PARALLAX

1985 AUTUMNAL EQUINOX

JOURNAL OF THE

IAAA

INTERNATIONAL ASSOCIATION OF ASTRONOMICAL ARTISTS
EDITORIAL MATTER

Once again, PARALLAX has been delayed due to various factors. Rest assured, however, that there will be a fourth issue for 1985, to be published within four weeks of this one (even if it does arrive in your mailbox in 1986).

One of the delaying factors involved a balky power port on the Commodore 64 we use for word processing. It promoted the tearing-out of hair when pages of text suddenly evaporated from memory, necessitating frequent "saves". A fix has been implemented with the purchase of a Commodore 128; for a while we understood how the Apollo 13 crew felt when they cludged their life support system together.

Another factor involved member participation in the journal or, rather, the apparent low level of same this past year. This is not meant to be a "who will help me bake the bread?" speech -- we have all known the anxiety of heavy workloads, approaching deadlines, and family obligations. These cause free time to become something we only dimly recall once having.

And so we wait for your articles and news, and try to produce enough material to fill an issue, but Don and I cannot make it all up ourselves. We do have a number of features in the works, and you can help by adding your tips, news, or suggestions. Don't be afraid to send something because you feel you can't write; if you send us an article, we'll take care of the editing.

We understand the life of the space artist, so it is all right if we don't always hear from you. We appreciate your patience with us as well, since we've received hardly any "where is my copy?" letters since we began publication. Please be assured that you will get your money's worth for your dues, a part of which goes toward producing this journal. What you have invested is helping the IAAA to coalesce and reach out to others, a process which will continue for the foreseeable future.

We thank you for filling out the questionnaires. Having taken
that small bit of time to talk about your craft and feelings, you are communicating with others and contributing to the space art field. It is possible that we may keep the momentum going with other special questionnaires, perhaps one related specifically to PARALLAX.

As we move ahead in 1986 we look forward to a new year of discovery and progress in space and new opportunities in art, whether they be to help plan space missions, educate the public, or simply challenge the mind and please the eye.

Rick Sternbach

AIR TO GROUND CHATTER

Dear Don, Rick, and IAAAers:

PARALLAX fills the void!

Besides my dues (which will have to wait until I sell another painting) I owe you some feedback on the last two PARALLAXes.

A show in Japan sounds exciting and has my vote; so does an exhibition at the Museum of Modern Art in New York -- what could be more modern than Astro Art?

Re: Bob Eggleton's letter (#3). I agree with Bob and tend toward pretty as opposed to accurate. Or at least to try for a 50/50 split. Since most of my art is for inspiration, not text books, I don't mind bending the rules a bit, although I try to never break the laws.

Also like Bob I get confused and bogged down when it comes to all that math. I do appreciate it, though, and want to encourage the technical articles. They really amaze me and I do try to understand them, but I prefer to paint the extrasolar stuff and Earth-based speculation, i.e. a current series called CETI (pronounced the same but standing for "Contact with..."). There's more to it than just being "hard to be proven incorrect!", we have the ability to explore the future along with space.

Re: the Art Auction. I was glad to participate despite it not generating more money. Although the price on my piece was high for the show, it was only half of what I would normally ask. The problem is, of course, the uneducated market. But then that's why

the IAAA is important.

I do want to congratulate Kim Poor on the OTHER WORLDS poster. It's an exciting-looking poster even in black and white and at such a reduced size! I look forward to seeing the real thing.

A suggestion: some of the newsletters I get make an effort to include the addresses of all of the people mentioned in them. This is a real encouragement for interactive communications (especially our international colleagues Shig Kamori and Li Yuan).

Carl Chaplin

P.S. A sad note about my 3D model of Jupiter at the Vancouver Planetarium: a couple of punks jumped the display barrier and went astro swinging. The plastic sphere came off its hook, crashed and was destroyed!

