyed at the fact that after all the hard work had been done by the Lowell Observatory to find the planet, all the other observatories were interested in was a list of positions. Slipher ignored them.

About a week later, another telegram came. But this time it was filled with congratulations! This did not impress Slipher because in the meantime they had made a statement to press casting doubt on the trans-Neptunian nature of the newly discovered body. Slipher was particularly bothered with the premature statements when in fact they hadn't even computed the orbit. Therefore they couldn't say that it was or was not trans-Neptunian.

Now here was an example where professional astronomers, like many others, did not understand the essence of the observational strategy involved in the estimation of a planet's distance when the plates are taken at opposition. It was simply a matter of parallax. With the measurements of the shift of positions on the various plates, the object could be nothing else but trans-Neptunian. The apparent slowing down of Pluto's motion between opposition and its approach to its stationary point during the following weeks was further proof.

Of course this did not indicate what sort of orbit the new body had. Whatever the nature of the new planet's orbit, it lay far outside that of Neptune. Now none of the astronomers at the Lowell Observatory had concerned himself with orbit computations. All of a sudden they needed it. The Lowell astronomers had taken courses in orbit computations many, many years before. What to do? Slipher got in touch with Dr. Miller of Swathmore, a professor who had taught courses in this subject for many years. He was asked to come immediately to Flagstaff to conduct the computation. Slipher was afraid that others would be first to compute the orbit.

Dr. Miller arrived in early April, and the computation immediately got underway. After fifty years, I can still see Dr. Miller, seated at a long table, furiously laboring over the computation. Four days later, on April 12th, as the computation came out to the end, the indication orbit was shocking! It worked out that Pluto's orbit was enormously elongated and greatly inclined to the plane of the ecliptic, like a comet's, and had a period of 3,000 years! The semi-major axis worked out to be 2217 astronomical units! I remember how terrible dismayed I felt because the new object was so unorthodox in its nature. Let me hasten to say that it is extremely difficult to accurately compute an orbit from so few observations taken over just a few months. We're talking about an extremely tiny arc of its orbit.

In the meantime, a graduate student, Fred Whipple, attempted to compute an orbit using observational data taken over a period of 19 days, from March 16 to April 4. He computed several orbits. At least two of them worked out to be highly elliptical. These were announced in the Harvard Announcement Cards on April 7, 1930, and a week later in the Lick Observatory Bulletin. Computations also showed that its distance from the earth to be 41 astronomical units. They also showed that the distance was far off the predicted distance that Lowell had given. Slipher got very angry over newspaper accounts purporting that the discovery was not of Lowell's Planet X, or possibly not a planet at all. He tried to convince them that it was indeed a planet, but following an entirely new path differing from any other solar system object.

The critics of Lowell's prediction caused considerable concern to those at Flagstaff. Whatever the true nature of the object turned out to be, Slipher tried to assure us, it was still a major discovery.

Earlier plates of the discovery star region taken at other observatories were examined to see if we could get pre-discovery positions of the object. We found the planet's image on a plate taken on January 27, 1927. This afforded the computation of a much longer arc. This reduced the huge amount of inclination originally figured and reduced the period to 265 years. The other elements were also refined in their values. This brought the orbit computation much closer to what predicted by Lowell.

Pre-discovery plates were also found going back to 1915. These allowed a further refinement of the orbit.

Further observations by Nicholson of the perturbations of Neptune led to the conclusion that the mass of Pluto was seven or eight tenths that of the earth. This wasn't far from Lowell's prediction either.
Yet there were still skeptics. Some still held to the belief that the discovery was just a happy accident. Others countered with the argument that the mass, distance, and orbital elements were too close to Lowell's predictions to be mere coincidence. Articles appeared in scientific journals, here and in Europe, presenting both sides of the controversy throughout the 1930's. The controversy hasn't ended yet! As late as 1968, an article, "The Mysterious Case of the Planet Pluto" appeared in *Sky and Telescope*. The later date shows how unresolved the problem of Pluto was. Other papers and articles were published all over the world down through the years. The Pluto problem had literally captivated the world.

The question, soon after its orbit had been calculated, was, "How did Pluto get that way?" "What was the nature of its origin?" The first suggestion was that Pluto might be an escaped satellite of Neptune. As late as 1979 this idea was further refined by comparing it to the strange new object, Chiron, discovered by Charles Kole in 1977. The idea is that both Chiron and Pluto are former satellites of Neptune. They escaped when a massive body passed close to Neptune early in the history of the solar system. I think this idea merits further study since it seems to answer the question of Pluto's intersecting orbit.

Another question asked, soon after its discovery, was, "What is Pluto like?" Spectrograms of Pluto were taken with what was then the largest telescope in the world, the 100 inch reflector at Mt. Wilson. The task taxed the power of this great telescope. We were told by the Wilson astronomers that the spectrogram was characteristically solar in nature. It was yellowish and wholly unlike that of Neptune. It was proposed that Pluto was covered by a blanket of liquid air, liquid because of its distance from the sun. It would appear to us on earth that it would reflect light like a convex mirror, the radius of a curvature of which would be equal to the radius of curvature of the planet. I immediately became interested in what kind of magnitude Pluto would have if this were to be the case. So I proceeded to compare the sun's apparent magnitude to that of Pluto's, since the spectrogram showed that Pluto was a solar type. This comparison would be a valid one. Assuming that Pluto was covered with this frozen blanket, its radius of curvature could be 5,000 miles; and therefore its apparent magnitude of the sun as seen from the earth is - 26.6. The way that the magnitude scale is set up, each step is a factor of 2.5. A difference of five magnitudes would represent a difference of a hundred fold. At Pluto's distance, forty times the earth's distance to the sun, the sun would appear 1600 times dimmer, 40 squared, or eight magnitudes. A Putorian the sun would have an apparent magnitude of 18.6. It would no be seen as a disc, but as an exceedingly bright single star point three hundred times brighter than the full moon seems to us. Then calculated how bright the surface of Pluto would be intrinsically, assuming the convex lens effect of a frozen atmosphere. Then I calculated how bright the intrinsic magnitude would seem to be as seen from the earth. To my utter amazement my calculations resulted in an apparent magnitude of +15 - exactly the apparent magnitude at which Pluto appears to us!

This led me to the tentative conclusion that Pluto might be 10,000 miles in diameter, twice the volume of the earth, with a mass possibly three times that of the earth. Amazing! The mystery of Pluto deepened.

It was not until the occultation of a 5th magnitude star by Pluto on the night of April 28, 1965 that I really abandoned the idea. It showed a much smaller diameter than I had thought. Little by little we were learning more and more about Pluto.

Getting back to 1930, because its mass was so much smaller than Lowell had predicted, many astronomers pleaded with Slipher to continue the search for Planet X. Might not there be still something else out there beyond the orbit of Neptune? They told Slipher that he had the observatory with the equipment, the expertise, and the experience to do the job. So Slipher, in May of 1930, asked me to continue the search. He would entrust the task of making, developing, and examining the plates to no one else. If such a planet did exist, it could have an inclination just as great, or even greater, than Pluto. It could be as much as 25 or 30 degrees outside the belt of the zodiac. The planet search had only just begun!

For the next 15 years I searched over 60% of the entire sky down to the 17th magnitude, and 10% more to the 16th magnitude. I searched all the way from Perseus and the Big Dipper in the north, clear down to Canopus and Argo Navis in the south. I had all those star images on my plates. That's a span of 110° in declination! I sat at the blink comparator for a total of 7,000 hours and checked 90 million star images for the other planet's position. I looked at every one of those stars. I had to! But no other planet image showed up. However, what my work did accomplish was the discovery of fine new open cluster of stars, a super cluster of galaxies, and hundreds of new asteroids and variable stars. My research was suspended during the Second World War, for I was assigned to teaching navigation.

For fifty years Pluto has remained an enigma as regards to its role in the formation of the solar system. Two recent discoveries have led to a drastic reassessment of Pluto. Infrared spectral studies of the surface by Cruikshank, et al, has yielded a brighter albedo which in turn indicates a much smaller diameter, probably no larger than the earth's moon. The other discovery, in 1978 of its satellite, Chiron, only 19 or 20,000 kilometers from Pluto has provided the first opportunity to calculate the true mass of the planet and its satellite. Pluto's mass turns out to be only 1/400 that of the earth. The mean density comes out to be that of water ice. The only other object in the solar system that closely resembles the characteristics of Pluto is Chiron, the strange object discovered just a few years ago. Chiron's orbit crosses Saturn's slightly, just as Pluto crosses Neptune's orbit. Had I searched the region of sky in the 30's that I searched in the early 40's, I would have discovered Chiron! Such are the fortunes of planet searching!

