The OBSERVER

The Newsletter of the Twin City Amateur Astronomers, Inc.

October 2002 Volume 27, Number 10

In This Issue:

Introducing the JWST

—Michael P. Rogers

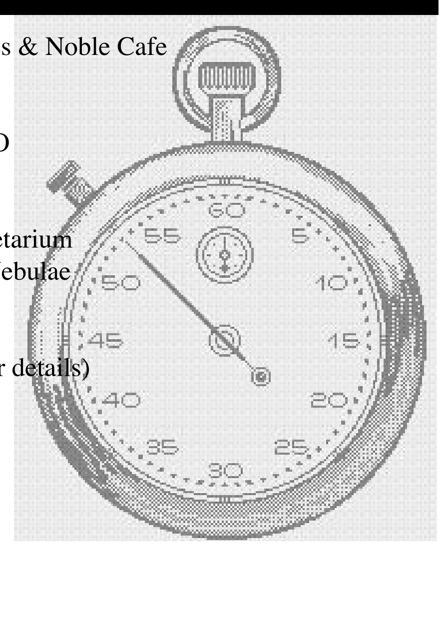
THE HUBBLE Space Telescope has now reached the point where it warrants the adjective "venerable": it has been in almost continual operation for thirteen years, during which time it has seen several substantial upgrades. Although it continues to push the frontiers of knowledge, the good people at NASA and the Space Telescope Science Institute — jointly charged with controlling the telescope — realize that something more is needed. Some of the most fundamental questions in astronomy remain unanswered, and the Hubble, because of its location and mirror size, will be unable to answer these questions.

THE JAMES WEBB TELESCOPE: AN OBSERVER SPECIAL EDITION

Planning for the Next Generation Hubble Telescope (aka the James Webb Space Telescope after the NASA administrator who spearheaded the Apollo missions) began in 1989, and has now reached an exciting stage. And so, in this Observer **special report,** we bring you extended, up-to-date coverage on the telescope that will, upon completion and deployment, eclipse the Hubble, as it peers back into the very beginnings of the universe.

continued on p. 4

TCAA Calendar



Monday, 7 October, 2002, 7:30-9:00 PM, Barnes & Noble Cafe
TCAA Reading Group. Selection: TBD

Saturday, 12 October, 2002, 7:30-9:30 PM, SGO
Public Observing Session

Monday, 14 October, 2002, 7:00 PM, ISU Planetarium
TCAA Meeting. Topic: Observing Planetary Nebulae

Tuesday, 22 October, 2002, Barnes & Noble
Presentation on common telescopes (see p. 3 for details)

Saturday, 2 November, 2002, Dusk-???, SGO
Members-Only Observing Session.

The Observer
The Newsletter of the TCAA, Inc.

The Observer is a monthly publication of the Twin City Amateur Astronomers, Inc., a non-profit organization of amateur astronomers interested in studying astronomy and sharing their hobby with the public.

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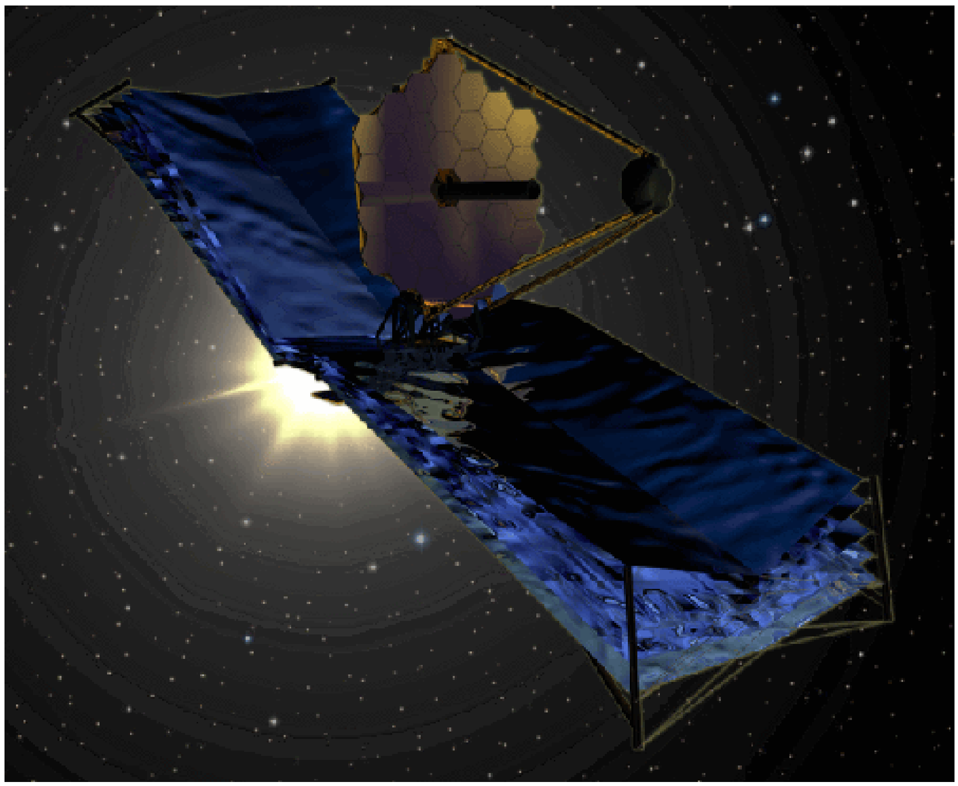
Articles, ads, etc., are due by the last weekend of each month. Items may be e-mailed to: mprogers@mac.com, or jmemken@ilstu.edu