[Editors' Reply: First of all, many thanks for the photo of the dear departed Jupiter model (see picture); it's clear from the original that you had put in a lot of detailed airbrush work. Sometimes it seems futile to hope that unappreciative dolts would adhere to "look, but don't touch".

Secondly, we know that math isn't for everybody, but people do turn to it in varying degrees. That is why we publish articles (continued on p.20)
Sharing the Wonder Part II: The Questionnaire Results

In response to our questionnaire in the Summer Solstice issue, we received 20 replies. While this sample is by no means close to the actual number of space artists practicing the craft today, it probably is large enough to present something of an accurate picture of our origins, our current state, and our futures.

Our numbers are growing. New members are being sent the very same questionnaire, and from time to time we will recalculate the results and offer them in these pages. At some future time we will likely produce a second questionnaire with many of the same queries as well as some we hadn't included in the first.

We thank those of you who responded. Your answers ranged from serious comments on art and science to simple wisecracks, but all were in some way indicative of a love of space art (the fact that they were mailed back was a start).

We also wish to thank Sharon Hammond for her help with the statistical data.

GENERAL INFORMATION

Ages ranged from 27 to 97; the median age was 33.2 years. The graph below shows the frequency within 11 age classes.

100% had at least graduated high school, 90% had attended some college, 55% graduated college, and 15% had gone on to receive advanced degrees.

40% are single, 60% are married.

As to what triggered interest in space or art, this question did not really lend itself to scientific analysis, although some major factors did arise more than once. Books and illustrations were mentioned most often, followed by viewing the night sky with and without a telescope, reading science fiction, watching Disney films and other space programs, witnessing Sputnik and other space missions, having a father who was an engineer, and being exposed to science in general.

Comments:

"I don't remember ever not being interested in either. I was always painting since I could scribble on walls with crayons. I was always following the space program."

"Don't laugh. Seeing Cosmos did it. I suddenly discovered that I could do something with it."

"...and a lot of juvenile SF (Mushroom Planet books, etc.) -- oh yeah, and Mr. Wizard!"
35% said their interest in space came before art, 55% said art came before space, and 10% were undecided.

As to which artists were most influential, this was another question for which it was difficult to come up with cold, hard numbers. 58 artists were named, representing many schools and periods, evidence of broad interest among the respondents.

The most often named artists were:

- Chesley Bonestell (13)
- Robert McCall (5)
- Maxfield Parrish (5)
- Salvador Dali (3)
- Ron Miller (3)
- Leonardo da Vinci (2)
- M.C. Escher (2)

Others named included Burian, Pesek, Schaller, Coggin, Moran, Pyle, Church, Wyeth, Monet, Lemberg, Delacroix, Puch, Sargent, Rockwell, Barks, Bosch, Lee, and Knight.

Comments:
"The two most influential artists were Chesley Bonestell and Maxfield Parrish. I spent years as a teenager copying their styles. Recently, though, because of the school that I'm at, I have been exposed to a vast number of artists who are influencing my work. Because of this I am finally developing a style that I can truly call my own, derived from a broad base of experience."

ART TRAINING

Most (75%) felt that self-teaching was their primary training, followed by books, school, and other artists. A few ranked school first, followed by self.

Of the respondents who went to college, 40% were art majors, 60% were not. Some of the majors mentioned were physics, teaching, biology, architecture, anthropology, and geology.

Of those who took art courses, the majority believed that the courses helped their artistic development. Most often mentioned art courses were color theory, illustration, design, drafting and perspective, life drawing, composition, and photography.

Courses in other areas which were deemed helpful were biology, physics, astronomy, music, and geology.

Comments:
"...I learned most about art from classes which were non-art-related. Art -- even astronomical art -- is a reflection of the society which spawns it. Wide interests and knowledge enrich the artist's abilities, outlook, and sensitivity."

35% replied that they did have a mentor to provide guidance and encouragement, 55% did not. 10% did not answer.

