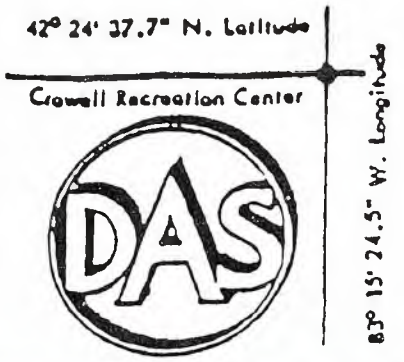
Detroit Astronomical Society Newsletter



JANUARY / FEBRUARY / 1989

FROM THE PRESIDENT

As we look forward to 1989, lets look back on some events that played an important part in the D.A.S. One of the most significant events sponsered by the society was the Clyde Tombaugh lecture at the University of Windsor with the Windsor Center of the R.A.S.C. Since the lecture, a couple of members have joined the Royal Astronomical Society of Canada (R.A.S.C.)

There is a renewed interest in timing occultations that is being spearheaded by Gary Frey and Jim Fanzini and the "I saw Deimos" observing session held at North Pines Observatory that led to the article published in the Detroit Free Press. Not to forget the general observing sessions at Camp Wathana and the public lectures that Dick Lloyd gave to local junior high schools.

Some of the members have expressed interest in attending "Hidden Hollow 89" sponsored by the Richland Astronomical Society (observatory with 31" telescope). It is about a 1½ to 2 hour drive from the Metro-Detroit area and there is always Astrofest and Stellafane. The observing sessions at Camp Wathana will continue as well as the impromptu observing sessions.

The Skywatchers Hotline (837-0130) is financed by the D.A.S. and made possible by membership dues. It is a public service of the DAS that keeps the general public informed on observational astronomy (naked eye) and local astronomical events and is often used to announce DAS events at the end of the tape, keep members informed of lecture topics and group trips.

For 1989 there is plenty to do in astronomy, but it is up to the individual to participate. Clear skies!

Jack Brisbin

CALENDAR OF EVENTS JANUARY 1989

Jan 6	Board of directors meeting 7:00 PM. Workshop activities 8:00 PM
Jan 13	General meeting 8:PM. Lecture: understanding magnitudes by Jack Brisbin
Jan 20	Workshop activities 8:00 PM
Jan 27	Workshop activities 8:00 PM, Astronomical films 8:15 PM (to be announced or call Skywatchers Hotline 837-0130)
Feb 3	Board of directors meeting 7:00 PM. Workshop activities 8:00 PM

Feb 10 General meeting 8:00 PM. Lecture: (to be announced or call Skywatchers Hotline 837-0130)

Feb 17 Workshop activities 8:00 PM

Feb 24 Workshop activities 8:00 PM. Astronomical films 8:15 PM (to be announced or call Skywatchers Hotline 837-0130)

OFFICERS FOR 1989

The following officers have been renominated and reelected for 1989.

President	Jack Brisbin
Vice pres.	Ralph Fortney
Secretary	Gary Frey
Treasurer	Ted Jasina

DIRECTORS FOR 1989

Charles Watson
Jim Pihajlic
Jim Fanzini
Joe Hanks
John Lines

Jim Pihajlic and Joe Hanks are newly elected.

Jim Fanzini is the membership chairman (ALCOR), astronomical league correspondent. He maintains an up to date roster of the members names, addresses and etc. Any name and address corrections can be mailed to him or your editor. His address is: 2420 Pontiac Lake Rd., Pontiac, MI 48054.

Jim has also been appointed the resident agent of the DAS. That duty involves taking care of the tax status of the society.

MEMBERSHIP INTEREST

Gary Frey and James Olden have renewed their membership for another year. To all members: Donot forget to renew your membership when your expiration date approaches. We would also appreciate your participation and attendance at the general meetings and also during the last meeting of the month when astronomical films are ordinarily shown.

On page 4 is a belated reproduction of a map and the text for a binocular Hyades variable star that would be an interesting object to observe during January. The dates and Universal times are given for that month at the end of the text.

There are also articles on a portable planetarium and work with a new mirror of light weight construction that may be the future material for amateur telescopes. The mirror material was submitted by Ed Dvorak.

The portable planetarium can be taken to any school in the metro area to get the students interested in astronomy.