Dues
$25.00 per household, per year
$15.00 for members over 60
$12.00 for newsletter only
$ 1.25 for a single newsletter copy

JWST Overview
— StScI

THE JAMES WEB Space Telescope (JWST), formerly the Next Generation Space Telescope (NGST), is a collaborative effort between NASA, the European Space Agency (ESA) and the Canadian Space Agency (CSA) to develop a large, near- and mid-infrared optimized space telescope by the end of this decade that can build and expand on the science opened up by the highly successful Hubble Space Telescope (HST). Development of the JWST is led by the JWST project at NASA's Goddard Space Flight Center.



The Space Telescope Science Institute (STScI) is responsible for the Science and Operations Center (S&OC) for the JWST (in a similar fashion as for HST) and as such plays an important role in the development of the JWST. The STScI is also responsible for public outreach for the JWST.

The STScI represents the intermediary between the astronomical community and the JWST project as a whole. As such, we make sure that the science community has a strong influence on the science goals for JWST, for instance by hosting the Science Working Groups. These science drivers immediately translate into specific needs for instruments and our team is making sure that these needs are met. Once the JWST is in orbit, the STScI will be responsible for Planning and Scheduling (selecting proposals and making sure that the observations are scheduled safely and efficiently), Flight Operations (operating the telescope and taking care of emergencies), and Data Release (calibration pipeline, data archive). These tasks are intricately connected to the JWST hardware and software and, therefore, we have a strong influence on the design of the NGST, making sure that it can be operated efficiently and effectively from an astronomer's point of view.

Barnes & Noble Presentation

Who: Jim Swindler
What: Public presentation on optics, mechanics, and performance of small telescopes
When: 22 October, 2002 @ 7 PM
Where: Barnes & Noble

TCAA Public Meeting

Who: Sandy McNamara
What: Observing Planetary Nebulas*
When: 22 October, 2002 @ 7 PM
Where: ISU Planetarium

*for both beginners and those who have been practicing for a while

JWST Current Status
— StScI

The James Webb Space Telescope (JWST) is currently on the brink of moving from Phase A (preliminary analysis, technical design studies) to Phase B (definition) in NASA speak. In this next phase, the mission's preliminary design will be developed. Before this transition can take place, an independent review board appointed by NASA will have to find that the mission's scientific objectives are achievable with the available resources.

Many elements of JWST are still in a state of flux. Below is a rough overview of who is going to be responsible for what.
Current status overview:

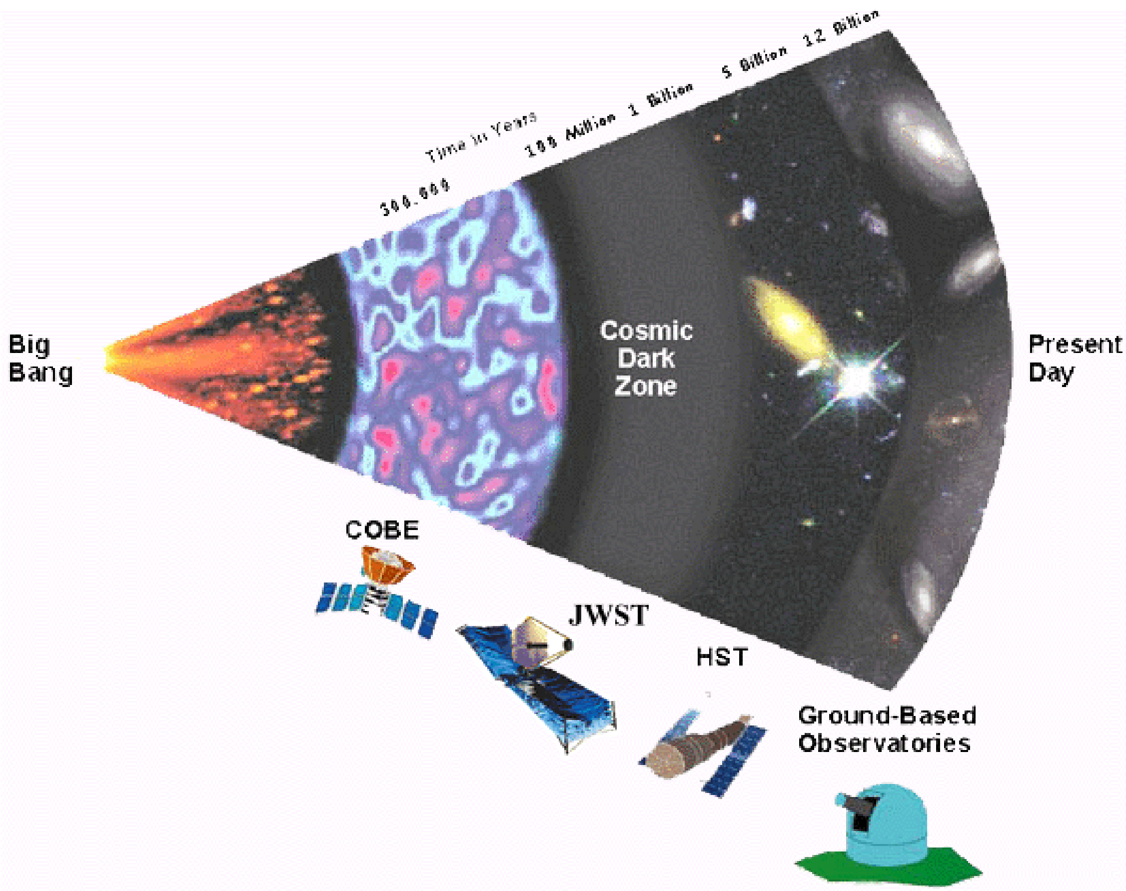
* NASA/Goddard is project lead
* The STScI will develop and operate the Science & Operations Center (S&OC), having the same function as it currently has for the Hubble Space Telescope
* TRW, the selected prime contractor, will design and fabricate the observatory, prime mirror, and spacecraft. They are also responsible for integrating the science instruments module into the spacecraft and performing the pre-flight testing and on-orbit checkout.