RESEARCH, MATERIALS, AND TECHNIQUE

Of the research materials described (almost everyone uses something), the ones mentioned most often were NASA photos, astronomical photos, USGS maps, specialty magazines (i.e. Aviation Week), landscape photos, models, other astronomical art, and personal observations.

75% of the respondents consult a professional during some phase of preparing artwork. The ones most often mentioned are astronomers, planetary scientists, aerospace engineers, general NASA information officials, and other artists.

55% of the artists polled own telescopes, from 2.4" to 13" in diameter. 45% of them have made sketches or paintings from their observations.

50% stated that they own a computer, and another 10% make use of calculators in the course of their work. The IBM PC, Commodore 64, Apple II, Atari 400 & 800, Kaypro 4, and Compaq portable were mentioned. Hewlett-Packard, Casio, and Sharp calculators were also represented.

Comments:
"I use my Casio wristwatch calculator and my brain to compute angular sizes."
"None. Seems nearly superfluous. I do calculate angular sizes with a hand calculator and usually transcribe all calculations onto the back of the painting."

100% of the artists work in 2D, 15% also work in 3D.

45% use some sort of projector to assist them, 55% do not.

80% replied that their primary medium is acrylic, 15% said oils, and 5% used pen and ink.
Sizes varied widely; the most-often stated size was 15"x20", followed by 14"x18", 24"x30", and 18"x18". One character replied 6'4".

55% use illustration board (Crescent, Bainbridge, Strathmore, Columbia); 25% use canvas (Fredrix, Myers Craft); 20% use masonite.

60% do some sort of special preparation to their working surface. Answers mentioned thin coats of gesso or white acrylic, shellac, thin coats of black, and such things as mounting the board on foamcore for reinforcement.

Most everyone makes use of other materials and tools in creating a painting. Most often mentioned were friskets, masking tape, and drafting templates. Other items included prismacolor pencils, color markers, and hair dryers.

80% work in airbrush. The most often mentioned models were Paasche AB, V, VL, and H, Ivata, Thayer and Chandler A, Badger, Fischer, DeVilbis, Binks, and Wold.

Of the 10 brands of paint mentioned, Liquitex acrylic came up 13 times, followed by Badger and Windsor & Newton (3), Grumbacher and Com-Art (2), and Shiva, Hyplar, Dr. Marten's, Speedball, and Magicolor (1).

75% use a final sealer coat.

Of the 15% who worked in 3D, the materials mentioned were "low-fire white clay, good for models of moons and planet surfaces"; "cartoon colors, airbrushed on gessoed acrylic spheres"; and "hydrostone gypsum cement for limited-edition planet surface miniatures".

**Week Habits**

Time to complete a piece ranged from 4 to 200+ hours. For those who indicated a range, an average was figured. If at all meaningful, the average time for all artists was 43 hours.

**Comments:**

"16"x20" -- 1 week, 10"x40" -- 3 months."

55% said that they work in long stretches, 15% in short bursts, and 30% worked in both.

95% listen to music while they work (5% before), and here the tastes were as varied as in the question about influential artists. Of the 40+ artists named, the most votes went to Vangelis (7); Beethoven (4); Brian Eno, Michael Stearns, Kitaro, Debussy, and the Beatles (3); Bach, Vivaldi, Pink Floyd, and Alan Parsons (2). Other artists mentioned included Spiero Gyr, Hayden, Elmer Bernstein, James Galway, Jimmy Buffett, Joan Armatrading, Neil Young, Glen Miller, Sibelius, Dvorak, Bob Dylan, Sons of the Pioneers, whale songs, John Denver, and Manhattan Transfer.

55% considered themselves "day" persons, and 45% labeled themselves "night" persons.

**Play Time**

Most people responded to the hobby question, and the favorite choices were hiking/camping, astronomy, photography, reading, biking, playing music, model building, writing, and visiting museums. Among other activities mentioned were frisbee tossing, computers, fossil collecting, gardening, exploring caves, family time, and studying biblical symbolism.

**Comments:**

"Taking walks in bad weather with my 14 year old dog (a pleasant way to do your thinking)."