This year marks the 50th Anniversary of the discovery of the planet Pluto. For anyone interested in searching for another planet, I bequeath these Ten Commandments:

1. Behold the heavens, and the great star masses there-of, for a planet could be anywhere therein.
2. Thou shalt dedicate thy whole being to the search project within the limit of thy patience and perseverance.
3. Thou shalt not set any other work before thee, for the search shall keep thee busy enough.
4. Thou shalt take the plates at opposition times lest thou be deceived by asteroids.
5. Thou shalt duplicate the plates taken at the same hour angle lest diffraction distortions overtake thee.
6. Thou shalt give more than adequate attention to adjacent plate regions lest the planet play hide-and-seek with thee.
7. Thou must not become ill lest thou fall behind the opposition time.
8. Thou shalt not have any dates except on full moon when full exposure plates cannot be taken at that time.
9. Many more plates shall appear before thee, so thee better check everyone of them on third plate.
10. Thou shalt not engage in dissipations, though diverse they may be many, for thou must leave them in the face of the job.
The Planetarium and Young Children's Assumptive Philosophies

John R. Nevius, Jr.
Associate Professor
College of Education
Texas Tech University
Lubbock, TX 79409

The capability of planetariums to deal with the mythology of the heavens can be important in the enculturation of young children to psychological reality.

The importance of every psychological theory is that in addition to ideas concerning instruction and values, it provides a unique description of children. The image presented by Piaget (1969) and other cognitive developmental psychologists such as Elkind (1974) and Kohlberg (1969) shows that mental growth related to rational logic takes place as young children act on the environment and reconstruct objective, relational, and reciprocal reality. The cognitive developmental image also shows that mental growth related to the cognitive enculturation of the psychological world occurs as children act on their assumptive views of consciousness and causality. The former process of mental growth dealing with the logical physical world has been commented upon previously with respect to both planetarium and television programs (see for example Beck, 1977; Bishop, 1976; and Cook et al., 1979). However, the process of young children's enculturation to the living psychological world has seldom been described. It is this latter phenomenon that is the central theme of this article, because, to my way of thinking, it is extremely amenable to planetarium programs. Children accept the mythological stories about Orion, Scorpion, Leo, Pegasus, and so forth because the stories fit children's assumptions concerning consciousness and causality. The story of a mythical hunter stalking the heavens is not just entertaining — it is, in fact fully believable and becomes psychological truth. The recognition by adults of such reality is important due to the fact that the group culture of children is constructed according to assumptive rather than validated views of the purposive psychological world. The ancient cultures that named the heavenly bodies, and gave the rich descriptions to the constellations, had similar assumptive views.

Piaget (1969) suggests that in western technological cultures children accommodate to culturally supported world views of a nonconscious and noncausal world by becoming psychologically ready to move to higher orders of thought. Such psychological preparation occurs as children consolidate their current levels or stages of thought. With young children, consolidation is achieved as they are able to operate as though their assumptions about the reality of the enculturating psychological world are in fact the truth. Elkind (1974) suggests that such assumptions are in fact assumptive philosophies, or a global set of beliefs about the psychological world. These philosophies of young children are composed of thoughts about consciousness or animism, causation, realism, purposivism, and artificialism.

For careful observers, the assumptions of young children's philosophies are at once both charming and unique. For example, children have an intense animistic perspective of the world, and believe that such things as wind, clouds, trees, rivers, and stones have a conscious being with motive and intention. Many of the classics of children's literature, such as the Wizard of Oz stand the test of time simply because the authors capitalized on the animistic condition of their audience. Obviously the same holds true for many popular children's movies from Disney and others in which moving trees, talking rivers, and mobile rocks match children's animistic mode of thought. In short, children have a real and empathic consideration of their world as a personified stage with a wide ranging cast of characters capable of both intention and motive.

The same holds true for causality, children in a singular sense believe that psychological thought affect physical reality. So we recognize children's belief that pixie dust caused Wendy, John, and Michael to fly, and a magic wand created a wondrous coach out of a dreary pumpkin. Unfortunately, in an unhappy sense, some of you may have encountered children who believed their angry thoughts were connected with a parents untimely death. This is because children believe that when two occasions or events occur in succession the first causes the second. Another example of causation would relate to the literal rising of the moon due to the falling of the sun, when as we all know the physical relationship is much different. So, because of psychological causational children are ready to assume as truth the causal components of the stellar legends, as the relationship between short tailed bears on earth and a long tailed Ursa Major, or the reason the moon is in the sky is because a revered and sacred god hurled it forth.

A part of causation involves children's assumptions about the Pliagetian (1969) concept of realism. As Elkind (1974) says, young children have a new found reverence for symbols, but they do not clearly distinguish between the name and the object. Because of this confusion they think that the name sun is part of the sun, and that the sun always and everywhere is called sun, realistically and logically it cannot be otherwise. Names like Orion are not arbitrary designations, but are the properties of what they represent.

Purposiveness relates to children's views that everything has a purpose or cause, and there can be no chance or arbitrary events. Although children's innumerable why questions are phrased as though physiological answers are desired, in reality children want to know the psychological purposes. For example, "Why does the sun go down?" Answer — "So the moon and the stars can come out, you can go to bed, and get up and have breakfast with daddy." Such an answer seems strange, but it is one that satisfied my young son — he could understand the purpose.

Assumptions concerning artificialism simply represent the belief that everything in the universe was made by and for man. The planets and stars are therefore man's use; consequently, the ideas of anthropomorphic beings existing in the heavens, and the idea of man traveling to the far reaches of the universe, are perfectly plausible psychological beliefs.

But not only children accept such "far out" notions of consciousness and causality. Even adults sometimes demonstrate their personifications of inanimate objects by talking to cars and planes, or by noting the magical causation connected with thoughts about mirrors, cats, and ladders. However, for young children their thoughts truly describe reality — there is no alternative. Adults on the other hand know what culture says reality is, and consequently revert only temporarily to less mature forms of thought.

Planetariums with their magical projectors are a means for children to use in the interpretation and manifestation of their assumptive philosophies. Importantly the planetarium should interpret the stellar legends just as the myth created
them. The ancients described the stories of the universe from the same perspective that children use to order their psychological world — one that is based on an erroneous set of global beliefs.

For children the psychological world is personal; assumptive philosophies are predominant. So, the mythological stories of constellations that suggest inanimate stars have psychological attributes of intention, motive, and cause, help children to consolidate a personal and erroneous view. As this happens, children become psychologically ready to move to culturally validated views of the personal living world.

SUMMARY

Children reduce their egocentric views of objectivity, relativity, and reciprocity by interacting with tangible ideas. The role and means of planetariums with such a system of learning is nicely described by Bishop.

On the other hand, the psychological living world of young children can be appropriately portrayed through brilliant graphics and oral richness that describe the stellar legends. Children will remember the story of the archer hunting down the venomous scorpion, or the legendary hero and his exploits, while simultaneously forgetting the shape of the constellations, or the relational aspects of direction, such as: east on the left, and west on the right when plotting the Moon’s motion along the southern half of the dome. The consciousness and causation inherent in the stories that describe the twelve famous constellations that form the plane of the ecliptic are easily understood by children. The stories match children’s thinking, and consequently they are one additional means of helping consolidation, psychological readiness, and movement to culturally validated thought.

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WHAT’S NEW

James Brown

From time-to-time I find myself looking back in old issues of The Planetarian for ideas or just to reflect on how far we have come since 1972. While looking at Vol. 2, No. 2, I came across the article on Ultra-Violet photography. Of the four companies listed, only Ultra-Violet Products, Inc. is still in operation (at least they are the only ones to respond to a letter). Ultra-Violet has a nice line of paints, lights, crayons, and other assorted supplies, however I found the prices to be higher than expected.

LASER Presentations, Inc., located at 1392 King Avenue, Columbus, Ohio, has announced they can build a Space Concert Light System to fit your planetarium. Their announcement did not make clear a price.

Hubbard Books of Box 104, Northbrook, IL, is advertising a 32-page, 11" x 14" Seasonal Star Chart for $6.50. It is described as a comprehensive guide for amateur astronomers that shows seasonal star positions, with exact locations, printed on each chart. The luminous star finder on the cover can be used outdoors at night to locate star and planet positions for any date. They also sell a single rotating chart for $2.75. It shows stars to the 5th magnitude and includes nebulae and the Milky Way. The major stars are, like the larger version, luminous. This chart measures 10½" x 11½".

David Aguilar has just released information about three new planetarium programs. “The Space Shuttle,” available July 1980; “Invisible Universe,” available October 1980; and “Tunguska!” available January 1981. Each program kit contains one annotated show script, one audio tape, one complete set of slides, one complete set of Kodakith Master Graphics and two sample public service announcements. Each program will cost you $150. If you are interested, contact him at P. O. Box 3186, Salinas, CA 93912.