Jim Fanzini and Bob Blanchard are discussing the possibility of promoting astronomy at the Ortonville, Michigan schools with the superintendent of that system. Their idea is to get the parents and teachers involved also. Ortonville is halfways between Pontiac and Flint. Anyone interested in participating in this program can call Jim at 683-8483 days or 858-4777 evenings. Or you can contact Bob at 645-2000 days or 559-5692 evenings.

Needless to say, the Clyde Tombaugh lecture was well recieved and a huge success. The University of Windsor auditorium has a capacity of about 430 and there were only about 15 vacant seats. He was introduced by Bernard McNamara, a University of New Mexico professor of astronomy. All proceeds from his lectures go to a scholarship fund at the UNM. He has a unique quality being the only person to discover a planet from the North American continent. His first telescope was a gift from the Sears Roebuck Co. purchased and given to him by a member of the family. After a time, he built a 9" telescope of his own and occasionally uses it today. Of course, Clyde Tombaugh is the discoverer of Pluto.

The planet Pluto is about 2/3 the size of our moon while its satellite Charon is 2/5 the size of the planet. The mass of Pluto is 1/400 that of the Earth. Since the size of Pluto did not measure up to the expected size of planet X, Tombaugh spent 14 years of additional searching for the elusive planet X but could not come up with any additional discovery. However, the work he put into the project was a great effort and when he finally concluded the lecture, he recieved a standing ovation.

The Capital Amateur Astronomy Club will have a lecture given by Steve Doindis on solar research with CCDs (charge coupled devices), as well as research on red giant variables and pulsars with the 24" MSU telescope. He acted as assistant to Drs. Jeff Kuhn and Horace Smith. The lecture will begin at 7:30 PM on January 11 at the Abrams Planetarium. Preceding that will be a planetarium show begining at 7:00 PM. Doors close promply at 7:30 PM but if you should be late for some reason, access can be made by the back door. There is no charge for either event. Steve Doindis is a graduate student at MSU. You can contact Kim Dyer for any further information at 835-0993.

The November meet of the RASC in Windsor had a lecture given on binary stars by John Griese, a professional astronomer working for the Wesleyan University in Middleton, Connecticut. No, he is not related to Bob Griese, former quarterback of the World Champions Miami Dolphins. The telescope at Wesleyan is a 28" refractor that he is using to collect data on the binary stars. He also has access to a large telescope in Stamford, Connecticut that he uses on his own time and considers himself then to be operating as an amateur astronomer. If anyone was interested in acquiring some data on binaries, they can do so through Kim Dyer since he has his address and possibly his phone number.

Astronomy Magazine will be put on our mailing list for the newsletter since the've expressed an interest in our society and any articles or events that we can be involved in. If we can come up with some important news item or activity, it could wind up in the magazine.

To those who may be interested, Steve Aggas has been elected the new president of the Warren Astronomical Society for 1989. He replaces Riyad Matti.

At the Royal Astronomical Society of Canada in Windsor, Steve Pellarin is the newly elected president for 1989. He replaces Randy Groundwater.

I would like to remind all the members and their friends and any newcomers that the DAS annual dues are:

Regular, $32.50 (18 years or older), family, $37.50 and junior, $22.50. Included is a subscription to Sky & Telescope magazine and the Reflector, a quarterly newsletter published by the Astronomical League. Both are mailed to your home.

Mail your dues to Ted Jasina, 1211 Beaupre, Madison Heights, MI 48071. Members forward renewal card from Sky & Telescope along with their dues.

