The Prairie Astronomer

The Official Newsletter Of The Prairie Astronomy Club, Inc.

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CLUB EVENTS

UNL Student Observatory Open House
Friday, October 25, 2002

PAC Meeting 7:30pm Hyde Observatory
Tuesday, October 29, 2002

Club Star Party
Friday, November 01, 2002

Hyde Observatory 25th anniversary
Sunday, November 10, 2002
1-4pm, UNL Student Union
7-10pm at Hyde Observatory

UNL Student Observatory Open House
Friday, November 22, 2002

PAC Meeting 7:30pm Hyde Observatory
Tuesday, November 26, 2002

OCTOBER PROGRAM

October program: "Lighting: The Good, The Bad, and the Ugly - and What You Can Do To Help". – by Jack Dunn

Jack will discuss how we should approach the public with our quest to lessen light pollution, and will show examples taken by his students in Astronomy 101 this summer, along with examples from the IDA Power Point Presentations. Please make sure to attend – this subject will no doubt come up many times during and after the Hyde Observatory Anniversary.

PAC-LIST: If you have an e-mail address and are not on the PAC List, you may subscribe by submitting an e-mail to list@4w.com. Write "Subscribe PAC-List" in the body of the e-mail.

READ THIS NEWSLETTER ONLINE

Those who wish to help with publishing and postage costs by receiving only the on-line version of the newsletter should contact Liz Bergstrom at 464-2038. Mark Dahmke or Liz can give you the logon account and password for access. You may receive both the mailed version and the on-line version if you wish. A printable PDF version of this newsletter is also available through the website.

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The Prairie Astronomer is published monthly by the Prairie Astronomy Club, Inc. Membership expiration date is listed on the mailing label. Membership dues are: **Regular $20/yr, Family $22/yr**. Address all new memberships and renewals to: **The Prairie Astronomy Club, Inc., PO Box 5585, Lincoln, NE 68505-0585**. For other club information, please contact one of the club officers listed on the last page of this newsletter. Newsletter comments and articles should be submitted to: **Mark Dahmke, PO Box 80266, Lincoln, NE 68501 or mdahmke@4w.com,** no less than ten days prior to the club meeting. The Prairie Astronomy Club meets the last Tuesday of each month at Hyde Memorial Observatory in Lincoln, NE.

Secretary's Report — Lee Taylor

Prairie Astronomy Club Minutes September 24, 2002

President Dave Knisely called the meeting to order.

Welcome our guest speaker, Brad Schaefer. For anyone interested in participating in any of the Astronomical League's observing programs, contact our observing chair, Jeff King.

On Saturday Sept 7th Twilight on the Tall Grass at Spring Creek Prairie near Denton was a great success with more than 100 attendees, with the PAC group being the top attraction.

There was a nova sighted at naked eye visibility in Sagittarius in the past week. It is passed maximum, but should provide a good target for 'scopes for the next couple of weeks.

Solar activity seems to be slowing somewhat, but there are still some good spots to watch.

Saturn is a good sight for early risers and/or up-laters.

The next PAC star party will be Friday Oct. 4, 2002 at Olive Creek.

On Wednesday, Sept. 25, Brad Schaefer will be giving a program on stellar 'superflares' at 7:30 PM at UNL.

The next Mahoney Star Party is scheduled for this Friday Sept. 27 at Mahoney State Park.

The annual PAC/OAS banquet will be at the Riverview Lodge at Mahoney State Park. The cost is $8.00 per person. Get your reservation in by October 1st.

The next UNL student observatory public night will be Friday Oct. 25.

Hyde News: on Saturday, Oct. 5 Hyde Observatory will be having another instructional star party. The public is invited to come out and learn how to use their 'scopes and get an idea of what telescopes work best for them. Club members are encouraged to bring their 'scopes out to help the public.

On Sun Nov. 10, HYDE MEMORIAL OBSERVATORY will hold its 25th anniversary. This is a public event with telescope designer Larry Stepp and astronaut Clayton Anderson along with many of the people responsible for the observatory's existence.