* The Integrated Science Instruments Module (ISIM) will be developed by NASA/Goddard.

* The Near-Infrared Camera (NIRCam) will be built by a team led by the University of Arizona, Tucson, with Lead Investigator Dr. Marcia Rieke. Other team members reside at Lockheed-Martin Advanced Technology Center, Palo Alto, Calif.; EMS Technologies, Ottawa, Canada; and COM-DEV, Ltd., Cambridge, Canada

* NIRSpec will be built by the European Space Agency (ESA) with a primarily European science team.

* The Mid-Infrared Instrument (MIRI) will be built in a 50/50 collaboration between NASA and individual European nation states, managed by ESA. The Jet Propulsion Laboratory (JPL) has been selected as the US lead implementing center for MIRI (Instrument Scientist Dr. Gene Serabyn). The US portion of the science team constructing MIRI is led by Dr. George Rieke, University of Arizona.



* The JWST guider (FGS) will be built under the management of the Canadian Space Agency (CSA) by EMS Technologies and the Herzberg Institute of Astrophysics (Project Scientist John Hutchings)

* Several detector technologies are currently being investigated. In the near infrared, HgCdTe detectors by Rockwell Scientific and InSb detectors by Raytheon Infrared Operations are being scrutinized. The NASA Ames Research center is developing mid-infrared Si:As detectors. Labs have been set up at the University of Hawaii, University of Rochester and at NASA Ames to characterize these technologies, while the Independent Detector Testing Laboratory at STScI/JHU is testing the detectors in a comparative hardware setup.

NGST Science Goals

— StScI

ASTRONOMERS in the last 50 years have made wondrous discoveries, expanded our understanding of the universe and opened humanity's vision beyond the visible portion of the electromagnetic spectrum. Our knowledge of how the cosmos was born and how many of its phenomena arise has grown exponentially in just one human lifetime. In spite of these great strides, there remain fundamental questions that are largely unanswered. To further our understanding of the way our present universe formed following the Big Bang requires a new type of observatory with capabilities currently unavailable in either existing ground-based or space telescopes. Simply put, a goal of the James Webb Space Telescope (JWST) is to observe the first stars and galaxies in the Universe. This grand effort is embedded in fundamental questions that have been posed to NASA's Space Science program:

1. What is the shape of the Universe?
2. How do galaxies evolve?
3. How do stars and planetary systems form and interact?
4. How did the Universe build up its present elemental/chemical composition?
5. What is dark matter?

Answers to most of these questions involve objects formed extremely early in the history of the universe. Such objects have their radiation greatly redshifted when observed in the current epoch, meaning that observations are best performed in the infrared portion of the spectrum. The JWST will be capable of detecting radiation whose wavelength lies in the range 0.6 to 28 microns (and be optimized for the 1 to 5 micron region). Furthermore, the JWST must be able to see objects 400 times fainter than those currently studied with large ground-based infrared telescopes (such as the Keck Observatory, or Gemini Project) or the current generation of space-based infrared telescopes (ISO, NICMOS or SIRTF), and it must do so with the spatial resolution (image sharpness) comparable to the Hubble Space Telescope (HST).

Where JWST fits in:

Our current understanding of how the Universe was formed and evolved is remarkably well constrained at the extreme ends of time. That is, we have a fairly good understanding of what the Universe is like today and the recent past (when the universe was between 10-15 billion years old) from observations at all wavelengths. We also have a pretty good understanding of what the universe was like when it was quite young (less than about 1 million years old) based upon observations of the cosmic microwave background and high energy particle physics. This middle ground, however, between 1 million and a few billion years old, is completely unobserved. It is during this time period that the first structures we see today, namely stars and galaxies, began to form (Figure 1).