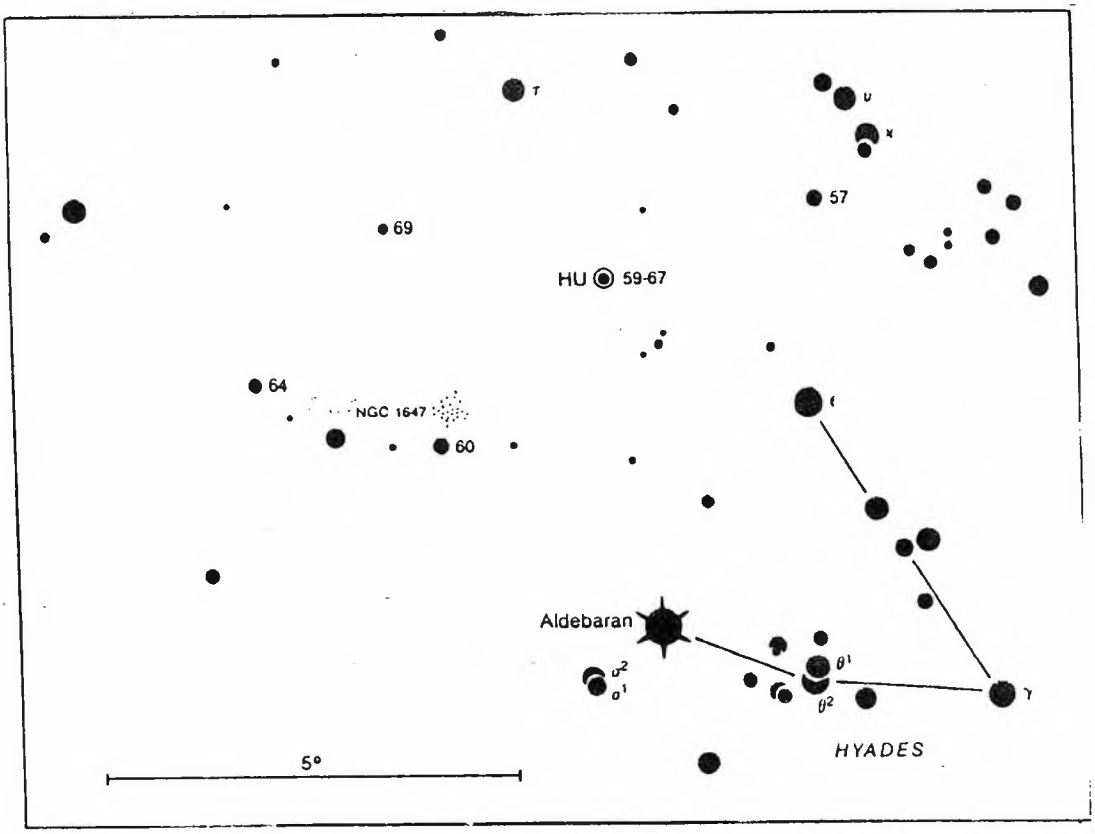
GENERAL INFORMATION

The D.A.S. is a non-profit organization with membership open to any individual who is interested in astronomy. Guests are always welcome without charge or obligation. Our purpose is to encourage and promote the study of astronomy and related sciences.

The D.A.S. meets each Friday evening at the Crowell Recreation Center located at 16630 Lahser Road, Detroit, Michigan. The Center is 1/4-mile south of McNichols (Six Mile Road), on the east side of Lahser Road at the traffic signal light. This facility is a modern, well equipped building with ample off-street, lighted parking. It is operated by the City of Detroit Recreation Department and it is their finest facility serving this side of the city. Since we are their guests, it is important to be considerate in the use of the Crowell Recreation Center to insure our continued welcome.

The meetings consist of talks, lectures, films, slides, mirror making, sharing and fellowship with Astronomy as our common denominator. Scheduled events and features will begin at 8:30 p.m. The officers and Board of Directors meet privately on the first Friday of each month at 7:00 p.m. in the mirror polishing room. The regular business meeting for the general membership is held on the second Friday of each month and starts promptly at 8:00 p.m. We ask that the last person be out of the building by 10.30 p.m. to accommodate the building custodian.

During the summer months of July and August the Regular and Board of Director Meetings are suspended. Formal programs are reduced and emphasis is placed on scheduled star parties.



A Binocular Hyades Variable

AS AUTUMN NIGHTS grow frosty and stars begin shining through trees' bare branches, the Pleiades and Hyades make their evening appearance in the east.

The Hyades, highlighted by bright orange Aldebaran in the foreground, present one of the sky's most attractive binocular fields. Close to Aldebaran are several wide binocular double stars, among them Theta (θ) Tauri, a white and orange pair, and Sigma (σ) Tauri, both components white. Less than 4° northeast of Aldebaran is the loose open cluster NGC 1647, which can be resolved with almost any optical aid.

This rich field gets at least a brief look from most binocular observers whenever they're out starwatching in fall and winter. Night after night, year after year, it never seems to change. Or does it?