Science Graphics, P. O. Box 17871, Tucson, Arizona, has just released a new set of slides called the New Geology Slide Series. It covers some 20 sets and over 600 slides! It’s reported that 50% are the same colorful style as the Astronomy series, while the remaining are photos of the real thing. They also are introducing Deluxe Editions of each of the slide sets. Each Deluxe set includes all the slides from a series in protective plastic pages and bound in a notebook for easy storage and filing.

If anyone out there knows of some item or material they would like more information on, please drop me a line and I will try to get it into my article.
A Commercial Message
Frank R. Engler, Jr.

(Reprinted with permission from AUDIO-VISUAL COMMUNICATIONS, April, 1980).

Frank R. Engler, Jr. MLS is acting director of Medical-Dental Communication at Georgetown University's Schools of Medicine and Dentistry, Washington, DC. He is also a media consultant and conducts television planning and production seminars. His association memberships include AECT, HEMA, ITVA and NAEB.

Thanks to the television commercial, a complete audio-visual communication in ten seconds has become a common message unit in American households. Although AV media producers do not generally create programming in such short time spans, they should be aware of the ten-second mental attitude of their nonbroadcast audiences.

All of us are very familiar with the wares of the television commercial pitchman. He coaxes, cajoles and vexes us right in our homes. We seldom allow a door-to-door salesman into our living rooms, but the TV pitchman has access whenever we turn on the set. And on the average, that is over 40 hours each week.

This has been the case, now, for approximately 30 years. How many remember "The Big Top" with Sealtest as sponsor or "Arthur Godfrey's Talent Scouts" and Lipton tea? If you do not, you can probably recite the McDonald's jingles or other "greatest hits of the adman." What does this have to do with AV media producers and users? The answer is plenty.

Commercials or spots are the most prevalent form of programming on broadcast television, from ten to 20 minutes of every viewing hour. You probably will not admit it, but you are "hooked" on that style of communication. The rapid-fire, repetitive, pulsating tool that admen use is continuously molding your mind and shaping your lifestyle — the food you eat, the clothes you wear, the places you go. Furthermore, because children make great consumers, the banal barrage thrown up by admen is calculated to reinforce the worst characteristics of childhood. We are all targets being shot at by millions and millions of dollars worth of broadcast bushchet.

There are your major goals that the TV admen have promoted:
1. Psychological reinforcement of very brief message statements as the major form of effective communication.
2. Intentional blurring of the boundary between fantasy and reality.
4. Psychological reinforcement of the worst aspects of childhood, i.e., impulsiveness, delight in the simple, selfishness, etc.

Consider, then that as a media producer you are dealing with a tempered audience, tempered in the sense that they have been pre-conditioned to:
1. Listen only at certain times and only in response to certain stimuli.
2. Not listen fully even when they are listening.
3. Identify high impact visuals as better and therefore probably worth paying attention to.
4. Relate only to statements with a "you" orientation, i.e., "You, You're the One," "Have it Your Way."

If you wish to be successful in communicating to such an audience, use their pre-conditioning to your advantage. For instance, use personal direct-appeal approaches, but be original. They have seen almost everything, but then you can play on that too.

Offer the audience digestible blocks of information with natural breaks built in. Remember they have been conditioned to ten-, 20- and 30-second complete communications segments.

Do not belabor a point. If it is necessary to pound it in, do so in a preview opening and/or in a review closing.

Use humor whenever possible to enhance a point or as a contrasting emphasis device. Life is not all business, procedure and policy, especially definitions of life audiences see in TV ads.

Link thought or statements to create a memory chain. Because people are used to short, choppy communications, you will stand a better chance of their remembering your message if you help them organize it.

Colors and shapes are psychological stimulants and can also act as memory triggers. People are very familiar with product containers and colors used in marketing. Employ these shapes and colors to identify concepts, procedures and statements.

Make and extra effort to vary the pace of your program. If TV admen can do it in 30-second spots, you surely can do it in ten- or 20-minute programs.

Produce your program as though you are selling something because you are. Whether it is an opinion, an idea or a new company policy, try to think like an advertiser and you will probably do a better job.

Above all, be positive about the project. Sometimes advertisers promote products and services that they do not believe in. But the professionals do not let that bother them. They are employed to do a job, and whatever it is, they try to do it well. If you are not positive about the program, everyone will know it by the time the credits roll.

My final statement concerns some advice James Littlefield offers students in his textbook, "Advertising: Mass Communications in Marketing" — "the advertising should determine the tastes of an audience... he should then cater to those tastes; he should not tamper with them. Never underestimate how subjective taste is or how wide the range. Just look at the magazines others read, the records they listen to, the movies they recommend and the foods and drinks they prefer."

Discover what your audience's tastes are and then cater to those preferences. That is what this article has been about. Remember your audience likes to be "catered to," and after 30 years of heavy reinforcement that may be the only approach they know.
The Commission 46 (Teaching of Astronomy) Newsletter of the International Astronomical Union for late June, 1980, contains several interesting items.

The Commission has obtained a small grant from the V. M. Slipher Fund of the U.S. National Academy of Sciences to make 35mm slides available at no cost astronomers in developing countries who find it difficult to purchase slides. Slide choices will be available from Kitt Peak Observatory and from Hansen Planetarium (part of which are slides from Hale Observatories and booklets of slides with descriptions in French) assembled by M. Gerbladi and L. Gouguenheim — "La loi de gravitation dans l’univers" and Connaissance des astres par leur rayonnement. Expression of interest was to be sent to Donat G. Wentzel, Astronomy Program, University of Maryland, College Park, MD 20742, U.S.A. by October 15, but apparently orders will be accepted until the grant is exhausted. (Incidentally the IAU Commission 46 Newsletter is also distributed by Dr. Wentzel from this address.)

The same issue of the IAU Commission 46 Newsletter noted that certain "Astronomy Education Materials" published by Dr. E. Konovitch (Russian, Slavice-langages) and by Dr. L. Mavritis ("other" languages) have been mailed to national representatives to the Teaching of Astronomy Committee of the IAU. The English-language materials by Dr. B. Peery and Dr. R. Robbins were to be mailed in August, 1980, to various countries. Dr. Wentzel notes that it is the intent of the Committee that these materials be made available within each country to anyone teaching astronomy. It is expected that planetarians could receive a copy of the materials by contacting their country's representative to the Committee. In the U.S., Dr. Wentzel, who is President of Commission 46, may be contacted.

Juliusz Domanski of Torun, Poland, reports in this issue of the Commission 46 Newsletter on methods of duplicating the discovery situation of the rings of Uranus. It seems that the procedures might well be adapted to planetariums, an excellent participatory idea. (See pp. 11-12 of the issue.)

The November, 1979, issue of The Science Teacher (Publication of the U.S. National Science Teachers Association) contains an article which could be quiet useful to creative astronomy educators. The article, "Game plans for Science," by L.D. Carter and R.T. Lee, describes how to plan and construct a game based on science information. Everyone knows that games are motivational to many students from elementary age through high school, but there are problems with commercial space games. Those like "Star Trek" do not meet educational objectives, and a rare one, "Space Hop: A Game of the Planets" (designed by Helmut Wimmer and distributed by Teaching Concepts Inc.), is fairly expensive for just one playing board accommodating four players at maximum. So read this article and construct playing materials which accommodate your particular astronomy teaching objectives for mere pennies. Don’t forget to send a copy of your best works to The Planetarian to be shared with the rest of us.

My husband and I recently returned from a month trip to Utah, Arizona, and New Mexico. In addition to visiting planetariums, observatories, and sites of astronomically oriented petroglyphs and pictographs, we also made a point of stopping at the Astrogeology Laboratory of the USGS in Flagstaff, Arizona. Jay Inge, airbrush artist for those beautiful journal depictions of Ganymede and Europa and the National Geographic maps of the moon and Mars, was a genial host. The Lab apparently does not receive a large number of visitors who teach astronomy in or out of the planetarium, and they welcome such visitors. It was fascinating to learn how the three types of planetary maps-photosaic, air brush, and astrogromatic (stereo pairs selected and used to make contour maps) — are made. Interestingly, Inge does not consider his airbrush work as "artistic," He explained this is because he and the three other airbrush experts at the lab are recreating exactly what is seen. One slight difference from photographic mosaics is that shadows indicate elevation rather than differing sun angle. Also, on a particular airbrush map, the same sun angle is maintained around the planet. Inge has worked on moon and planetary projects for 15 years, through the height and the decline of U.S. space programs. He notes that two undesirable aspects of the decline in space work are the dispersion of many good people and the dwindling of practical spinoffs from space research. At least we can look forward to some nice airbrushed maps of Saturn from the Voyager program. And we can look for a set of matched globes of Earth, Mercury, Mars, and the Moon, designed by Inge. The globes contain only topographic features (no water or ice). They currently are being produced in a limited quantity of 300 for a special Congressional and university distribution, but a commercial producer will then be given rights to make many sets. I saw a set; they make a fine educational display.