To address some of the questions mentioned above astronomers have created a prototype observing mission for the JWST designed to answer just these questions. The program is divided roughly into five theme areas.

1. Cosmology and the Structure of the Universe

Understanding the history of the Universe, from the Big Bang to today, has been at the center of intensive research over the last decade. We have a reasonable understanding of this history from the early times of nucleosynthesis (when proton, neutrons, and electrons plus other

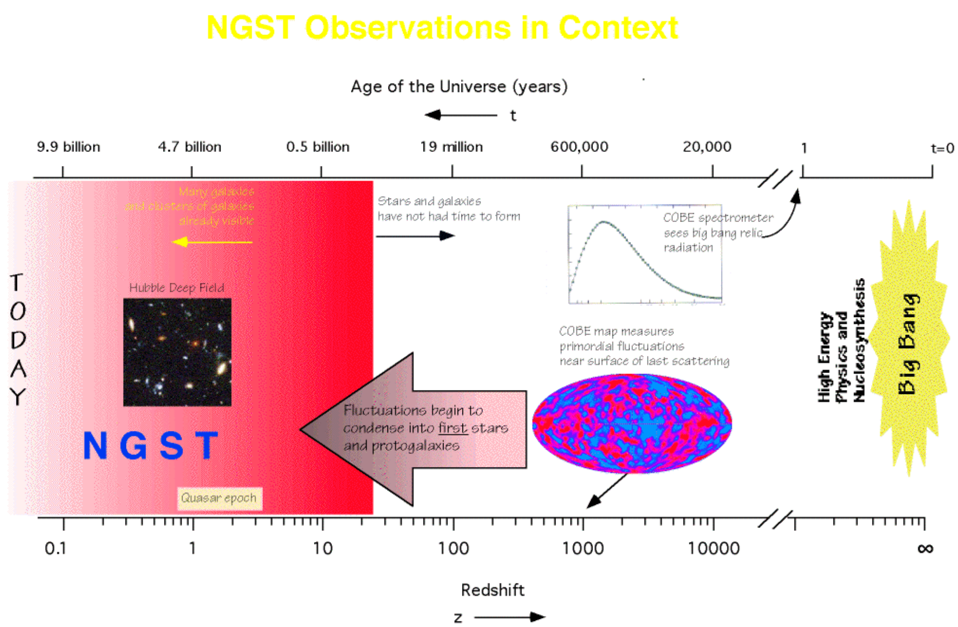


Figure 1: Schematic history of the Universe with the present ('today' on the left and the most distant past, (big bang' on the right). The shaded red region shows the region of Universe history accessible via the JWST. The JWST will sample that part of the Universe's history during which the first stars and galaxies formed. In contrast we show the regions of history studied by other missions (COBE and HST). The age of the universe is shown on the top scale, going from zero at the right to 10 billion years at the left. The bottom scale is called redshift, labeled z. It is the fractional increase in the wavelength of light from the moment it was emitted to the moment we receive it, and the number (1+z) is the ratio of the size of the universe now to the size it was at an earlier time.

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elementary particles were formed) to the recombination era (when the protons and electrons combined to form Hydrogen). Observations by COBE (Figure 1) and later ground-based experiments of this epoch in our Universe's history found the fingerprints of cosmic density fluctuations — the seeds of current structure in the Universe.

After recombination, the Universe fell into the "dark ages"; it became opaque to ultraviolet light. A transition must have occurred between these dark ages and the current state of the intergalactic medium, which allows us to view ever more distant sources. Finding the redshift and nature of this transition is essential for understanding the first luminous objects formed.

The level of fluctuations seen by COBE also provides clear evidence for our Universe to be dominated by an as yet unseen matter component whose nature and spatial distribution are unknown. Nevertheless, the dark matter governs the formation and evolution of galaxies and clusters of galaxies. Therefore, knowledge about the relationship between dark and luminous matter lies at the heart of understanding the evolution of galaxies like our own. The total density of this dark matter decides the global geometry of the Universe and its final fate, expanding infinitely or recollapsing in a distant future.

The science programs in this theme are currently centered around these topics:

* The End of the Dark Ages: when and how did the first structure in the universe develop ?
* When and how did the universe reionize itself?
* What is the large scale distribution of dark matter in the Universe?
* Is part of the dark matter made up of compact objects?
* What is the geometry of the Universe?

2. The Origin & Evolution of Galaxies

Understanding the formation and subsequent evolution of galaxies is central to the science mission, and indeed the Origins program. The formation of galaxies may be thought of as the process by which material in the Universe is concentrated, from an initially uniform state produced by the Big Bang (and whose evolution was subsequently mapped by COBE), into distinct structures in which stars are able to form (Figure 1). These stars not only "light up" our Universe, but also produce the chemical elements necessary for the formation of planets, and for the very existence of Life.