Just off the northern end of the Hyades' familiar *V* shape is a 5.9-magnitude star that sometimes fades to half its normal light. HU Tauri is an eclipsing binary with a period of 2 days 1 hour 21 minutes. Since this is close to 2 days exactly, the star's dimmings are only slightly out of step with the turning of the Earth. So every five weeks HU Tauri has a week-long "eclipse season" when it's dim every other evening.

The star remains near minimum light for a couple of hours. A complete eclipse, from the first trace of fading to full recovery, lasts about 8 hours.

The chart below shows comparison stars near HU for estimating its brightness. The numbers are magnitudes to the nearest tenth with decimal points omitted (59-67 means magnitude 5.9 to 6.7). Once you learn the comparison stars, it's easy to check HU Tauri at a glance whenever you look in on the Hyades.

Here are the upcoming predicted Universal times of mid-eclipse. For North Americans, evening "eclipse seasons" occur in late October, late November, and early January.

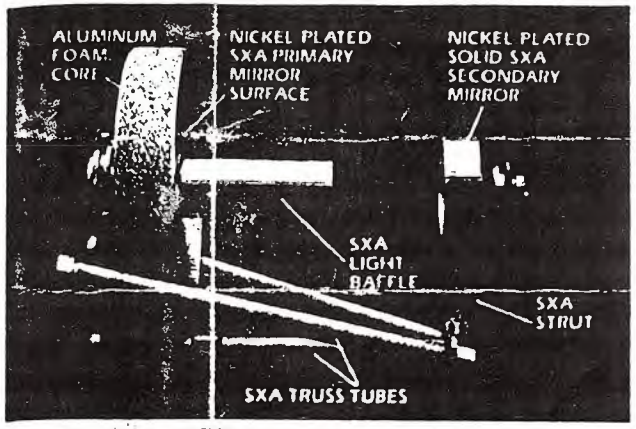
October 22, 0:56; 24, 2:17; 26, 3:38; 28, 4:59; 30, 6:19.

November 1, 7:40; 3, 9:01; 5, 10:22; 7, 11:43; 9, 13:04; 11, 14:25; 13, 15:46; 15, 17:07; 17, 18:28; 19, 19:49; 21, 21:10; 23, 22:31; 25, 23:52; 28, 1:13; 30, 2:34.

December 2, 3:55; 4, 5:16; 6, 6:37; 8, 7:59; 10, 9:20; 12, 10:41; 14, 12:02; 16, 13:23; 18, 14:44; 20, 16:05; 22, 17:27; 24, 18:48; 26, 20:09; 28, 21:30; 30, 22:51.

January 2, 0:13; 4, 1:34; 6, 2:55; 8, 4:16; 10, 5:38; 12, 6:59; 14, 8:20; 16, 9:41; 18, 11:03.

Ultralight Telescope



Metal-foam core and SXA construction allow weight reduction.

TUCSON, AZ—Using two lightweight materials, University of Arizona engineers have pared down a 12-in. reflector telescope from 50 to 10 pounds. Contributing to the breakthrough is an aluminum-foam primary mirror that weighs only 4½ pounds. A comparable glass mirror would weigh 20 pounds. SXA, a new aluminum-silicon carbide composite used for other parts, also helped shave pounds off the telescope. In the future, they hope to use foamed SXA in the cores of primary mirrors.

The first lightweight, metal foam-core telescope system has been designed and built by engineers and opticians at the University of Arizona. The telescope weighs only 10 lb and is just 1.5 ft long, compared to standard 12-in. f5 reflector telescopes that weigh nearly 50 lb.

"We've moved away from the traditional method of making lightweight mirrors — a ribbed core between a front-and-back plate — and replaced that core with metal foam," says UA mechanical engineer Dan Vukobratovich. "You can literally take the foam-core telescope system apart and carry it with one hand."

A metal foam-core mirror is made by bonding two metal faceplates to an inexpensive metal foam that has been machined to a specific contour. The faceplates are covered with a scratch-resistant electroless nickel surface. After polishing, the surface is coated with an aluminum film to enhance reflectivity.

The foam core is not only lighter than a traditional ribbed core, but also contains tiny cells that eliminate the problem of waffling during fabrication. Waffling occurs when a mirror with a very thin front plate and a cellular core "dimples" in certain areas from polishing pressures.

Another advantage to metal foam cores is that metal is thermally conductive. Thus, a metal mirror can change temperature in a few seconds, eliminating image distortion caused by temperature differences between the mirror and ambient air temperature.