90% travel and do something work-related during those trips, such as photographing landscapes.

**Comments:**

"I try to visit aerospace museums, NASA installations, or sketch desert landscapes...I would like to travel internationally and observe the constellations of the southern hemisphere..."

"Yes, and inescapably I find something relevant to my work whether I plan it or not."
100% feel that space art has a legitimate place in the world of fine art.

Comments:
"But try to get a space painting into the Louvre!"
"Of course! Space art is a fine art."
"The definitions of fine art vs. illustration are somewhat nebulous. The issue, ultimately, is this: how was the piece intended, and how is it perceived. Space art is being perceived more frequently as belonging to landscape art or even abstract in some cases."

On the question of possibly doing art other than that asked for by clients, 60% gave examples of other desired projects (many wanted to go off-planet to do them). These included murals, pieces depicting extrasolar planet systems, future spacecraft, Mars and astronauts, extraterrestrials, maps, and performance art. 40% stated that they were satisfied with what they were already doing.

Comments:
"...develop a visual language (artilicytics) like a dictionary of concepts, emotions, for the purpose of communicating with a) each other b) extraterrestrials."
"The largest space painting in the world, probably a nebula vista."
"Paint on location in Valles Marineris."
"Work bigger and more often."

70% felt that art had both learned and inborn components, with a heavy leaning toward the inborn. 25% felt it is only inborn, and 5% felt it is only learned.

Comments:
"...I must share the wonder with others, and describing a place won't do, I have to show others visually."
"Part of it is something inside that drives you to paint relentlessly but part of it has to be learned."
"I think it is inborn, although only a very few potential artists are educated to learn to express their inner vision."
"All artists seem to have inborn talents but some must learn how to express and communicate their observations of the world to others while a small group of artists seem to be able to express themselves naturally without having to learn how to manipulate media to do so."

40% felt that a ride on the shuttle or time on the space station would change their artistic style, 40% felt it would not; 20% did not respond specifically about style but felt that something would change.

Comments:
"I don't think it would affect my 'style', but it would improve my paintings of Earth and serve as a great analog for other planets..."
"Only by making it better! How can you have an experience like that and not be affected?"
"Certainly! Reality always affects how you see and feel things."
"It is the artist's ability to creatively acknowledge the objective reality while expressing the subjective emotions of the experience in unique and unexpected ways which requires the presence of a professional artist on an Earth orbital mission."
"It would probably enhance my seeing of real phenomena -- airglow, cloud and mountain shadows, aurorae, lightning, and so on, I suspect my color palette will be significantly altered."

"Anyone can, and should, learn to draw -- but you cannot learn to be an artist."

Both, I suspect there may be some truth in the 2-hemisphere model of the brain and artists are those with more right hemisphere dominance, who synthesize and do not think linearly. But learning techniques is clearly also crucial.

The reasons most often given for pursuing space art were the science/exploration/education involved, sheer enjoyment, visual realization of an idea, and money. One character (from before) said "It beats working."

Comments:
"I love to paint what our inquiries into space and time have shown us."
"The urge to see the future; play the tourist and travel to where it is not possible."
"My goal is to communicate the wonder and excitement of Earth's transition from a planet-bound to a space-faring civilization."
"As I've said many times, the desire to convince people of the reality of the other worlds in space, that they are real, interesting, solid, unique places, not just some 'artist's impression' or an astronomer's table or graph."
"The vicarious feeling of participation in the unfolding discovery and exploration of the universe I live in that is still beyond my physical means."

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"Frankly, no. However, it would be of immense value, since we could see first hand how ably we have been applying space photography to its 2D translation as art. The value of first hand observation of the near-Earth environment has already been recognized by NASA, resulting in the flight of an oceanographer to observe with human eyes the 'drift' of the seas."

"No, but it would unquestionably change the content; affect the enthusiasm and commitment to space art; and have profound effects on my own world view, which would eventually affect style."