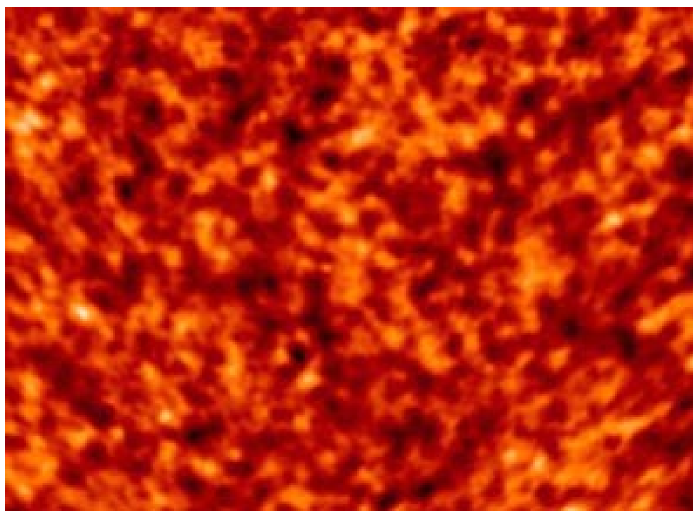

FIGURE 1: A millimeter wavelength picture of minute temperature variations in the early Universe taken by the BOOMERANG telescope over Antarctica. Showing the Universe at perhaps only 300,000 years old, these tiny temperature fluctuations would later evolve into stars and galaxies. [Credit: BOOMERANG Project]

We do not yet know when the first sources of light lit up the previously dark Universe, nor do we even know whether these first beacons were powered by thermonuclear fusion (i.e. stars), or by accretion of material onto black holes. We are also uncertain as to the relative importance of different mechanisms such as gravitational collapse, energy losses from cooling gas, or energy injection by explosive events such as supernovae - in moving gaseous material into, out of, and around, young galaxies. Using the Hubble Space Telescope and large ground-based telescopes, we have seen star-formation activity at high redshifts, z ~ 7, but we are unclear how this relates to the different present-day components of galaxies like the Milky Way. Furthermore, we have also learned from COBE that about half the radiant energy in the Universe comes to us in the form of thermal emission from dust which has been heated by absorbing ultraviolet light emitted by stars and active galactic nuclei, but we do not yet know much about the nature or redshifts of these thermal sources, or to what extent the effects of this dust obscuration have biased our present view of the Universe at high redshifts. Another major uncertainty is that we do not know to what extent material has been exchanged between galaxies and the intergalactic medium. Only a modest fraction (about 10%) of all the baryons in the Universe are thought to be in galaxies today.

Finally, while evidence in the nearby Universe suggests that massive black holes represent up to 1% of the mass of most galaxies, we have little evidence as to how these black holes came to be there and how their formation is linked to the formation and evolution of the stellar component of the galaxies.

Questions central to this theme include:

* What were the first sources of radiation to light up and reionize the universe?
* How were the heavy elements built during in the early history of the Universe?

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3. The History of the Milky Way and Its Neighbors

Though JWST will investigate the early Universe and the creation of the first galaxies, our understanding of this process would be incomplete without answering some of the most basic questions about the history of our Galaxy and its neighbors. JWST will be the first observatory capable of uncovering the "fossil record" of star formation for our Galaxy and dozens of neighboring galaxies of differing types and metal enrichments. This fossil record is held by the oldest stars in any galaxy. Deciphering this record is a difficult task and requires measuring the brightness and colors of individual stars at great distances and in crowded regions. In particular, globular clusters like M4 (Figure 2) are thought to be among the oldest objects in our galaxy -- forming along with the galaxy itself. Determining the ages of these clusters accurately will help refine our estimates of the age of our galaxy.

To more completely understand the record of star formation in our own Galactic neighborhood we must learn:

* When did the central bulge and disk of the Milky Way form?
* What is the age of the oldest stars?
* Have our neighboring galaxies (like Andromeda (Figure 3) or the Magellanic Clouds) formed in similar ways and at similar times?
* Was the outcome of star formation - the relative masses of stars - the same for the first stars and for lower metal environments as for the active star forming regions we observe today?