A key element in the future of metal foam-core mirrors is SXA, a new class of dimensionally stable composites made of aluminum and fine silicon carbide particles. This material is patented and manufactured by Advanced Composite Materials in South Carolina.

To optimize the foam-core mirror design, SXA composites were used in the tubular truss assembly, secondary mirror, and secondary mirror support design of the UA telescope. SXA composites have about the same density as aluminum, but are much stiffer, and have greater dimensional stability than aluminum, or even beryllium.

"We've only used aluminum foam with conventional aluminum faceplates on our foam-core mirror," says Vukobratovich. "We feel that a better system in the future would be one in which we used foamed SXA. There could be a weight savings of 30 to 60% more than what we've done right now."

Lightweight optics technology has applications in enhanced defense systems, aircraft guidance systems, and laser communications. Aside from telescopes, other commercial applications include 35-mm camera bodies and telephoto lenses. ■

Outreach Program Features Star Lab

The Detroit Science Center Outreach Traveling Science Program is pleased to announce a new portable planetarium program entitled STARLAB. The Starlab planetarium is an easily inflated dome (15 foot diameter), capable of holding up to 30 students and providing educational enrichment in Astronomy, Earth Science and Biology. It can furnish all of the features of a traditional planetarium, such as the stars and constellations of the night sky, with a similar degree of accuracy; however, its special feature is that it's not limited only to astronomy. The interior can also be converted from the night sky to the inside of a living cell! Students can experience a fantastic voyage, as though they were floating in cytoplasm, that demonstrates how cells function, divide, and assemble proteins! On a larger scale, the dynamic earth itself can be projected on the dome to illustrate basic elements of geography, oceanic currents and wind patterns. It can also be used to demonstrate the exciting concept of plate tectonics...including the changing positions and configurations of the continents and ocean basins and the distribution of earthquakes and volcanoes.

The programs presently available are:
(1) The Solar system, stars and deep space
(2) Fantastic voyage inside a living cell
(3) Dynamic Earth

Meet John Zawiskie

Title: Planetarium instructor (Starlab, The Inflatable Planetarium)

Job Responsibilities: Develop Starlab program, demonstrate Starlab at schools, excite kids with the many wonders found in Starlab

For further information contact the Detroit Science Center at (313) 577-8432

AN EXERCISE IN CELESTIAL MATHAMATICS

I've accumulated all the basic formulas in astronomy and have developed a quiz for the members to renew their mathamatical ability. Good luck! Answers are inverted on page 8.

We should all know the light gathering power of a telescope in relation to the eye. If the dark adapted eye is 7mm in diameter, then it's square area in mm would be 38. A 3" telescope would have 4560 square mm of area. This area divided by 38 would give the telescope an increase in light gathering power of 120 times. This is equivalent to 5.5 magnitudes which then gives this telescope the ability to see just beyond the 11th magnitude.

Problem #1

The magnifying power of a telescope is calculated by dividing it's focal length by the eyepiece focal length or:

$$\frac{F}{f} = M$$

F = Focal length of telescope
f = Focal length of eyepiece
M = Magnification

What would be the magnification of a 3.2" telescope with an f/12 ratio and a 24mm eyepiece? Hint: Find focal length of telescope in mm first.

Problem #2

This problem deals with the resolution of a telescope. The formula for resolution is:

$$R = \frac{1.22\lambda \times 206265}{d}$$

R = Resolution in arc seconds
λ = Wavelength of light in meters
d = Diameter of telescope in meters

The problem is: What is the resolution of the telescope in problem 1 for 580 nanometer wavelength of yellow light? Hint: Convert wavelength and diameter to meters.

Problem #3

The formula to determine absolute magnitude is:

$$M = (m_v + 5) - (5\log_{10} r)$$

M = Absolute magnitude
m_v = Visual magnitude
r = Distance in parsecs

1 parsec = 3.26 l.y.

The absolute magnitude is the magnitude a light source would have if placed at a distance of 10 parsecs or 32.6 light years.

The problem is: What is the absolute magnitude of a star of 3.5 m_v at a distance of 75 l.y.?

Problem #4

The gravitational accelerated free fall velocity at the surface of the earth is 9.8 m/s.