Anyone interested in joining the online newsletter, contact treasurer Liz Bergstrom to stop receiving the mailed newsletter.

Nominations are open for Club officers. They will remain open until the next meeting when elections will be held. The following are current nominees for positions:

President: Dave Knisely
Vice President: Dave Brokovsky
2nd VP(program chair): Brian Sivill
Secretary: Lee Taylor
Treasurer: Liz Bergstrom

Liz moved to adjourn and your's truly seconded.

Adjourn to Brad Schaefer's program, 'How far can you see'

Respectfully submitted by,

Lee Taylor

Hyde Observatory Volunteer Schedule

Date	Team Leader	Operators		Supervisor	Events
Winter Hours (7:00 PM to 10:00 PM)					
November					
11/2	Brian Sivill	Karla Bachman	Justin Devries	Erik H	
11/9	Jeff King	Lynda Beck	Steve Lloyd	Jack D	
11/10 *	Bill Wells	Josh Machace	AJ Benker	Dave C	25th Anniversary
11/16	Dave Hamilton	Dan Delzell	Jared Delzell	Brian S	
11/23	Dave Churilla	Bob Leavitt	Joey Churilla	Rick J	
11/30	Bill Wells	Jeff Campbell	Steve Lloyd	Dave H	
December	**(Tentative)**				
12/7	Jeff King	Lynda Beck	Karla Bachman		
12/14	Dave Churilla	Joey Churilla	AJ Benker	Brian S	
12/21	Bill Wells	Dan Delzell	Jared Delzell	Rick J	
12/28	Brian Sivill	Jeff Campbell	Bob Leavitt	Dave H	
*** Open 7 to 10 PM (Guests including dignitaries and Astronaut)**					

Hyde Observatory's 25th Anniversary— Dave Churilla

That's right, Hyde Memorial Observatory has been serving the community for 25 years! Staffed entirely by volunteers from the community, UNL and the Prairie Astronomy Club, Hyde has shown thousands of people dramatic views of planets, stars, galaxies and nebulae, given countless lectures and talks to patrons and classes about Space Exploration and Astronomy, and shown thousands of films….and all this without ever charging a fee. The facility is funded by your donations.

Anniversary events begin with special speakers from 1 to 4 p.m. on Sunday afternoon November 10th at the UNL City Union Auditorium. The presentations are open and free to the public. Our guests include:

Larry Stepp, an optical designer for giant telescopes. He grew up in Lincoln and was president of the Prairie Astronomy Club during the beginning years of Hyde Observatory. Today he has just finished years of work building twin large observatories in Hawaii and Chile. He currently is Project Manager of the New Initiatives Office of the Gemini Telescope Project a part of the National Optical Astronomical Observatory. Stepp brings the unique perspective of an amateur astronomer from Lincoln who was there at the beginning of Hyde Observatory and a designer of systems for some of the world's largest telescopes.

Dr. Kevin Houser, an illumination engineer at the University of Nebraska at Omaha. He is a member of the International Dark Sky Association and a specialist in lighting design. Houser will share his thoughts about how lighting designers and astronomers might work together toward their common goals of dark skies and good lighting.

Astronaut Clayton Anderson, whose hometown is Ashland, Nebraska. He joined the Johnson Space Center in 1983 in the Mission Planning and Analysis Division. Selected by NASA in June 1998, he reported for training in August 1998. Anderson also serves as a Space Station Capsule Communicator (CAPCOM) for Station missions and as the Astronaut Office crew representative for the Station's electrical power system. In August of 2002, Mr. Anderson was selected to begin training in the Extravehicular Activity (EVA) Skills program. He will serve in technical assignments until assigned to a space flight.

On Sunday evening, November 10th, Hyde Observatory will host a special Open House from 7 to 10 p.m. in celebration of the Observatory's Anniversary. The Observatory's telescopes will be open for viewing and members of the Prairie Astronomy Club will have their telescopes set up on the front lawn for your viewing pleasure (weather permitting). Informal visits with our guest speakers will round out the evening. Mayor Don Wesley will be on hand for a brief ceremony at 7:30 PM and Astronaut Clay Anderson will be there to sign autographs for children who visit the observatory and be available for pictures.