"Would not change style. Would be an emotional and intellectual input into depiction of light, color, and the visceral idea of spaceflight."

**Product Review**

**SKY TRAVEL**

As Comet Halley rounds the sun on its way back out of the solar system, one only need glance through astronomy and computer magazines to see the explosion in astronomical software.

Programs now abound for a variety of home and small business computers, from hand-held units like the Hewlett-Packard HP-45 to large desktop machines like the IBM PC and its clones. The interested user can now compute planet locations, convert between coordinate systems, and predict eclipses.

One well-designed package is **Sky Travel** for the Commodore 64. It is a fairly complete home planetarium program accompanied by a 138-page manual. **Sky Travel** offers a number of on-screen operations, as well as the ability to produce hard copy charts on any Commodore-compatible dot-matrix printer.

The program data contains the sun, moon, and all of the planets, Comet Halley, over 1200 stars, and a number of deep-sky objects.

**Sky Travel** supports a wide range of functions in four modes: 

*Map, Set, Sky, and Chart*. Map mode allows the user to find his/her viewing location on a mercator projection of the earth; keyboard or joystick inputs place a cursor on the map, and the latitude and longitude numbers can seen changing on the screen until correct.

Set mode allows the user to set the time (hours:minutes:seconds) and date (9999 B.C. to 9999 A.D.). Sky mode displays the way the sky looks for the set time and location (the default settings have the view centered on Leo on January 1, 1985). The field of view can be toggled between 9°, 18°, 36°, and 72°. On the right side of the screen are displayed the azimuth, elevation, right ascension, and declination of the cursor. Chart mode allows the user to print a black-on-white chart of the portion of the sky being viewed. This chart is not an exact copy of the sky view, but rather a piece of a vertical north-south star map. For an exact copy of the sky view (which automatically prints out in black on white to save your printer ribbon from an early demise), a print command in **Sky mode** will do the trick.

The sky scene can be viewed stationary, or at clock rates from 1X to 64X real time, so that the user can watch objects rise and set. A special tracking feature allows the user to keep any planet or Comet Halley centered on the screen. In a way, **Sky Travel** can behave much like a telescope with a clock drive.

For those who don't feel like consulting a separate star chart, the **Inform** function will display a bit of text describing any object covered by the cursor.

The manual, while devoted in large part to the operation of the program and its many options, is something of an abbreviated astronomy textbook by itself, with sections dealing with geography, eclipses, occultations, precession, archeoastronomy, navigation, and space exploration. It includes a glossary, tables of latitudes and longitudes for some 200 major cities, constellations, conversion equations, and an extensive supplementary reading list.

The program is easy to use once one has become familiar with the settings and viewing controls. The manual give numerous examples of historical and future events which the user can set up and enjoy watching. Undoubtedly, there are many more surprises packed away within the 20,000 years of motions on this disk than any one person has time to study. This reviewer has only used it to check up on Halley's position and brush up on constellations so far, but it will be consulted for other information as time goes on.

The space artist looking for total accuracy will find a few problems, however. The images of the sun and moon are unrealistically large in all but the 9° field of view, and this can
lead to confusion when checking object positions in terms of the number of moon diameters. Another potentially annoying problem is the fact that the lunar phases are not properly aligned with respect to the sun. This might have been corrected with a couple of trigonometric and graphic routines to rotate the pixels to the proper orientation.

The cursor movement across the sky or earth map is painfully slow at first, but the longer one commands the cursor to move, the faster it goes. The slow movement is desirable when attempting to place the cursor on precise coordinates, but this might have been unnecessary if the numbers could have been typed in directly.

One additional grumble involves the copy-protection scheme, which causes the disk drive head to bash itself about when the program is loading, causing potential head alignment problems (and a trip to the repairman).

Sky Travel does not attempt to be all things to all people, of course, and should be considered as a good general planetarium program with great educational value. As far as the space artist is concerned, Sky Travel can be a useful addition to an existing collection of research materials.