The problem is: What is the free fall velocity at the surface of the sun? This velocity is designated by the small letter g. The formula is:

$$g = \frac{GM}{R^2}$$

g = Gravitational accelerated free fall velocity
R = Radius of body in meters
G = Gravitational constant 6.672×10^{-11}
M = Mass of body in kg.

Problem # 5

The escape velocity at the surface of the earth is 1.12×10^4 m/s.

What would be the escape velocity at the surface of a white dwarf the size of the earth with a mass 2/3 that of the sun? The formula is:

$$V_e = \sqrt{\frac{2GM}{R}}$$

V_e = Escape velocity in m/s
R = Radius in meters
G = 6.672×10^{-11}
M = Mass in kg.

Problem # 6

The schwarzschild radius of the sun is 3 km and that of the earth is 1 cm.

What would be the schwarzschild radius of a planetary body 5 times more massive than Jupiter? The formula is:

$$R_s = \frac{2GM}{c^2}$$

R = Schwarzschild radius in meters
c = Velocity of light (2.998×10^8 m/s)
G = 6.672×10^{-11}
M = Mass in kg.

Problem # 7

The gravitational redshift at the surface of the sun is 2.12×10^{-6}. At the earths surface it is 7×10^{-10}. You'll notice that these redshifts are extremely small.

What would be the gravitational redshift of the white dwarf at it's surface in problem 5? The formula is:

$$Z_g = \frac{GM}{c^2 R}$$

Z_g = Gravitational redshift
R = Radius of body in meters
c = 2.998×10^8 m/s
G = 6.672×10^{-11}

Problem # 8

What would be the Doppler recessional velocity of an object with a redshift of 3.2? Use relativistic formula below.

$$V = \left(\frac{Z^2 + 2Z}{Z^2 + 2Z + 2}\right)c$$

V = Recessional velocity in m/s
Z = Redshift
c = 2.998×10^8 m/s

Problem # 9

What would be the Doppler distance when the recessional velocity is .7 c? Hint: convert .7 c to km/s. Note km.

$$d = \frac{V \times 3.26 \times 10^6}{H_o}$$

d = Distance in l.y.
V = Recessional velocity in km/s
H_o = Hubble constant of 55 km/s/mp

Problem #10

In the S&T magazine, November issue on page 461, a supernova was observed and it was considered to be the most distant star. It belongs to a star cluster with a redshift of .31. Calculate it's exact distance by using the formulas in problems #8 and #9. Then determine the distance in l.y. that the star is from the galaxies core which is equal to .8 arc seconds. Use 55 km H_o.

Sources:

Contemporary Astronomy by Jay M Pasachoff
International Encyclopedia of Astronomy by Patrick Moore
Cosmology by Edward R Harrison
Illustrated encyclopedia of Astronomy and Space by Ian Ridpath
Facts on File Dictionary of Astronomy by Valerie Illingworth

NOTE

Most mathamatical formulas in science are given with SI units. These are:
Unit of length - meter; unit of weight - kilogram; unit of time - second; and unit of temperature - kelvin.
SI units is the acronym for System International Units.

Members having materials to submit for future newsletters and all correspondence should be addressed to:

Mike Cyrek, editor
Detroit Astronomical Soc.
17149 Caldwell
Detroit, MI 48212

Answers to quiz:

Problem #1 F of telescope is 975 mm, magnification is 40X.
" #2 λ in meters is $.58 \times 10^{-6}$ or 580×10^{-9}. 3.2" diameter is .0828 meters. Resolution is 1.79 arc seconds.
Problem #3 Absolute magnitude is 1.69.
" #4 $M_\odot = 1.989 \times 10^{30}$kg, $R_\odot = 6.96 \times 10^8$m, $g = 274$ m/s.
" #5 $M_{ow} = 1.326 \times 10^{36}$kg, $R_{ow} = 6.378 \times 10^6$m, $V_e = 5.267 \times 10^4$ m/s.
" #6 Mass of body is 9.49×10^{27}, $R_s = 14$ m.
" #7 $M = 1.326 \times 10^{30}$kg, $R = 6.378 \times 10^6$m, $Z_e = 1.543 \times 10^{-4}$
" #8 $V = 2.676 \times 10^8$m/s or .89 c.
" #9 $d = 12.44 \times 10^9$ l.y.
" #10 $V = 7.9 \times 10^4$km or .26 c, $d = 4.68 \times 10^9$ l.y., .8 arc seconds = 18,171 l.y.