NASA has announced, (NASA Activities, July, 1980), that the National Science Teachers Association has been selected for negotiation of a NASA contract to manage a nationwide competition to be conducted annually among high school students. The competition will determine experiments to be flown, at NASA discretion, on the Shuttle. Said NASA Administrator Dr. Robert Frosch, "The vitality of NASA depends heavily on an infusion of fresh ideas. Therefore, our connection with students is extremely valuable to us and is an important part of our program."

Competitions in the Shuttle Student Involvement Project will be conducted each fall. Selection of winners will take place in the spring. The NSTA will formulate rules and define 10 regions from which semifinalists will be selected. Twenty semifinalists will be chosen in each of the 10 regions, and each region will hold a seminar in which semifinalists will discuss their proposals. Then up to 10 proposals in each region will be selected for final review. Currently a program to involve college students is under consideration.

Continued on page 21
(Above) U. S. President, Jimmy Carter.
(Right) Greeting from President Carter to the I.P.S. membership at their 1980 Conference, read by I.P.S. President, Jim Hooks.
May 30, 1980

It is a pleasure to greet all those attending the Biennial Convention of the International Planetarium Society.

Throughout the ages men have looked to the stars and sought in them answers to the mysteries of the universe. Today, as astronomers and space scientists explore the heavens with ever more sophisticated instruments, the public's fascination with the planets and stars grows even stronger.

Planetariums, therefore, meet a special need. They are among our most unique institutions in advancing the public understanding of astronomy and the nature of the universe. Through them our people can study the solar system, explore the galaxies and learn about the vast and fundamental forces of creation at work throughout the universe. They are truly the endless frontiers of nature and knowledge.

I send my best wishes for success at your convention and in your future work in advancing the valuable contributions of planetariums to society.
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THE WHITE HOUSE
WASHINGTON
May 30, 1980

U. S. President, Jimmy Carter.
(Right) Greeting from President Carter to the I.P.S. membership at their 1980 Conference, read by I.P.S. President, Jim Hooks.
The planetarium is very useful in demonstrating several precessional effects. These changes include identifying new pole stars and vernal equinox positions, visibility of certain constellations, changes in seasonal constellations, new coordinates for the stars, and the changes in the azimuth rise and set points of a given star. The ability of being able to tell where stars rose and set thousands of years ago is especially useful to someone investigating ancient archaeological sites.

The Big Horn Medicine Wheel is an interesting example of this precessional effect. This medicine wheel is in north-central Wyoming, between Sheridan and Lovell, just south of the Montana border. It is near the summit of Medicine Mountain and is now protected by a high fence and the U.S. Forest Service (see figure #1). Its geographic position is: Longitude, 107°55' West; Latitude, 44°50' North. The wheel is about 25 meters in diameter and contains 28 unevenly spaced spokes that connect to the rim.

Of special interest in this exercise is the azimuth rise point of Sirius. From figure #1, we can measure this to be 118°. The questions that must now be answered are:

1) What is the declination of a star that will be seen to rise at this azimuth (118°) at this latitude (45°N)? and
2) At what time in the past (if any) did Sirius have this declination?

To answer these questions, we need a pocket calculator with trigonometrical functions. For the first question, we will use a simplified version of the spherical triangle formula (we set altitude:::0°):

\[ \sin d = \cos \text{Az} \cdot \cos L \]

where \( d \) = declination, Az = Azimuth, and \( L \) = latitude.

\[ \sin d = \cos 118° \cdot \cos 45° \]
\[ d = -19.40 \text{ or } 190S \]

To answer the second question, that is, at what time in the past did Sirius have a declination of 190S, we will need to do more calculations. This method is approximate, in that it will produce a reasonably accurate answer, but will not take into consideration all the subtle effects that change star positions over long periods of time.

We must first change the present right ascension (RA0) and declination (d0) to current celestial longitude (CLgo) and celestial latitude (CLt0) coordinates:

a. Present Celestial longitude:

\[ \cos (CLt_0) = \frac{\cos RA_0 \cdot \cos d_0}{\cos (CLt_0)} \]
\[ \cos (CLt_0) = \frac{\cos 100.75° \cdot \cos (-16.70°)}{\cos (-39.70°)} \]
\[ CLt_0 = 103.40° \]

b. Present celestial latitude:

\[ \cos (CLt_0) = \frac{\cos RA_0 \cdot \cos d_0}{\cos (CLt_0)} \]
\[ \cos (CLt_0) = \frac{\cos 100.75° \cdot \cos (-16.70°)}{\cos (-39.70°)} \]
\[ CLt_0 = 103.40° \cdot 46.00° = 57.40° \]

c. Past celestial latitude (CLt1)

Since the precession axis is perpendicular to the plane of the ecliptic, the celestial latitude of a star remains constant during precession.

\[ CLt_1 = CLt_0 \]
\[ CLt_1 = 39.70°S \]

d. Past celestial longitude (CLg1)

During precession, the celestial longitude decreases by 50° of arc per year, going backward in time.

Let's go back 3300 years (to -1300)

\[ 50°/yr = .8333°/yr = .01395°/yr \]
\[ 3300 \times .01395° = 46.00° \]
\[ CLg_1 = CLg_0 - 46.00° = 103.40° - 46.00° = 57.40° \]

e. Past declination (d1)

\[ \sin d_1 = \cos 23.5° \cdot \sin (CLt_1) + \sin 23.5° \cdot \cos (CLt_1) \cdot \sin (CLg_1) \]
\[ \sin d_1 = \cos 23.5° \cdot \sin (39.70°) + \sin 23.5° \cdot \cos (-39.70°) \cdot \sin (57.40°) \]
\[ d_1 = -19.10° \text{ or } 190S \]

We now know that Sirius had a declination of about 190S about 3,300 years ago. If the Big Horn Medicine wheel was built about that time, then we can be reasonably sure that the "F" to "O" alignment (see figure 1) was intended to mark the Sirius rise position.

I should also include a note about the difference between historical and astronomical time scales; -3000 is not the same as 3000 B.C. The historical calendar (A.D. and B.C.) does not contain a "zero" year, but the astronomical calendar does:

Historical: 2AD 1AD 1BC 2BC 3BC
Astronomical: +2 +1 0 -1 -2
Therefore, -3000 is equivalent to 3001 B.C. For A.D. dates however, the numbers are the same and 1980 A.D. is equivalent to +1980.

The following table for the position of Sirius will serve as a check for your calculations and demonstrate the magnitude of error introduced by the simplifications of these formulae:
This table has been plotted on a graph, see figure 2. This change can be demonstrated in the planetarium, if the horizon ring has azimuth degrees marked on it. The azimuth starts at $0^\circ$ at true north and increases eastward such that $E = 90^\circ$, $S = 180^\circ$, and $W = 270^\circ$. The scale can be measured as follows:

Set the planetarium for a latitude of $90^\circ$ North. Turn on the celestial equator and it will be projected along the horizon. Adjust the if necessary, to align a pair of hour circles with a N-S line in the room. Use temporary markings to locate each hour circle (15° apart). Use a light piece of cardboard (poster board) to make a scale for the 15° interval. Divide the scale into 15 equal divisions. The 360 one-degree azimuth points can now be located around the room. Use self-sticking labels for the markers. They come in a variety of shapes, and colors. You can stick a different type for each of the 1°, 10°, and 15° marks. Self-sticking numerals and letters can also be used for labeling the 30° intervals and the cardinal points.

Once the azimuth points have been marked, the correct precession position can be set on the planetarium by using either Table II or Table III. Two tables are required, because the Spitz A-4 ecliptic turns with the stars and Regulus, for example, will always be at the same position with respect to the “date” projected on the dome. You can set precession using Table II. Set the “date” on the vernal equinox that coincides with the time period for which you wish to set the machine. Other machines that allow Regulus to slide along the ecliptic more accurately the events that take place. Table III should be used for setting these machines. Regulus can be set according to the “date” on the ecliptic or according to its new celestial longitude.