Life, Evolution and the Universe (Part 1 of 3)— Mark Dahmke

This article is based on a speech I gave at the Torch Club (www.torch.org). I decided to rewrite it for the PAC newsletter. Due to its length, this article will be published in three parts.

In Arthur Clarke's novel, 2001: A Space Odyssey, which was based on his short story called "The Sentinel," an advanced intelligence from another star visits Earth about 4 million years ago and provides some on-the-job training for our distant ancestors. The visitors leave behind a sentinel, buried on the moon. In 2001, humans dig up the sentinel and while trying to discern its purpose, it emits a powerful signal that alerts its creators that humankind has reached a level of intelligence and technology that warrants further observation.

In the real 2001, the search for extraterrestrial intelligence is still on, but we haven't detected any alien signals yet. Although I'm in favor of continuing the search, I suspect that if life does exist elsewhere in the universe, most of it will be simple microbial forms, perhaps as complex as bacteria. Simple life forms are much harder to detect though, but some interesting work is going on in that area. But before we can speculate about what other life forms might look like, we need to define what life is. This might seem to be simple matter, but it really isn't. As we discover new life forms on earth, and as we design and animate them in our computers, it's becoming increasingly more difficult to come up with a clear-cut definition, other than "we know it when we see it."

What is Life?

Webster's defines life as: "that property of plants and animals (ending at death and distinguishing them from inorganic matter) which makes it possible for them to take in food, get energy from it, grow, etc." Until recently this definition was probably adequate, as it served to exclude such things as inorganic crystals that can also grow, but do not share the other properties we associate with organic life. I like Werner Loewenstein's definition of life. He argues that life is really an information carrier and that information flow, not energy, is the prime mover of life. There are many examples of self-organization in nature, such as inorganic crystals, but these other forms cannot compare with the self-organizing power of living beings. It is this ability to store, utilize and propagate large quantities of information, collected piece by piece over millions of years, that defines life. And this definition does not limit us to organic or carbon-based molecular constructs.

Implicit in this definition is the functioning of a biosphere. A single life form will not survive for long on by itself; it can only exist within a network of other life forms, or at the very least where the environment is not at thermal equilibrium. Energy, or more accurately, "negative entropy" or a flow of information must be present.

Much research has been done on the subject of how life got started on earth. In 1936 a Russian chemist named Oparin suggested that Earth's early atmosphere was rich in ammonia and methane and lacked free oxygen. He proposed that a large variety of organic molecules were washed into the ocean by rain and that early organisms didn't need complex structures such as cell walls, because everything they needed was available in their environment.

In 1952 at UCSD, Stanley Miller tested this idea by recreating this early atmosphere in the laboratory. He used electrical discharges to simulate lightning, and after a week found that the simulated ocean contained many organic compounds, including two of the amino acids that are the building blocks of proteins. Additional experiments of this type have produced the nucleosides that are the building blocks of RNA and DNA.

It is now known that many of these substances are present in space, and rain down on the earth in the dust from comets and in rocky meteorites. It seems that all the components for organic life are readily available, but what does it take to make them self-assemble?

The DNA molecules that carry most of the information needed to operate the complex machinery of cells is so complex that it's unlikely that any meaningful sequences could come together spontaneously, even if you assume that the early oceans where a thick prebiotic organic soup. However simpler self-replicating forms such as RNA or autocatalytic sets are possible. Experiments are currently under way to create self-replicating systems based solely on short RNA chains, however there's no way to know if an earlier RNA world lead to the more complex DNA chains that are used by all life forms on earth today.

Autocatalytic sets or groups of self-sustaining molecules such as chains of amino acids called polypeptides are another possibility. Work done by Huber and Wachtershauser has provided evidence that such systems are viable. Short peptides can form from amino acids on the surface of metal sulfide grains in conditions similar to those found at deep-sea volcanic vents. What's more interesting is that according to Stuart Kauffman, as you add more diverse molecules to the soup, these autocatalytic sets do not form gradually-- there is a phase transition in which the whole system emerges as a self-sustaining network, provided that an outside source of energy is present to keep it going.