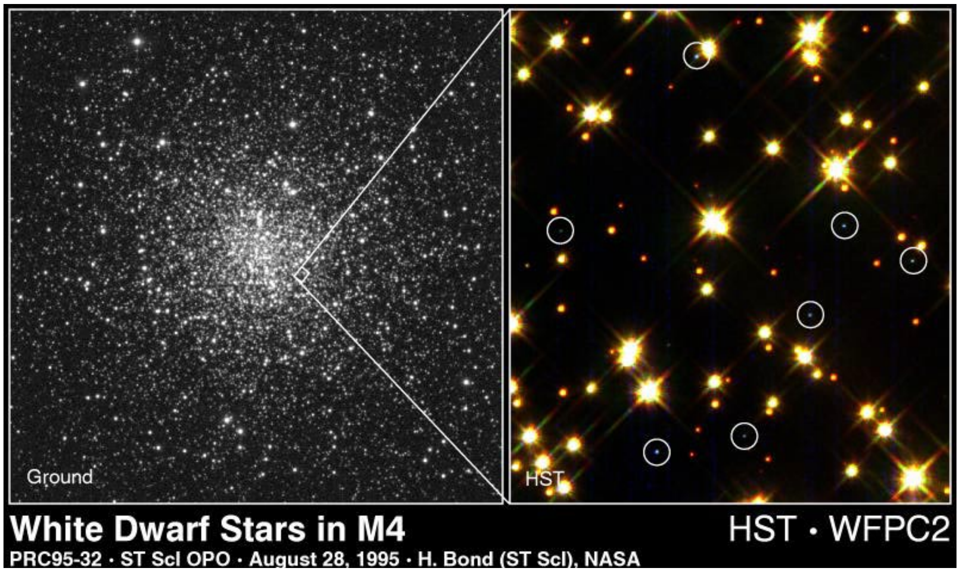

FIGURE 2: At only 7000 light years away, M4 is the closest globular cluster to Earth. M4 is visible to the naked eye one degree west of the star Antares in the constellation Scorpius. Not visible to the naked eye but visible to the HST are numerous white dwarves within the cluster. Since white dwarves cool at a very predictable rate, it is possible to determine the age of the cluster and therefore roughly the age of the galaxy by studying these dying star embers. [Credit: H. Richer (UBC) et al., WFPC2, HST, NASA]

Figure 3: At a mere 2 million light years away Andromeda (M31) is the closest major galaxy to the Milky Way. Most astronomers agree that the Milky Way probably looks similar to M31 but one very interesting difference is Andromeda's double nuleus. [Credit & Copyright: Jason Ware]

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4. The Birth and Formation of Stars

How do stars form? Consider, the Hubble Space Telescope finds stars being born in the constellation of Orion (Figure 4), the Eagle nebula (Figure 5) and the Cone nebula, but they are hidden inside dusty cocoons. These cocoons prevent much of the visible light from young, protostellar objects from ever reaching us. The JWST will use infrared light, which is not blocked as effectively by the surrounding dusty material to see deeper inside the dust clouds and measure their structures. JWST will enable observations crucial to our further understanding of star and planet formation. For example, by investigating the distribution of stellar masses found in star forming clusters — as a function of physical environment — JWST will help to address the question: are the masses of stars fixed by the set of initial conditions (ie. temperature, density) that characterize the material from which they form? Or is this process self-regulating, tied to the physics of the star forming process itself? JWST, with its combination of resolution, sensitivity and field of view, uninterrupted wavelength coverage, and low thermal background will be able to:

* Sample the emergent mass distributions of young clusters down into the realm of planetary mass objects.
* Catalog their circumstellar properties.
* Investigate atmospheric chemistry for a representative sample of these astrophysically interesting objects.

Moreover, JWST will enable us to study the very earliest phases of protostellar collapse in order to test theoretical predictions which have guided our thinking. Some of the aims for this theme of science investigations are:

* Characterize the physical conditions in pre-stellar cores and the initial conditions found during the star-formation process.
* Explore the evolution of protoplanetary disks from their role in the buildup of stellar masses through the planet-forming epoch.
* Study the physical and chemical conditions in our Galaxy's interstellar medium (ISM)

tFIGURE 4: The most famous of all star forming regions -- The Orion Nebula, as seen from the Hubble Space telescope. It is only 1500 light years away and is visible with the naked eye in the constellation Orion. [Credit: C. O'Dell and S. Wong (Rice U.), NASA]

FIGURE 5: This HST image of the Eagle Nebula shows a giant pillar of gas and dust illuminated by newborn stars. [Credit: J. Hester & P. Scowen (ASU), HST, NASA]

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5. The Origin and Evolution of Planetary Systems

Many important clues about the origin and evolution of planetary systems lie hidden in the structure of our Solar System. The Solar System is made up of bodies of widely varying sizes and composition. The inventory ranges from zodiacal dust (a few microns in size) in the inner Solar System to the Edgeworth-Kuiper belt, a disk of icy planetesimals that orbit past Uranus (tens of kilometers in size) to planets (thousands of kilometers in size). Astronomers suspect that the Edgeworth-Kuiper Belt was left over from the formation of the planets 4.5 billion years ago. Since the IRAS satellite made the startling discovery of a "debris disk" around other stars, the similarity of these debris disks to the zodiacal dust and Kuiper Belt objects as well as any other similarities to our own Solar system remains a subject of speculation. However, recent observations suggest that a planet does orbit around Beta Pictoris, a star with one of these debris disks. (FIGURE 6)

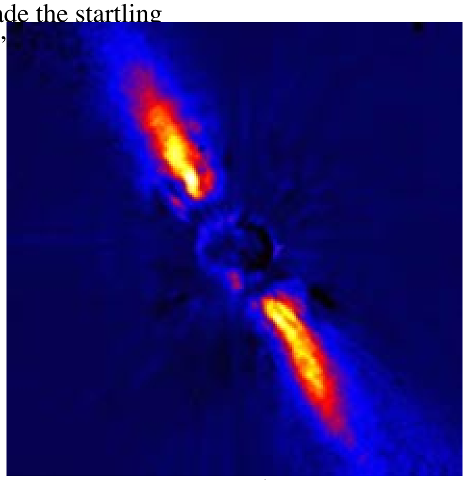


FIGURE 6.