A planetarium program of this type can be presented at several levels of sophistication. It can range from a straightforward demonstration with the machine having been set beforehand to having the students actually do the trigonometric calculations and predictions. Azimuth rise or set points and the time periods associated with a specific event can be determined with these formulae. Almost every culture has an example of such observations; Stonehenge in England, temples in Central and South America, pyramids in Egypt, structures in India and China, and of course the stone circles of the North American Indian. There is an equally wide latitude in time, such observations have been recorded from about -3000 to 1600. Using examples such as these help “brighten” up a lecture on precession. Hopefully, they will convince the students that knowledge of this topic is important even though the process goes on, unnoticed by them, during their lifetimes.
Figure 1: The azimuth rise point of Sirius at the Big Horn Medicine Wheel

Figure 2: The precessional effects on the coordinates of Sirius

REFERENCES
A RESPONSE TO AN ASTROLOGY STUDY APPEARING IN The National Enquirer

Gary Mechler, Cyndi McDaniel, Steven Mulloy
North Kentucky University
Highland Heights, Kentucky 41076

Editor’s Note: This article is to be printed in the Winter, 1980 issue of The Skeptical Inquirer and appears here with the kind permission of the authors.

The January 22, 1980 issue of the National Enquirer proclaimed to its millions of readers in large red type: "Astrology Works—Test Shows Zodiac Sign Does Affect Your Personality." The article begins with "Astrology really works! In a remakable, first-of-its-kind study commissioned by The Enquirer, an astounding 91 percent of 240 randomly selected persons proved that their personality is determined by the astrological sign." Apparently the study was carried out by the article’s writers, John Blosser and John South. They requested their subjects to give their birthdates and then check off the personality description in the list given below which best described them. The writers claimed to check their procedures with astrologers and psychologists.

Since one of us (GM) discusses astrology in one of the Northern Kentucky University introductory astronomy courses, it was felt desirable to use NKU students in a follow-up study of the claims made in the article. Their primary claim, that 91% of their 240 subjects correctly recognized themselves in their choice of sun sign descriptions, is the first we will respond to.

262 students were offered the National Enquirer’s sun sign personality description list. The day students were polled in class. Almost all were in general introductory courses. 32 students were evening students taking a Supervisory Development course, a rather more focused course. Their results were analyzed both together with and separate from the main body of day students.

Were we to support the National Enquirer results we would have had around 238 students choosing the personality description of their astrological sun sign. Our study resulted in 26 correct choices.

Now, from chance alone we would expect one correct choice in twelve or 8.3% correct choices. More correctly, to allow for random sampling errors, we would expect (95% of the time) to find between 5.0 and 11.6% correct choices from chance alone. For our sample of 262 students that would translate to between 13.1 and 30.4 correct choices. Clearly our result of 26 correct choices (9.9%) is within the range expected by chance alone, and the National Enquirer result of 91% is far beyond that range.

The Enquirer made further claims when breaking down their success rate by sign. Comparative results are shown in Table I.

Best Results Claimed:

<table>
<thead>
<tr>
<th></th>
<th>Enquirer</th>
<th>NKU</th>
</tr>
</thead>
<tbody>
<tr>
<td>Virgo</td>
<td>100%</td>
<td>23.8%</td>
</tr>
<tr>
<td>Gemini</td>
<td>100</td>
<td>19.0</td>
</tr>
</tbody>
</table>

Worst Results Claimed:

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Cancer</td>
<td>85</td>
<td>9.5</td>
</tr>
<tr>
<td>Taurus</td>
<td>85</td>
<td>11.1</td>
</tr>
<tr>
<td>Sagittarius</td>
<td>85</td>
<td>19.0</td>
</tr>
</tbody>
</table>

In the NKU study, Virgo showed the best results with 23.8% correct choices and Pisces showed the worst at 0.0%.

The 32 evening students in the Supervisory Development courses showed a different preference for choosing signs than did the more general day group, but the relative number of correct choices was identical. Three correct choices out of 32 = 9.4%.

A few further comments on the distribution of choices may be of some interest. Table II shows the distribution of true signs (according to birthdate and the key provided by the Enquirer accompanying their article), the number of times chosen for each sign, and the number of correct choices for each sign. The dates defining the sun sign periods were classical astrology dates; precession was not taken into account.

<table>
<thead>
<tr>
<th></th>
<th># true signs</th>
<th># times chosen</th>
<th># times correctly chosen</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aries</td>
<td>22</td>
<td>16</td>
<td>1</td>
</tr>
<tr>
<td>Taurus</td>
<td>27</td>
<td>34</td>
<td>3</td>
</tr>
<tr>
<td>Gemini</td>
<td>21</td>
<td>15</td>
<td>4</td>
</tr>
<tr>
<td>Cancer</td>
<td>21</td>
<td>7</td>
<td>2</td>
</tr>
<tr>
<td>Leo</td>
<td>27</td>
<td>14</td>
<td>1</td>
</tr>
<tr>
<td>Virgo</td>
<td>21</td>
<td>36</td>
<td>5</td>
</tr>
<tr>
<td>Libra</td>
<td>20</td>
<td>15</td>
<td>2</td>
</tr>
<tr>
<td>Scorpio</td>
<td>20</td>
<td>20</td>
<td>1</td>
</tr>
<tr>
<td>Sagittarius</td>
<td>21</td>
<td>42</td>
<td>4</td>
</tr>
<tr>
<td>Capricorn</td>
<td>21</td>
<td>29</td>
<td>2</td>
</tr>
<tr>
<td>Aquarius</td>
<td>24</td>
<td>24</td>
<td>1</td>
</tr>
<tr>
<td>Pisces</td>
<td>17</td>
<td>10</td>
<td>0</td>
</tr>
</tbody>
</table>

In case the reader noted the agreement between the Enquirer study and NKU study with Virgo represented by both as their most “successful” sign, perusal of Table II will put that coincidence in perspective. The Virgo sign was simply chosen more often by people of all signs. One would expect Virgos to reflect that fact. One can see by inspection the general correlation of the number of correct choices with the number of times that sign was chosen by all.

The favorite personality descriptions of the evening course people provided a fair profile of people who work during the days and take management courses at night. Their favorite choices were labeled Virgo (6), Scorpio (7), Capricorn (6), and Taurus (6). The remaining seven subject choices were evenly scattered amongst the remaining eight sun sign personality descriptions.

Frankly, we did expect a greater than chance result. The reason for this is that astrology is well known and we expected many people to be familiar with their sun sign personality description. In this regard 92.4% of our sample responded positively to the statement “Give your astrological sun sign, if known.” When asked the question, “Do you have at least some familiarity with the personality description for your sun sign?” 66.4% of 125 polled responded positively, and in fact two of our
were an article tended to suggest extent in the or worldwide. The sample should be random according to consultants, Dr. Harold Voth, senior psychiatrist at the Menninger Foundation in Topeka, Kansas. Dr. Voth underrepresents black people and other minorities. But it subjects were necessarily students. survey to the communication) that their survey was carried out on our sample selection. That we learned from the results-turned out to be exactly what one would expect from chance alone we decided not to bother. This leads us to the final part of the NKU study—a survey on attitudes towards astrology. 264 subjects responded to the request to check off the statement which most closely matched their own feelings. The results follow in Table III.

Table III—Attitude Survey (264 subjects)

I feel that astrology is basically correct 5.3%
I'm not sure, but I've seen some evidence in astrology's favor which impressed me. 27.7%
I'm not sure, but I'm skeptical of astrology 24.2%
I do not feel that astrology is basically correct 24.2%
I have no feelings/knowledge on astrology 18.6%

The NKU study may be criticized on a demographics basis. The sample was local—not nationwide or worldwide. The sample should be random according to sex, but not age or race. Our sample, compared to U.S. averages underrepresents older people and greatly underrepresents black people and other minorities. But it must be said that a correlation of attitude with age was looked for and not found. Further, the students did not volunteer. All students present in the classes utilized participated. And the courses the students were taking were quite varied and mostly introductory. The specialized evening course provided an internal check which showed that although different personality descriptions were preferred by the evening students, their rate of correct choices was essentially identical to that of the more generalized day student group.

Although extrapolations of our attitude survey to the general populace may not necessarily be very accurate, we feel that the basic rebuttal of the NKU survey to the National Enquirer claims is unaffected by our sample selection. In this regard we should mention that we learned from the National Enquirer (private communication) that their survey was carried out on “a Florida state college” campus, though not all of their subjects were necessarily students. One may safely conclude that whatever sample limitations with respect to an ideally universally representative sample may be present in the NKU study, is also present to a similar extent in the Enquirer study.