Rick Sternbach

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INTERVIEW

For some twenty years, Jay L. Inge and Patricia M. Bridges have been two of the best-known cartographic airbrush artists. They work at the U.S. Geological Survey in Flagstaff, Arizona, and have participated in numerous planetary programs. If you've ever unfolded a map of Mars or Mercury, or any of the satellites of Jupiter or Saturn, you've seen their meticulous cartography.

Parallax co-editor Rick Sternbach talked with them recently about their craft and its relationship with planetary space missions.

Parallax: The highly detailed renderings of solar system objects that you and your colleagues produce at USGS are well known to many Parallax readers. Could you briefly describe your task for anyone who may not be familiar with your work?

Inge: Basically, we have two missions here; we're funded by NASA, and the point of the funding is to engage in all mapping activities of the planets. Basically, there are two kinds of maps at present; one kind is the photomosaic, which you use, perhaps, in doing your artwork. This has been done for a number of the different planets and satellites. Secondly, we make the actual airbrush drawings, using images from spacecraft and photomosaics and other information tools. We're the only ones who do it that I know of.

Bridges: As far as the airbrush drawings are concerned, we usually start with the basic photomosaic and lay a sheet of acetate over it. I use the photomosaic for positioning of the features in the drawing and then we look at all the other pictures of the area. So, eventually, it becomes a composite of many, many photographs rather than only one view, which you get with the photomosaic.

Inge: The point is that we don't attempt to make a photograph, we attempt to make an interpretation of what the photo shows. It really taxes your interpretive abilities as to understanding what's going on.

Bridges: And, too, it depends on what body we're working with. There'll be one kind of interpretation of one body, and another body will be entirely different.

Parallax: In the course of interpreting the photographs, do you run across puzzling structures, features that leave you scratching your heads as to how to draw them?

Inge: Pat can answer this very easily. There's a famous satellite that we know of -- it confused the both of us -- Tethys. Come on, Pat, tell him.

Bridges: I've tried to avoid thinking about Tethys lately. Well, this happens all the time, really. I guess my mind was thinking more in terms of Io, because that's more recent for me. We had a changing surface that we were trying to map, and the illumination, where you could see relief along the terminator, was very dramatic. The light and dark markings made the interpretation extremely difficult.

Inge: Pat was the one who did the mapping, and the map contained this large shield thing that looked like a crater but just wasn't.

Bridges: The albedo made it look as if it were a raised feature, because it was light on the side that should be dark, and vice versa, but it was really the albedo that "filled in" the features so that it looked the exact opposite.