In recent years Astronomers have discovered more than 100 planets orbiting other stars nearby in our galaxy. Most of these extra-solar or exoplanets are many times the mass of Jupiter and most orbit very close to their parent star.

How do we find exoplanets?

Since stars are so big and bright and planets are small and only reflect light, it will be very difficult to image planets directly and no exoplanet has been imaged to date. However they can be found by the gravitational influence they exert on their parent star. Planets in orbit around a star cause the star to wobble slightly. (FIGURE 7.) It is simply a matter of detecting and following this wobble to determine the mass of the planet and the period of its orbit.

While it is unlikely JWST will image an extrasolar planet directly, it may be possible to detect the spectrum from the atmosphere of such a planet. The spectrum can be analysed for the presence of water, oxygen, nitrogen and other chemicals that are indicative of life

Because the technique for finding extra solar planets is relatively new we have thus far only discovered very large planets with short periods -- most have several times the mass of Jupiter and have orbits inside of Mercury's. However, as time goes by, more and more are being discovered with lower masses and longer orbits. Could it be possible to find an Earth sized planet in an Earth-like orbit?

Where does JWST fit in?

JWST will continue and extend the search for debris disks and extra solar planets. Its increased resolution and light gathering power will allow it to make better images and better determine the properties of solar systems in the making. It will also be able to see the smaller wobble of a star caused by smaller planets as well as peer further out to see more star systems that exhibit such behavior.

The JWST will also investigate the following questions:

* Are debris disks remnants from the formation of planetary systems?
* What is the evolution of a young circumstellar disk to a debris disk system?
* How important are processes like fragmentation and collisions in such disks?

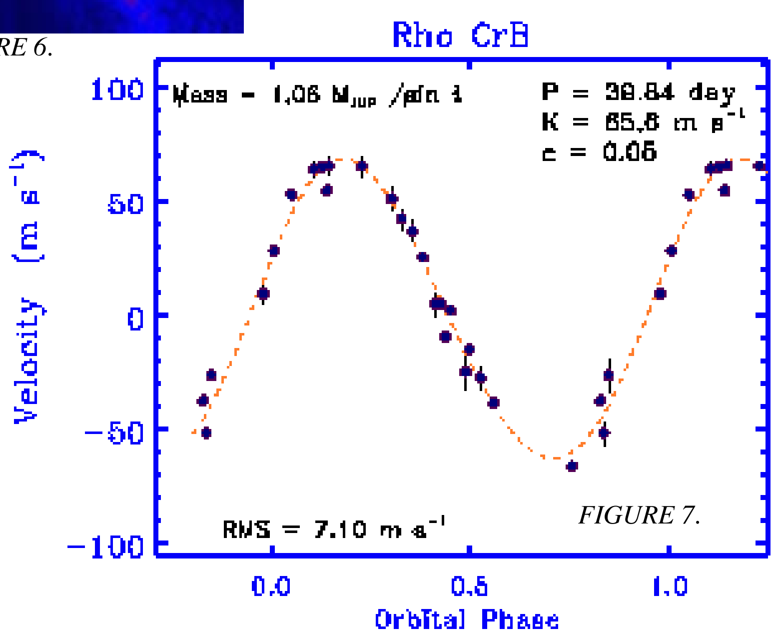


FIGURE 7.

NGST Design: Key Elements Summarized
— StScI

* 6m class mirror, lightweight, deployable
* Telescope passively cooled by large sunshade
* Second Lagrange point (L2) orbit
* Diffraction-limited imaging quality (Strehl = 0.8) for lambda = 2 micron
* 0.6 - 10 micron wavelength range with zodiacal-light-limited imaging performance with extended performance to 20+ micron
* Imaging and spectroscopic instrumentation over this wavelength range
* 5 year required lifetime, 10 year goal

Instruments:

NIRCam

* Near-IR and visible camera
* Sensitive over the 0.6-5 micron wavelength range
* Two broad- and intermediate-band imaging modules, each with 2.3x2.3 arcmin field of view
* Each imaging module has two channels, with light split by a dichroic at ~2.35 micron
* Short wavelength channel 0.034” pixels, long wavelength channel 0.067” pixels
* Two R=100 tunable filter imagers, one for below and one for above 2.5 micron
* All imagers have coronagraphic capability

NIRSpec

* Multi-object dispersive spectrograph (MOS)
* Sensitive over the 1-5 micron wavelength range
* > 3’x3’ field of view
* ~0.1” pixels
* R~1000 spectral capability, maybe an R~100 capability
* Capable of observing more than 100 objects simultaneously
* Probably with MEMS (micro-electro-mechanical system) technology, but other options are kept open.

MIRI

* Mid-IR camera and slit spectrograph
* Sensitive over the 5-28 micron wavelength range
* 2’x2’ field of view imaging or R=1500 slit spectrograph
* A preference for a single focal plane array

FGS

* Enable stable pointing at the milli-arcsecond level
* Sensitivity and field of view to allow guiding with 95% probability at any point on the sky (i.e. 95% at the galactic poles, better at most other places)

Design elements in more detail:

The primary mirror will have a 6m clear aperture, will be deployable, comprised of 3 to 8 hinged segments that are individually monolithic or segmented in the manner of the Keck telescopes. The position of the segmented optical elements must be measured and re-aligned to reach the required optical performance (Strehl ratio, governed by large scale errors, and encircled energy, limited by small, sub-segment sized errors). This process will probably require dedicated observations of bright stars on a weekly or more frequent basis. Wave Front Sensing to keep the mirror in shape is currently studied at the Jet Propulsion Laboratories.