We could contact only one of the Enquirer's consultants, Dr. Harold Voth, senior psychiatrist at the Menninger Foundation in Topeka, Kansas. Dr. Voth informed us (private communication), "The Enquirer article tended to suggest I was a co-investigator in the research—I was not—I did discuss the research design with an Enquirer reporter and concluded it was adequate. He contacted me for this purpose only." Dr. Voth went on to say that he was greatly surprised by the results. So were we, particularly after calculating the statistical odds for the Enquirer getting their claimed 91% correct choice rate in a 240 subject sample. By chance alone, as we've said, one would expect one correct choice in 12. The results of the NKU study show that only chance is involved here with only negligible contamination in the results possible from people knowing a priori their sun sign personality description. (Did the Enquirer check for this?) And from chance alone we can calculate the odds for the Enquirer results to be, shall we say, significantly less than one. They are, in fact, 1 chance in 680 million million billion trillion trillion trillion trillion quadrillion quadrillion quadrillion quadrillion quadrillion quadrillion quadrillion quintillion quintillion.

KEY

Mark the one statement which best describes you.

6 Virgo: I am a perfectionist, paying attention to small, important details that others often forget. I hate to let a job go until it is finished properly by my standards. Others may find me critical, but I am more critical of myself than of them.

12 Pisces: I am an "easy touch" and would rather help people than make a lot of money. I enjoy daydreaming and usually get good results by trusting my intuition and following my hunches.

7 Libra: I am very interested in all of the creative arts, like writing, art, and music. I like to settle arguments between my friends. I'm good at this, because I can see both sides of an issue.

10 Capricorn: I am very good at business and making money, and I like taking charge and leading. I have my sensitive, emotional side, but I show this only to those closest to me. In public, I prefer to remain cool and collected at all times.

8 Scorpio: I like to finish whatever I start, and my strong, determined personality makes me succeed. I can be jealous, but as a mate, I am very passionate.

3 Gemini: I like to create with words, either in writing or in speech and may sometimes monopolize conversations. However, my friends find me witty and interesting, if a bit fickle. I am usually logical and cool but change moods quickly and frequently.

4 Cancer: Family is very important to me, and I want to have children. I feel happiest when I am at home with my family, pets, and plants, and when I spend time cooking and decorating my home.

11 Aquarius: My mind is filled with new ideas, and I like to invent things. I like to feel that I am in control of my life, and running it in an organized, efficient manner, I like to learn and have a good memory for facts.

5 Leo: I am very happy and cheerful, and I like making others happy. I am openly emotional and usually optimistic. I want my mate to cater to my every whim, but I am warm and generous in return.

1 Aries: I am so enthusiastic about life that I am active at something all the time. I usually have five things going at once. If a project interests me, I will work long, hard hours on it. I love to talk and talk quickly, and I sometimes exaggerate.

2 Taurus: Once I make up my mind, I don't like to change it. I can be stubborn, especially when I know I am right, but I am too easygoing and quiet to get into arguments over anything.

9 Sagittarius: My love of the outdoors and outdoor sports shows me to be a person who hates being tied down or restricted in any way. Freedom is what I need, and animals, travel, and humor are the things I love.
Jack Dunn

What group features harpsichords, recorders, synthesizers, drums, piano, and guitar? Some call Mannheim Steamroller's music "18th century Rock 'n Roll." I call it "supremely enjoyable."

Led by drummer Chip Davis, the Steamroller has produced three albums of "Fresh Aire." The settings are natural, often with background sounds of birds, crickets, rain, and thunder. Fresh Aire has a principally instrumental sound—a mixture of both the old and the new. One minute, you may hear the synthesizer and rock drums; the next, you are listening to a clavicord and cello. All of the music is original and the arrangements are first-rate. There is a quality of technical and artistic production that is immediately impressive. Mannheim Steamroller albums are not inexpensive, but like the ads for Curtis Mathis say, "they are darn well worth it." How much would you give for records that were pressed with care, instead of the sloppy work we get from most record companies?

Here is the amazing part. I discovered that I live only 50 miles from the home of this talented group. Yes, that's right. This group lives and works, not in New York or L.A., but in Omaha, Nebraska. Their record label is known as "American Gramophone," and they are distributed by Polydor.

"Fresh Aire" is something your audiences will enjoy. It's a blend of classical, jazz, and rock. To be sure, it is not appropriate for every application. Like all music, to be used correctly, it must match the mood or context you have established. Try it. Next time, we will visit with Chip and Carol Davis about the creation of "Fresh Aire."

FOCUS: Continued from page 13

An outstanding contribution to planetarium education should reach you soon, if you do not have it already. IPS Special Report No. 10, Planetarium Educator's Workshop Guide, by Alan Frieman, Lawrence Lowery, Steven Pulos, Dennis Schatz, and Cary Sneider, with excellent illustrations by Budd Wentz, is a carefully prepared and tested in five locations across the country. "Intended to be used by any group of planetarium educators who want to get together to experiment with new techniques" (p.2), the guide contains many suggested activities prepared by both the authors and planetarians who were workshop participants. It is probably the best educational guide for planetarians yet published, and it should stand tall on our professional shelves. For me, it will stand near my copy of the MAPS publication, Under Roof, Dome, and Sky, which also contains many excellent activity ideas.

INFORMATION FOR CONTRIBUTORS

All materials submitted will be considered. Contributions should relate to one or more of the following: planetarium activities and/or education, astronomy, or space sciences.

Articles, reports, planetarium programs, letters, technical comments, guest editorials, items of humor, pictorials (black and white) or selected planetarium facilities and general news relating to the planetarium/astronomy community is published. This list is not all-inclusive.) The Planetarian will make the final decision as to appropriateness of material submitted.

All material should be submitted directly to the Executive Editor. Contributors will be notified of acceptance, rejection, or need for revision within a reasonable period of time.

The manuscript should be typed free from errors, double-spaced, on 8 1/2 x 11" paper. Strikeovers and other markings are to be avoided. Use the first page to show the title, author's name, complete address, and exactly how the byline is to appear. Begin the text on the second page. Place all legends for figures on a separate sheet at the end of the manuscript, and enumerate in the text where each figure should be located. Place all tables in the manuscript in their appropriate locations.

Photographs must be black and white, on 8 x 10" glossy paper. DO NOT mark or label on photographs. Labels referring to a part of a photograph should be indicated on a separate sheet or onion-skin overlay.

Line drawings, charts, and similar drawings (excluding halftones) should be drawn with dense black (preferably India) ink with a high carbon content. If only printed copies are available they must be equal to the above specifications. Copies duplicated on electro-static type duplicators are not acceptable. DO NOT SUBMIT COLOR WORK of any kind.

REFERENCES should appear in the body of the manuscript by the Author's last name and the date of the publication; e.g., (Nelson, 1972), with full references listed alphabetically at the conclusion of the manuscript, giving author's name, year, title, publication, volume, number and page(s). Example:

PLEASE NOTE: Effective with the Winter, 1980 issue, Creative Corner will be conducted by Mr. David A. Aguilar.

Our thanks to Herb Schwartz for his dedicated efforts in conducting this outstanding column since the Summer, 1978 issue of the Planetarian.

Please send your Creative Corner articles to Dave Aguilar, J. Frederick Ching Planetarium, Hartnell College, 1516 Homestead, Salinas, California, 93901.

Planet-Building for Fun and Profit
Jim Manning
Morehead Planetarium
University of North Carolina
Chapel Hill, NC 22514

I MODELS IN GENERAL

In developing visuals for planetarium programs, the use of models can be an extremely effective device. The reasons for this are quite obvious: 1) Models simply look more realistic than drawings or paintings in most cases, and 2) you can build one model and photograph it from many positions and lighting angles when you would otherwise need many separate drawings to get the same result.

There are basically three options available when you wish to use model spacecraft (which is what is usually meant when one refers to models). You can:

1. Buy and put together commercial models and use them as they are.
2. Buy commercial models and adapt them for your purposes with whatever techniques and "junque" you have at your disposal.
3. Build them entirely from scratch, using ingenuity and lots of junk!

At Morehead, we have used all three methods successfully. Once a spacecraft is constructed, we paint it with several coats of white paint and highlights in black or other colors (it covers the cracks and flaws, and the models seem to photograph best this way and show up well in our zoom projectors which are slightly dimmer than our other projectors). We then suspend the spacecraft against a black background, hanging it from a wooden frame with fishing line (it's strong and rather unobtrusive if you're careful; black nylon sewing thread is better if you can get it). Finally we photograph the model from various positions and lighting angles as called for in the storyboard, and mount and opaque the resulting slides. No doubt all planetariums that use models employ similar procedures.

However, it can also be very useful to have models of planets; they can work as well as spacecraft models and for the same reasons. You have essentially only one option here, though, and that is to make such a model from scratch.

II PLANETS IN PARTICULAR

There is always a need for realistic planet images. In recent years and in recent months, this need has been met to some degree by increasingly high quality spacecraft photos of many of the planets and major moons. But there are several areas where the clever planet-builder can shine:

1. When you want to do something fancy, such as a flyby dissolve sequence of a planet;
2. When you need a realistic planet or for which we don't have a decent picture (like Uranus, Neptune, and Pluto);
3. When you need a hypothetical or fictional planet.