Parallax: If this sort of thing happens all the time, why worry
about it? Won't better data eventually come along to allow you to revise a map?
Inge: Well...I don't know. Better data has come in, for example, on Ganymede, on what they refer to as the "dune buggy" terrain, the highly grooved terrain. Features that were difficult to read. On the photographs, you just have a series of parallel dark and light lines. The question is, are you looking down-sun at it, or what? That's really messy, an you think you've worked it out, you get to the edges of the region and discover you're wrong. It's very annoying. And when you change illumination, it really becomes a problem. We only have a western light source in our drawings, and when you start playing games with illumination on top of a limited perception and understanding of an area, that's where it could be embarrassing.
Bridges: That's a problem. It makes the drawing we're making a statement as to what's there, and it could come back later as an entirely different answer.
PARALLAX: Do planetary scientists make use of your drawings in their research?
Inge: In part. They use it as an adjunct to their work. They find our interpretations useful, maybe laughable. But any map we do is sent out for reviews by the geologists so they can make comments.
Bridges: We couldn't get by with just making an artist's interpretation. We have to have reviews in to keep us honest.
Inge: They use our interpretations frequently to compare with their understanding of what the photos show.
PARALLAX: Have your maps of the Jovian satellites had a bearing on mission planning for Galileo?
Bridges: The maps that we're producing will be used for mission planning as far as figuring out where they are. They will be used more as Galileo gets closer to the planet.
Inge: Where Pat and I really got our feet wet was doing the preliminary maps when we were out at JPL. Those were all quite "real time". They were big crayon sketches; they're quick and dirty, and yet they were used frequently for targetting the Voyager spacecraft.
PARALLAX: So you'll produce early maps right in the middle of an encounter?
Bridges: In fact, those were very widely used as the base maps for all of the preliminary information that the scientists put out.
Inge: We saw that they liked the maps very much because it puts things in a conceptual mold very quickly. They get to make general interpretive statements from them.
Bridges: If you just have a scattering of pictures, then they're not organized the way the drawings and other tools are.
PARALLAX: Once you have the overall picture, do certain structures and possible processes begin to pop out at you?
Bridges: We've had comments like that from scientists who are involved in the planetary projects. The work that we're doing has pulled together all of the separate elements.
PARALLAX: How do you go about the actual execution of a map? We know that the Paasche AB airbrush is a favorite tool, despite its cantankerous nature.
Inge: It's hard not to make a book out of it all. I would say that probably of equal value to our work and underrated, unknown, and unnoticed and kind of forgotten by the company is the little K+E motor eraser that we use. The kind of style that we utilize in the drawing, the erasing if ink off an acetate surface, the motor eraser is a superb instrument for detail and control. Very light, with half of it in front of your hand, so you can control the weight far more easily. It reaches speed very quickly, not like these great hulking things that they have out now, that have a great deal of the weight behind the hand, so you always have this balancing act. With my drawings, I'm using the K+E about 40% of the time.
PARALLAX: Are you saying that half the time is spent applying pigment and the other half is spent removing it?
Bridges: That's not far off. We have to get the basic drawing down with the airbrush first, of course, but when you get toward the end, there's no better way to get these nice, sharp ridges and highlights. We draw with it, not fix mistakes. It's really a drawing tool.
Inge: We probably own about the last twelve in the United States. They've kept together with a lot of luck. With regard to the AB airbrush, yes, it is cantankerous and requires a good deal of practice. Once you think you understand it and have it adjusted, it can change.
Bridges: We adapt ourselves to what it's doing.
Inge: I think Pat and I are far less sensitive to the peculiarities of the airbrush now than when we started.
PARALLAX: Do you perform your own maintenance and repair work? You don't send them back to Chicago?
Inge: Entirely. They don't know what it is they're doing.
Bridges: Jay's the real airbrush mechanic for our group.
Inge: Thank you. It's been a matter of survival that we go through it ourselves. For one thing, we sharpen the needles, which is just one example of the mechanical alteration, and we can now get a line down to the size of the line you get on a sheet of 8 1/2" x 11" notebook paper. That kind of line is sensitive to the smoothness of the airbrush, how you operate it, and so forth. When you press the trigger on our airbrushes now, for example, you will not feel a
clicking sensation. The air comes on rather slowly, so you can modulate the spray even more. The company uses the term "double action", but the AB is basically a triple action airbrush; people don't realize that you can control not only the speed of the needle and the amount of paint, but also the pressure coming out of the air jet. So you have a three-mode control.

PARALLAX: Some of us who worked on COSMOS found it a bit difficult maintaining our ABs to produce a consistent "look" from artist to artist. Do you find the same to be true at USGS?

Bridges: There's a little different touch that everybody has, so you have to take your gun and make it work for you.

PARALLAX: Do you find yourself changing the AB's settings much during the course of producing a map?

Bridges: I don't adjust mine very much once I start. I don't want to have to stop and fiddle with it.

Inge: I keep mine so that they can be basically finger adjustments, especially if I'm doing a lot of high-detail work. If I have just finger adjustments, like the angle of the air jet, I can take just a few moments to get it back where I want it, very quickly, which is vital to me.

PARALLAX: At what size would the average map original artwork be done?

Inge: Approximately 20"x30". We usually approach sizing our jobs by the number of square inches of detail we have to do.

PARALLAX: How would you compare the time spent gathering research materials and the time spent rendering?