The Game of Life

This type of self-organizing network is very similar to Conway's Game of Life. The Game of Life was popularized through Martin Gardner's column "Mathematical Games" in Scientific American. The Game of Life was played out on a checkerboard using a simple set of rules. Cells were either on or off – alive or dead. If a cell is alive, it will survive into the

next generation if there are two or three neighbors also alive. It will die of overcrowding if there are more than three live neighbors. It will die of exposure if there are fewer than two. If a cell is dead, it will remain dead in the next generation unless exactly three of its eight neighbors are alive. In that case the cell will be born in the next generation.

According to Kauffman, networks with a moderate number of connections between members produce surprisingly orderly behavior. For example, a network of 100,000 units will have the square root of 100,000 (or about 316) different state cycles and each cycle will be about 316 states long. This means that if you pick an initial state at random out of 10 to the 30,000 states, it will end up in one of 316 cycles. In chaos theory this is known as an attractor. After only a small number of iterations, this type of network will settle down into a fairly orderly system.

What I find interesting is that researchers are using this same type of modeling technique to create self-organizing systems within computers-- systems that exhibit surprisingly life-like behavior. Much work has been done in recent years with genetic algorithms using super computers (an algorithm is a formula or set of steps for solving a particular problem). Danny Hillis of MIT created artificial organisms that were represented in a computer as lists of numbers. He decided to start with a simple task that could be used to judge the fitness of the organisms he hoped to create. He would require them to arrange their bits in sequential order. This was accomplished by rewarding those that came closest to the desired arrangement after each generation. He began with strings of twelve random numbers, and tried to encourage the organisms to sort the numbers into sequential order. He quickly discovered that after a few generations they would reach a certain level of efficiency and could evolve no further. He then added sexual reproduction, using a random crossover point to combine the genes of two organisms. Actually he implemented a system that gave the organisms the choice of sexual reproduction. If it turned out that sexual reproduction helped improve the organism's ability to sort numbers, it would be selected more frequently by more of the organisms. The experiment indicated that sexual reproduction did allow the organisms to escape a local maximum and improve their ability to sort numbers.

Artificial Life

One of the fundamental problems of computer science is to determine the most efficient way of sorting a list of numbers. In the early 1960s, it was assumed that the best possible sorting algorithm would require at least 65 steps to sort a list of 16 numbers. In 1969, Milton Green devised an algorithm requiring only 60 steps. Hillis decided to use his genetic algorithm and supercomputer to see if an artificial organism could evolve an algorithm that would be as efficient as the best-known sort algorithm. He ran his population of 65,000 organisms through 5,000 generations and found that the best of the organisms sorted all the numbers successfully and required 65 exchanges to do so.