During the feasibility studies (1995-96), NASA and the STScI considered a wide variety of orbits for NGST. The most promising was the second Lagrange point (L2), approximately 1.5 million km from Earth, outside the orbit of the Moon. The region about L2 is a gravitational saddle point, where spacecraft may remain at roughly constant distance from the Earth throughout the year by small station-keeping maneuvers. NGST, near the L2 point, is in a benign and essentially unchanging environment. There are no significant gravitational torques and thermal influence from the Earth and Moon are greatly reduced.

The whole telescope will be shielded from Sun and Earth light by a large sunshade. The sunshade will have many layers of lightweight reflecting material, sufficient to sustain a 300K temperature drop from front to back. With a back sunshade temperature of ~ 90K, the primary mirror, the optical truss, and the instrument payload can radiate their heat to space and reach cryogenic temperatures of 30-50K. These low temperatures and the total blocking of direct or reflected sunlight are crucial to the scientific success of NGST. Combined with the L2 orbit, the large sunshade provide a stable, cold environment with a minimum of background radiation.

The Integrated Science Instrument Module (ISIM) will house the science instruments (NIRCam, NIRSpec and MIRI) and the guider (FGS). While the specific design of the ISIM will depend on the selected observatory architecture, its basic capabilities are fixed. It must provide the structural mounting of the science instruments relative to the science focal plane and a thermal system capable of passively cooling the near-IR detectors to ~ 27 K. NASA has the responsibility of providing the ISIM as well as integrating the science instruments into the enclosure and testing them in this environment.

TCAA Treasurer's Report — August, 2002
— L. Duane Yockey, Treasurer

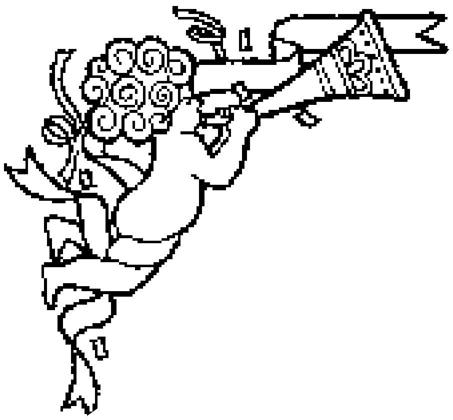
-OPERATING FUND BALANCE – July 31, 2002 -	**$ 1,051.91**
Income	
Al Herrman (dues renewal) -	$ 25.00
Eldon Bricker (dues) -	$ 25.00
Annilee Rohrscheib (dues) -	$ 25.00
Expenses	
None!!	
OPERATING FUND BALANCE – August 31, 2002 -	**$ 1,126.91**
OBSERVATORY FUND BALANCE – July 31, 2002 -	**$ 782.41**
Income	
Vic Connor (Key Deposit)	$ 10.00
Expenses	
SGO Expenses	$ 50.00
OBSERVATORY FUND BALANCE – August 31, 2002 -	**$ 742.41**
NOTES PAYABLE –	**($ 1,400.00)**
TOTAL TCAA FUNDS – August 31, 2002 -	**$ 469.32**

Listing of Official Keyholders (Paid $10 deposit/$5 renewal)

Jim Swindler (April 2001),
Duane Yockey (April 2001),
Sandy McNamara (June 2001),
Dan Miller (August 2001),
Dan Meyer (February 2002),
William Carney (March 2002),
Vic Connor (August 2002)

The Welcome Mat

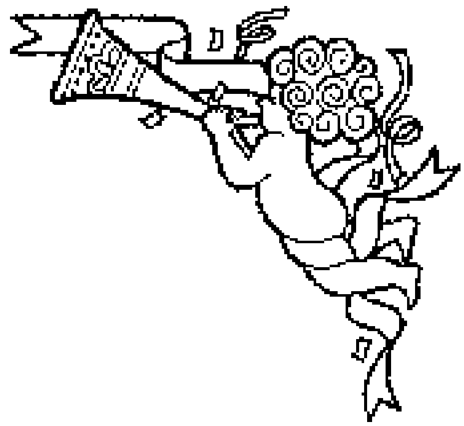
They say that 3 is the loneliest number, but when it comes to new members, 3 is an *excellent* number. A warm welcome to the newest members of the TCAA family...



Eldon Bricker

Annilee Rohrscheib

Antionette Wudtke



The OBSERVER
The Newsletter of the Twin City Amateur Astronomers, Inc.

Michael Rogers & Jean Memken, Editors
2206 Case Drive
Bloomington, IL 61701

Dues Due? ☐

The Dues Blues

If you see a check in the box above, it means **your dues are due.** To retain membership -- and with a new observatory, why quit now??? -- please send $25 to our esteemed treasurer:

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As always, thank you for your support!!