Bridges: We can usually gather the research material together fairly quickly, but the organization that goes on throughout -- as you run into problems -- that's rather unpredictable.

Inge: I can't think of a simple way to figure it.

Bridges: It's very difficult to estimate the numbers. We could, if all the jobs were the same, but we have projects where we have a lot of very fine detail mixed with very low-resolution data, and may have a problem pulling that all together. It depends on the project.

PARALLAX: Do you work on one set of maps at a time, or do you do a variety of objects simultaneously?

Bridges: Something of both. We're in the final stages of finishing the Ganymede series. That's been going on for three years or so, at 1:5,000,000. We may have other ones, like those of Io I've been working on during part of the time on Ganymede.

PARALLAX: Are you looking forward to the Uranus encounter and future missions?

Inge: I thought, several weeks ago, of something mind-boggling, about what a leap it is for us. There can be a kind of time machine in your mind and you go back and forth in time to when you were fifteen to wherever you are now; I recall looking through my reflector at home at Ganymede and thought "I wonder what that looks like up close". I thought I could see a little shadow on it and thought "That's neat." I never thought that twenty years later I'd actually be making maps of the silly thing. It's this incredible leap to think of going further out and seeing not only Uranus but Neptune. I think people fail to appreciate what a golden age we're in, one of planetary exploration.

PARALLAX: Do people make comparisons between yourselves and ancient mapmakers? Do you ever stop to find yourselves thinking profound thoughts?

Inge: (laughing) As few as possible.

Bridges: It depends on the mood. When you're really busy working on a particular map, you've got to lose track of that and then it comes back to you in waves.

Inge: The excitement, really, is the participation in missions when you realize how fortunate you are to be there at the moment when you're getting your very first look at something, and you're getting to "unwrap" it. That is exciting, and it's a feeling I just can't share with anybody. There are other times, as I was joking before, when the most profound thing that crosses my mind is "Why am I doing this? Four hundred little grooves on Ganymede -- will one more matter?"

PARALLAX: The maps you produce are made, in a sense, "second hand", since they begin as photographs made by unmanned spacecraft. Do either of you want to go out there and see things in person? Also, once space travel is truly commonplace, will the cartographer still serve a useful function?

Bridges: I'd like to have gone if it were easy, if I could get there without the pain or strain, I'd like to see it. Up close. But just knowing the practical aspects of it, it doesn't appeal to me a whole lot.

Inge: I'm sure that the "Right Stuff" generation, the kids, appreciate space travel as alien a terrain as a bowl of corn flakes. They don't have quite the wonder that our generation has. I'd give my eye teeth to go up and take a look. As far as where we are going, I think I alluded to that earlier an Pat would probably agree that until we actually have airplanes flying over Mars where we're getting fifty foot resolution, there will be a need, at least in some areas, for very high-resolution mapping. This high-detail stuff is very tedious, very time-consuming, and really kind of boring. Pat, would you agree that tearing apart a high-resolution image that's terribly fuzzy, that's fun?
Bridges: Well, the more interpretation involved, the more you can get involved in it. If the images are good already, and you don't feel like you're contributing that much, that's when it becomes boring.

PARALLAX: I gather, from what you've been saying, that you would like to be on the leading edge of things. Or would you rather be producing road maps for tourists on Mars?

Inge: God. No.

Bridges: (laughs)

Air to Ground Chatter

(continued from p.3)

covering topics for which math is necessary. More space artists are purchasing computers and calculators to assist them. With a bit of programming, the math can be taught to the machines and then "forgotten" for a bit so that the user can more easily get the required results to apply to a painting or other project. Most of the math we run into involves trigonometry in order to calculate sizes and locations of objects. Other times we'll see exercises in celestial mechanics, with its orbits, velocities, masses, etc.

It all depends on what you do and what you need to get the job done — you may want to go back and hit the books to bone up.

Lastly, we will take your suggestion and begin the practice of running contributor's addresses in the next issue.

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