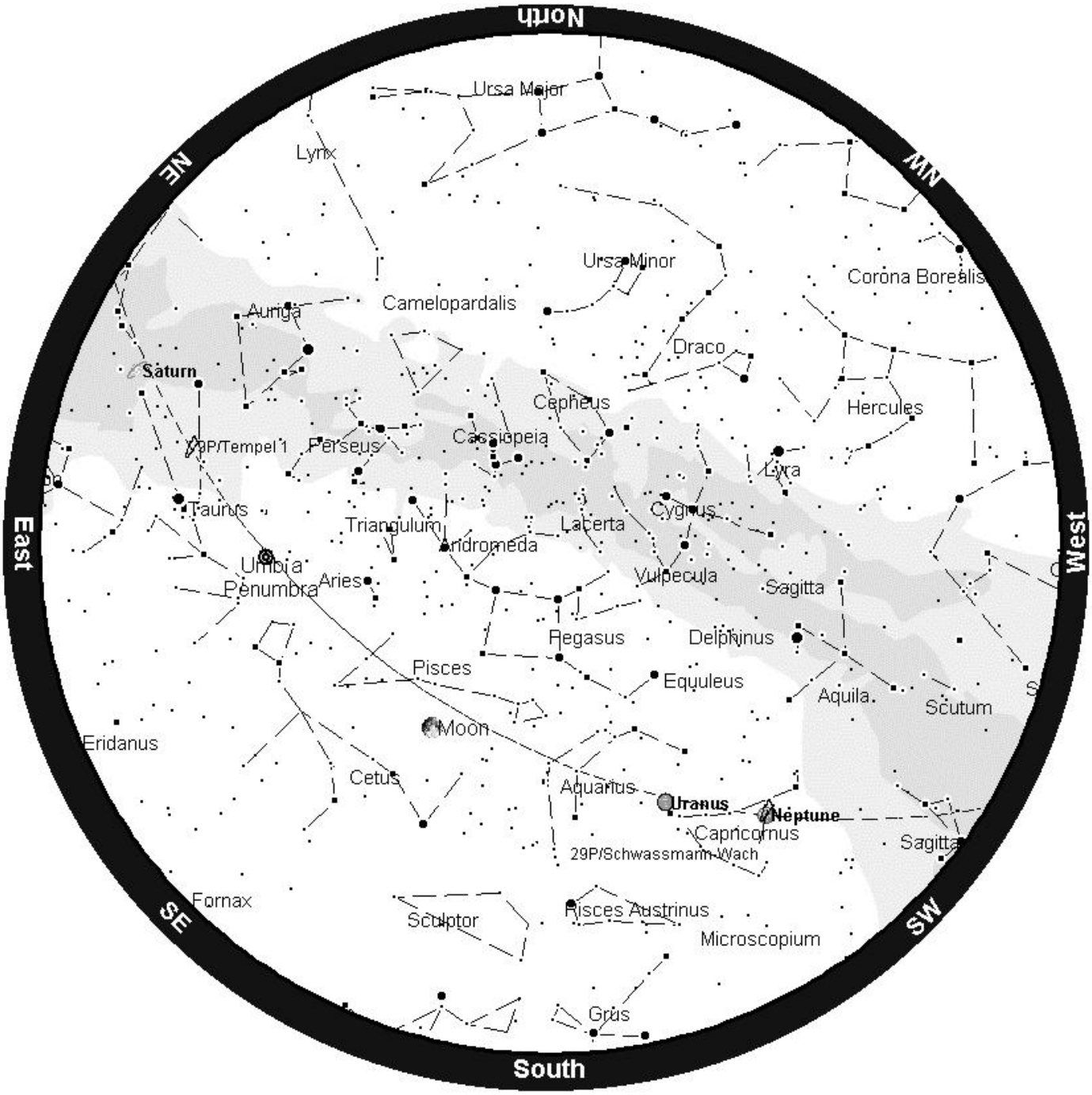
He proved that blind evolution could find a solution as good as the best known algorithm at that time, and it took the computer less than one day to find it, starting with randomized genetic codes. He then tried a variety of techniques to push the organisms to a higher evolutionary plateau, including increasing the rate of mutations, but the results were not very impressive. He next added parasites that were rewarded on how well they harassed the organisms that were trying to sort numbers. The parasites provided tests to the sort organisms to determine their fitness. As the organisms grew better at sorting numbers, the parasites evolved better and better tests. Instead of using days of computer time, the new co-evolutionary system generated results in fifteen minutes. The best the organisms ever achieved was an algorithm that required 62 steps, just short of the best-known human-devised algorithm.

Another way to discover the minimal requirements for self-replication is to reverse-engineer a living cell. At the Institute for Genomic Research, a team of researchers is trying to create something that isn't found in nature: a single-celled organism with the smallest number of genes necessary to stay alive. Scott Peterson is attempting to connect together a series of genes based on the simplest known bacterium, Mycoplasma genitalium. This particular bacterium has, over the course of millions of years, shed thousands of unnecessary genes, given that its human hosts fulfill most of its needs. Exhaustive testing has allowed them to determine which of mycoplasma's 470 genes are required for survival. Although it's turned out to not be that simple – nature doesn't always follow the rules we expect-- they have identified approximately 300 essential genes. Armed with this library of genes, they intend to build a life form that will be used as a laboratory to model the basic processes that take place within cells.