Planet building can be divided into two basic categories: gassy planets and rocky planets.

Gassy Planets
Gas giants and planets with thick atmospheres like Venus and Earth are relatively easy to make. You simply buy a ball of reasonable size and color and paint (with airbrush or spray can or hand brush) the appropriate cloud formations or cloud bands on its surface (perhaps with continents showing through in the case of Earth-like planets). A ball made of foam rubber or similar material works well because it has some texture and cuts down the glare from your lights when you're photographing.

Once the ball is painted, it can be suspended against a black background and photographed in the same manner as spacecraft models. At Morehead, we then fitted the resulting slides with circular kodalith masks the same size as the planet images. Such masks are easily produced by photographing black circles of a variety of sizes (or at a variety of distances) against a white background using kodalith film. The masks virtually eliminate the need for additional opaquing (if dense enough) and ensure perfectly round planet images.

Incidentally, for our backgrounds we use Black Velwrap, a material consisting of black rayon fiber on Kraft Paper. It resembles velvet without the sheen, and is an excellent absorber of light. It is one of several similar
types of material that can be purchased by the sheet (20” x 26”) or by the ream (26½” x 280 yds) in a variety of colors from Creative Coating Corp., P. O. Box 1165, Nashua, NH 03060. The company’s 1977 price lists put Velwrap at $4.00 per sheet for 50-450 sheets and $8.50 for a half-ream, with decreasing prices for greater quantities. (Also good is black velour, a cloth of similar texture obtainable from Stage Decoration and Supplies, Inc. 1204 Oakland Avenue, Greensboro, NC 27403. It’s more expensive [$9.50 per yard according to a 1968 price list] but lasts longer than Velwrap.)

Rocky Planets

What you’re aiming for in a rocky planet is a moon-like body; mountainous, cratered, generally rough. Needless to say, they’re considerably more difficult to construct! But we needed just such a planet name Loki (for the Norse god of evil and mischief) in our science program Juggernaut, which was presented in the summer of 1977 and is being rerun this summer. And so we built one, and share with you below the benefit of our experience.

III THE MAKING OF LOKI

1. In order to begin the construction of Loki, we needed a solid sphere to serve as the core and foundation of the planet. We selected the two foot-wide hemispheres of an unused, unused, plastic celestial sphere.

2. We glued the two halves of the celestial sphere together, and put a thin metal rod through the sphere, slipping the top of the rod into a small metal holder glued in the inside of the “northern” hemisphere, and securing the bottom of the rod in a wooden base. We put the rod through a piece of pipe from the sphere to the wooden base to give the sphere additional support. (See Figure 1) We were now ready to begin the surface construction.

3. We needed to apply an initial surface material to the sphere that we could be fairly certain would adhere to the plastic without popping off. We chose a latex caulk (available at any lumber yard or hardware store), and spread it on with a knife. Once applied and dry, we did some sanding and scraping to smooth the more unnatural-looking spreading marks and to make it look more naturally rough. It made a good, rough surface on which to build further.

4. We were leery of painting right on the caulk, so we next applied a coating of gesso. (Gesso is a substance that is spread on canvas, etc., as a basic white painting surface for various media, and can be obtained at an artists’ supply store.) We also did some texturing with it where we wanted to build mountains, craters, and so on.

5. To construct the actual features (mainly mountains and craters), we used a combination of Elmer’s Glue, sand, and spackling compound (a powdered material obtainable at lumber yards, which is used for such things as filling nail holes in walls and which dries hard). The mixture gave the right consistency for building features and did indeed dry hard, providing a substantial completed surface on which to paint.

6. Then we painted Loki, using an airbrush and different shades and mixtures of mainly browns and yellow ochre. We used designers’ colors for a matte finish (to prevent a gloss) and sprayed according to the contours and features. We then did some hand work with a fine brush, adding such things as crater rays. At this point the construction of Loki was complete.

When Loki was finished, we put it against a black Velwrap background and masked its stand for photographing. We shot it in a number of sizes and a variety of phases from crescent through full phase according to the dictates of the Juggernaut storyboard. We were able to obtain remarkable detail and shadows especially along the terminator of Loki, giving the body a realistic look that we would never have been able to achieve effectively with a drawing. Circular kodak masks fitted to the selected slides completed the process.

IV THE FILMING OF LOKI

As long as we had the planet model, we weren’t content to produce mere slides with it! Several Juggernaut scenes used a panorama of the command bridge of the Argus, the main spacecraft used in the story. We wanted more interest in the panorama, and decided that a 16mm film of Loki projected into the bridge’s main viewing screen would be a nice touch.

What we wanted was not a simple rotation of the planet, but rather how it would appear as viewed by a spacecraft in orbit around it. That meant that as the surface passed below, the same half of it would have to remain in sunlight. We decided that the easiest way to do it was to in fact rotate Loki in front of the camera while always keeping the same hemisphere lit. We accomplished the filming in the following manner:
1. We first took a stool with a revolving seat and bolted a twelve-foot long plank to it.
2. Next we bolted the planet on its stand to the center of the plank above the stool seat, and placed a standard Viewlex projector on one end of the plank directed at Loki to serve as the light source. We put a circular kodalith mask in the projector of the proper size so that it projected a circle of light just big enough to cover the disk of the planet, so we'd get as little excess light as possible. Lastly, we put some “ballast” on the opposite end of the plank to serve as a stabilizing counterweight to the Viewlex.
3. Then we masked Loki's stand, the Viewlex projector, and the counterweight with black Velwrap, and put Loki against a background of the same material. (See Figure 2) At this point we were ready for filming.
4. A person was stationed at each end of the plank. Together they very slowly and carefully rotated the contraption while another person filmed Loki. The effect was as desired and—aside from a few fairly subtle “Lokiquakes”—was very pleasing. We couldn't film an entire orbit of the hypothetical spacecraft because as the Viewlex “sun” emerged from behind the limb of Loki, it had a definite gibbous shape due to the long barrel turning at an angle. But we were able to obtain satisfactory segments of partial orbits. Two such segments—one with the entire planet in view and the other a close-up—were ultimately used in scenes with the command bridge panorama.

V CONCLUSION

If you've read this far, you may just believe that planet-building is fun. "But is it really profitable?" you ask! In the case of Loki, indeed it was. When Juggernaut ran in 1977, it proved to be one of the most popular and profitable programs at Morehead in recent years. Now of course, Juggernaut's popularity may have had something to do with the fact that it was science fiction in the midst of Star Wars, and that William Shatner was featured in the lead narrating role! But all kidding aside, the use of Loki and other models contributed greatly to the overall effectiveness of the program and helped support Shatner's narration along with the soundtrack. Such devices and methods help to make programs both effective and appealing. And it is the effective and appealing program that becomes the popular program.
HISTORY OF ASTRONOMY RESOURCE CENTER PROVIDES VALUABLE SERVICES TO PLANETARIANS

George Reed
West Chester State College
West Chester, PA

Just as Clark Kent is Superman, Bruce Wayne is Batman, and Don Hall is Captain Science, so too, Paul Lutner is the History of Astronomy Resource Center. Just as Kent, Wayne, and Hall will all deny the above accusations, so too will Paul Lutner. The History of Astronomy Resource Center is described, in the Center’s literature, as “a clearing house for access to the primary and secondary sources of the history of astronomy.”

The function of the Center is to provide for the historical preservation, and practical accessibility, of the records pertaining to the history of astronomy, especially in the 19th and early 20th centuries. The Center is not a museum or library in the normal sense, but it is just as, if not more valuable to someone involved in the history of astronomy, or to the collector of astronomical materials.

The services provided by the Center could be of considerable benefit to planetarians who regularly include the historical aspects of astronomy in their programs. For instance, the Center can help locate needed information or materials from its expanding reference library of bound volumes, pamphlets, and reprints. This will be especially beneficial if you are searching for the works of one particular astronomer, since the Center is working on special collections devoted to the complete works of individuals.

Materials from the Center are available on loan, or for the cost of photo-copying and postage. Materials not available at the Center’s library may possibly be available from the 5,000 plus volumes of the voluntary decentralized library that is composed of the personal libraries of Center members who volunteer to participate. A plate and illustration library is also available, and again the entire cost is nothing more than copying and postage.

In addition to these services, the Center also publishes Books and Astronomers Monthly which is an excellent and detailed biographical overview of the life and work on one astronomer or astronomy popularizer. An extensive bibliography of the works of each subject is also included.

If you are a collector or interested in used, out-of-print, or rare astronomy books, the Center has another service of note. A quarterly newsletter provides information about the collecting, care, and preservation of astronomy books. In addition, the Center issues several book sale catalogues each year. The Center also provides a search service for members looking for specific books.