I expect that within a few years, scientists will have learned enough about the mechanics of working with DNA and RNA to finally be able to sequence designer life forms and switch them on, creating new life in our own image. This will be a major breakthrough, but it still doesn't answer the question of whether life could have evolved independently on other planets. For the first time in history, we now have the means to determine if we are or are not alone in the universe.

In part 2, next month: *The possibilities of life on Mars, life in deep space, superstring theory and quantum evolution.*

November Star Chart



Events Calendar

November 2002						
Sun	Mon	Tue	Wed	Thu	Fri	Sat
					1 Sun: 06:56 - 17:22 Club Star Party	2 Sun: 06:58 - 17:21 Hyde Observatory open to the public
3 Sun: 06:59 - 17:20	4 Sun: 07:00 - 17:19	5 Sun: 07:01 - 17:18	6 Sun: 07:02 - 17:17	7 Sun: 07:04 - 17:15	8 Sun: 07:05 - 17:14	9 Sun: 07:06 - 17:13 Hyde Observatory open to the public
10 Sun: 07:07 - 17:12 Hyde Observatory 25th anniversary	11 Sun: 07:08 - 17:11	12 Sun: 07:09 - 17:11	13 Sun: 07:11 - 17:10	14 Sun: 07:12 - 17:09	15 Sun: 07:13 - 17:08	16 Sun: 07:14 - 17:07 Hyde Observatory open to the public
17 Sun: 07:15 - 17:06	18 Sun: 07:16 - 17:06	19 Sun: 07:18 - 17:05	20 Sun: 07:19 - 17:04	21 Sun: 07:20 - 17:04	22 Sun: 07:21 - 17:03 UNL Student Observatory Open House	23 Sun: 07:22 - 17:02 Hyde Observatory open to the public
24 Sun: 07:23 - 17:02	25 Sun: 07:24 - 17:01	26 Sun: 07:26 - 17:01 PAC Meeting 7:30pm Hyde Observatory	27 Sun: 07:27 - 17:00	28 Sun: 07:28 - 17:00	29 Sun: 07:29 - 17:00	30 Sun: 07:30 - 16:59 Hyde Observatory open to the public

Directions to Olive Creek Observing Site

Shorter:

Take Hwy 77 South out of Lincoln until you get to the Crete corner (junction Hwy 77 and Hwy 33). Go West on Hwy 33 (toward Crete) until you get to SW 72 St. Turn Left (South) on SW 72 St. and go about 5 miles until you get to SW Panama Rd. Turn right (West) until you get to SW 100 St. (SW 100 St does NOT go through to Hwy 33). Turn Left (South) on SW 100 St and go about 1 to 1 1/2 miles until you see the sign and entrance to Olive Creek (this is the West side of the Park). It's on your left (East) side of the road.
More Black Top:

Take Hwy 77 South out of Lincoln until you get to the Crete corner (junction Hwy 77 and Hwy 33). Go West on Hwy 33 (toward Crete) until you get to about SW 114 St. - the first intersection after SW 100 St. (forgot to look at this street sign, sorry - you'll see a sign for Olive Creek though at this road- but don't count on anymore signs after that, I didn't see any). Turn Left (South) on SW 114 St and go about 5 miles or so until you get to SW Panama Rd (you'll see a church and small school on your right). Turn Left (East) and go about a mile to SW 100 St, then turn Right (South) and go 1 to 1 1/2 miles until you see the Olive Creek entrance and sign (on your left hand side of the road).

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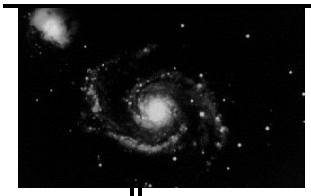

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First Class Mail

Next PAC Meeting
October 29, 2002
7:30 PM
Hyde Observatory