Individual memberships ($37.50 per year) for planetariums, schools, libraries, or astronomy clubs, are ridiculously low in view of the fact that all of the members of the parent organization have access to the same services as those provided by an individual membership.

So, who is Paul Luther and how does he do it? Paul Luther is a long time astronomy enthusiast and an antiquarian, astronomy book dealer. He has been a teacher and a college administrator. He keeps the Center functioning by means of long hours (8:00 a.m., to 11:00 p.m., 7 days a week), along with an Apple II computer system and a Comprint 912p printer.

Literature about the History of Astronomy Resource Center can be obtained by writing to:

History of Astronomy Resource Center
P. O. Box 262
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Ann Dreas
Manager, Space Shop
Strasenburgh Planetarium
P. O. Box 1480
Rochester, N.Y. 14603
On February 1, 1979, author James Michener appeared before the Subcommittee on Technology, and Space of the U. S. Senate Committee on Commerce, Science, and Transportation. He concluded his statement with the following question and observations:

"Are there spiritual advantages to be gained from a space program? The spirit of man, and the resolve of a nation, are tenuous things, to be fortified by the strangest experiences or destroyed by the most unanticipated accidents. Outward events influence them but inner resolves usually determine outcomes. A novelist sees men and women destroy themselves because the will to survive has been lost; the historian watches nations go down because of fatal wrong choices which sap the national energy. Usually the tragedy occurs when inner convictions are lost, or when a sense of general frustration or waning purpose prevails.

"It is extremely difficult to keep a human life or the life of a nation moving forward with enough energy and commitment to lift it into the next cycle of experience. My own life has been spent chronicling the rise and fall of human systems, and I am convinced that we are all terribly vulnerable.

"I do not for a moment believe that the spiritual well-being of our nation depends primarily upon a successful space program. There are, as William James said, moral equivalents to war, moral substitutes for any charismatic national experience. I am sure we could as a nation attain great spiritual reassurance from rebuilding our cities or distributing our farm produce better.

"And my experience in the arts has taught me to be suspicious of late fashions or high styles. Space programs are stylish today and run the risk of being abused.

"But I also believe that there are moments in history when challenges occur of such a compelling nature that to miss them is to miss the whole meaning of an epoch. Space is such a challenge. It is the kind of challenge William Shakespeare sensed nearly four hundred years ago when he wrote:

There is a tide in the affairs of men,
Which, taken at the flood, leads on to fortune;
Omitted, all the voyage of their life
Is bound in shallows and in miseries.

On such a full sea are we now afloat,
And we must take the current when it serves,
Or lose our ventures.

We risk great peril if we kill off this spirit of adventure, for we cannot predict how and in what seemingly unrelated fields it will manifest itself. A nation which loses its forward thrust is in danger, and one of the most effective ways to retain that thrust is to keep exploring possibilities. The sense of exploration is intimately bound up with human resolve, and for a nation to believe that it is still committed to forward motion is to ensure its continuance.

"I doubt if there is a woman or man in this room who honestly believes that the United States could ever fall backward, as other nations have within our lifetime. Intuitively, we feel that we are exempt. Yet for us to think so is to fly in the face of all history, for many nations at their apex were inwardly doomed because their will power had begun to falter, and soon their vulnerability became evident to all. Enemies do not destroy nations; time and loss of will brings them down.

"Therefore we should be most careful about retreating from the specific challenge of our age. We should be reluctant to turn our back upon the frontier of this epoch. Space is indifferent to what we do; it has no feeling, no design, no interest in whether we grapple with it or not. But we cannot be indifferent to space, because the grand slow march of our intelligence has brought us, in our generation, to a point from which we can explore and understand and utilize it. To turn back now would be to deny our history, our capabilities.

"Each era of history progresses to a point at which it is eligible to wrestle with the great problem of that period. For the ancient Greeks it was the organization of society; for the Roman it was the organization of empire; for the Medievalists the spelling out of their relationship to God; for the men of the Fifteenth and Sixteenth Centuries the mastery of the oceans; and for us it is the determination of how mankind can live in harmony on this finite globe while establishing relationships to infinite space.

"I was not overly impressed when men walked upon the moon, because I knew it to be out there at a specific distance with specific characteristics, and I supposed that we had enough intelligence to devise the necessary machinery to get us there and back. But when we sent an unmanned object hurtling into distant space, and when it began sending back signals—a chain of numbers to be exact—which could be reassembled here on earth to provide us with a photograph of the surface of Mars, I was struck dumb with wonder. And when computers began adjusting the chain of numbers, augmenting some, diminishing others, so that the photographs became always more clear and defined, I realized that we could accomplish almost anything, there in the farthest reaches of space.

"My life changed completely on the day I saw those Mars photographs, for I had participated in that miracle. My tax dollars had helped pay for the project. The universities that I supported had provided the brains to arm the cameras. And the government that I helped nourish had organized the expedition. I saw the universe in a new light, and myself and my nation in a new set of responsibilities. My spirit was enlarged and my willingness to work on the future projects fortified.

"No one can predict what aspect of space will invigorate a given individual, and there must have been millions of Americans who did not even know Mars had been photographed.

"But we do know that in previous periods when great explorations were made, they reverberated throughout society. Dante and Shakespeare and Milton responded to the events of their day. Scientists were urged to new discoveries. And nations modified their practices.

"All the thoughts of men are interlocked, and success in one area produces unforeseen successes in others. It is for this reason that a nation like ours is obligated to pursue its adventure in space. I am not competent to say how much money should be spent. I am not competent to advise on how the program should be administered. But I am convinced that it must be done."
As recently reported, I am proud of coming in second in the "Smallest Planetarium in the Southeast" contest. I love contests. I am originating a new one, as of today, for all planetarians. The contest is called:

"How Long Have You Been Stuck With a Group Whose Bus Didn't Come Back To Pick Them Up?" Richard Joyce, planetarian from Hampton, VA has submitted "3½ hours." If you can beat it, respond by sealed bids only, please. Winner gets to initiate a new contest category.

OVERHEARD

* In late Spring, 1980, a distressed lady called planetarian Jim Summers of Fernbank Science Center in Atlanta, GA. She had been reading a California groups' prediction that the world's end was imminent. She had also noticed that three planets (and a star) were very close together in the evening sky and was convinced that this grouping reinforced the impending doom of the earth. Jim reassured her: "Well, we astronomers have control of all this. For a fee, we could arrange for those ol' planets to begin drifting apart."

* Another phone call, familiar to planetarians, was received by Richard Joyce: "Do you have any plants on sale this week?"

* The staff at MacMillan Planetarium in Vancouver reports that they knew they were in trouble when all the teachers who accompanied several school groups sat in one small area leaving the rest of the theater packed with unsupervised primary students. The students were incredibly noisy, and after several warnings, the show was stopped and the entire group thrown out only half-way through the advertised one-hour program. Apparently the show ended abruptly for the teachers as well as the students. In the theater clean-up following the show, in the area the teachers occupied, a ladies bra and panties were found behind a row of seats.

* Tony Barnette, planetarian with Bristol, Tennessee's school system, had to fight for his job. An incoming member of the School Board in his district, after looking over the introductory information that new school board members receive about the system, could not understand why Bristol had in its employ a full-time fortune-teller who casts horoscopes.

* Diana Knapp, assigned to pick up several airline passengers arriving in Jackson, Mississippi to attend planetarian Richard Knapp's June, 1980 SEPA conference, waited until they had all settled in her VW bus with their luggage, then glanced back and noticed an unfamiliar face. "Are you one of the planetarium conferences?" she asked. The man looked startled and said, "No! I thought this was the airport limousine."

Jack Horkheimer, planetarian arriving from Miami, Florida, leaned back from the front seat: "I didn't think you were one of us. You're wearing white shoes!"

An Interim Report on the State of the Art

* Comment by Lee Golden, planetarian at Mark Smith Planetarium in Macon, GA: "I could do so many more things if I could get the ___ machine out of the middle of the room!"

* Jack Dunn, planetarian of Muller Planetarium in Lincoln, Nebraska has a question that all planetarians should consider: "How do you react to the comment from a departing visitor, 'I really enjoyed the movie'? a) Are you flattered that your show is so "slick" that it looks like a movie, OR b) Are you reminded that skill for showing a movie requires only turning on a switch? Jack seems intent on messing around with our minds. He wants planetarians to think carefully before responding to this: "Do you do shows, programs, or lessons?"

* Re: Planetarian business cards. A black card with white letters belonging to Jim McMurtray, of Vancleave, Mississippi which announces that Jim is: "Bringer of Light, Destroyer of Worlds, the Great and Powerful Wizard of Vancleave."