



REGULUS

JUNE-JULY-AUGUST 1990

NEWSLETTER OF THE KINGSTON CENTRE
OF THE ROYAL ASTRONOMICAL SOCIETY OF CANADA

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ASTRONOMY DAY COORDINATORS	Stan Manna	(000) 000-0000
	Denise-Sabatini-Enright	(000) 000-0000
	Peggy Torney	(000) 000-0000

UPCOMING MEETINGS

Regular meetings of the Kingston Centre are held at 8:00 p.m. on the dates indicated in Room D-214, MacIntosh-Corry Hall, Queen's University. Non-members are welcome. Executive meetings are one-half hour before-hand.

<u>Date</u>	<u>Speaker</u>	<u>Subject</u>
June 8	Walter MacDonald	"The Quester 12 Experience"
July 13	Terry Hicks	"Where Will the Sun Rise?"
August 10	Bill Broderick	"Our Cosmic Connections"

KINGSTON CENTRE FACILITIES

Our Centre has a most extensive library of books devoted to astronomy, suitable for every level of serious interest--see listing of most of the books available, included with this newsletter. As well, we have a video-tape of Dr. Clyde William Tombaugh's address, which was given on the occasion of his visit to Kingston on October 20, 1989. This tape is VHS-120. Books and video are available to members on a loan basis. Contact our Librarian, David Stokes. The Centre also boasts a fine 10" Newtonian telescope on a Dobsonian mount. Members are invited to make use of this instrument. Contact Leo or Denise Enright.

DR. DAVID MALIN

DR. DAVID MALIN, of the Anglo-Australian Observatory, will speak on "THINGS TO SEE AND DO IN THE DARK", Thursday, May 31, 1990, 8:00 p.m., at the National Museum of Science and Technology. On Friday, June 1, 1990, at 2:00 p.m., Dr. Malin will speak on "PHOTOGRAPHY IN ASTRONOMY", at the National Research Council Auditorium, 100 Sussex Drive, Ottawa. These talks are "musts" for everyone interested in astrophotography.

THANK YOU

A hearty **THANK YOU** to everyone who helped out with the mall displays and public observing for **Astronomy Day/Week**. Both the Cataraqui Town Centre (Kingston) and Quinte Mall (Belleville) displays were well put - together. The **Whig Standard** in Kingston and **CJBQ Radio** in Belleville both gave these events good publicity.

MEMBERS' NIGHT

May 11 was **Members' Night** with **five** interesting talks being presented.

Bill Broderick spoke about tektites. **Stan Hanna** talked about time. **Leo Enright** gave us another way to calculate sidereal time. **Denise Enright** enlightened us further on archeo-astronomy. And **Gisela Broderick** presented some points on astrology.

Altogether a most enlightening and delightful evening.

ASTEROID NAMED IN HONOUR OF RASC

Minor Planet No. 4113 has been named **RASCANA** by its discoverer, **Dr. E. R. Bowell** of the Lowell Observatory. The name was chosen to commemorate the **Centenary** of the **incorporation** of the **Royal Astronomical Society of Canada**.

ASTRO JUMBLE

Unscramble the letters (see clue), then use the circled letters to solve the puzzle. Good luck!

Clue

Parts of a telescope

Y E E P E E C I
[] [] [] [] [] [] [] []

S N E L S E
[] [] [] [] [] []

K O C L C V I D E R
[] [] [] [] [] [] [] [] [] [] [] []

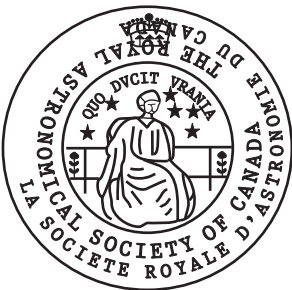
R I M R O R
[] [] [] [] [] []

N U T I M N O G
[] [] [] [] [] [] [] []

WHAT GOOD OBSERVING DEPENDS ON

[] [] [] [] [] [] [] []

(Answer in next issue.)



NEW R.A.S.C. PROMOTIONAL ITEMS

The National Council of the R.A.S.C. has recently approved the use of the R.A.S.C. emblem on several new items for sale to members:

- 1) R.A.S.C. golf shirts: white jersey material, 50/50 poly/cotton, with knitted collar and buttoned opening, sizes adult S,M,L,XL, with 3 inch diameter navy emblem screened on upper left ... \$ 20.
- 2) R.A.S.C. stickers: white round vinyl self-adhesive stickers, peelable backing, with 3 1/2 inch diameter navy emblem imprint ... \$ 1.
- 3) R.A.S.C. keychains: clear acrylic keychains with metal ring, white insert with navy emblem imprinted on both sides ... \$ 4.

Add packaging & postage of: \$ 2 / shirt
\$ 1 / item or batch order for stickers, keychains

These are available by sending a Canadian cheque or money order, payable to Royal Astronomical Society of Canada, to:

R.A.S.C. Promotional items,
c/o Mrs. Cathy L. Cresswell,
00 XXXXXXXX XXXXX,
XXXXXXXXXXXXXXXX, Ontario. XXX XXX

Group orders through your Center treasurer are encouraged in order to reduce packaging and postage charges. Where possible, I will arrange delivery to avoid mailing charges completely - contact me by phone at (000)-000-0000 or by fax at (000)-000-0000. These items will also be available at the R.A.S.C. General Assembly.

WHERE WILL THE SUN RISE?

By Bill Broderick

(Continued from last issue.)

The idea for this article was born in an incident that happened many years ago. I happened to be in the Society's office in Toronto one day back in the sixties when Marie Fiddler, our executive secretary at the time, took a phone call. The caller, she told me later, had wanted to know how to figure out where the sun would rise on a particular date. Unfortunately, the call took her completely off guard and she was unable to help.

I subsequently wrote an article for the Toronto Centre newsletter, **Scope**, in which I offered one method by which the sun's rising (and setting) point for a particular date can be determined. As promised in our previous article, that method will be discussed here.

Also, I'm happy to say, another method was submitted, by Walter MacDonald, so we can offer two different approaches to solving this problem. Basically, my approach is an exercise in geometry, while Walter's is mathematical.

Geometrical Solution

On a clean sheet of paper, rule a straight line. Label one end "North", the other "South". This line represents the plane of your horizon.

Above this line, with a compass or protractor, draw a semi-circle. This semi-circle represents the half of the Celestial Sphere that is visible to you at any one time--in other words, your sky.

Having determined your latitude, mark the North Celestial Pole on your semi-circle. Its distance above the northern horizon, in degrees of arc, is the same as your latitude. For Kingston, this is $44^{\circ}14'$. Use a protractor to measure this distance.

Draw a line from the North Celestial Pole to the centre of your horizon. This line represents the axis of rotation of the Celestial Sphere.

Draw another line at right angles (90°) to the above, out to the edge of the semi-circle. This Line represents the Celestial Equator and zero (0°) declination.

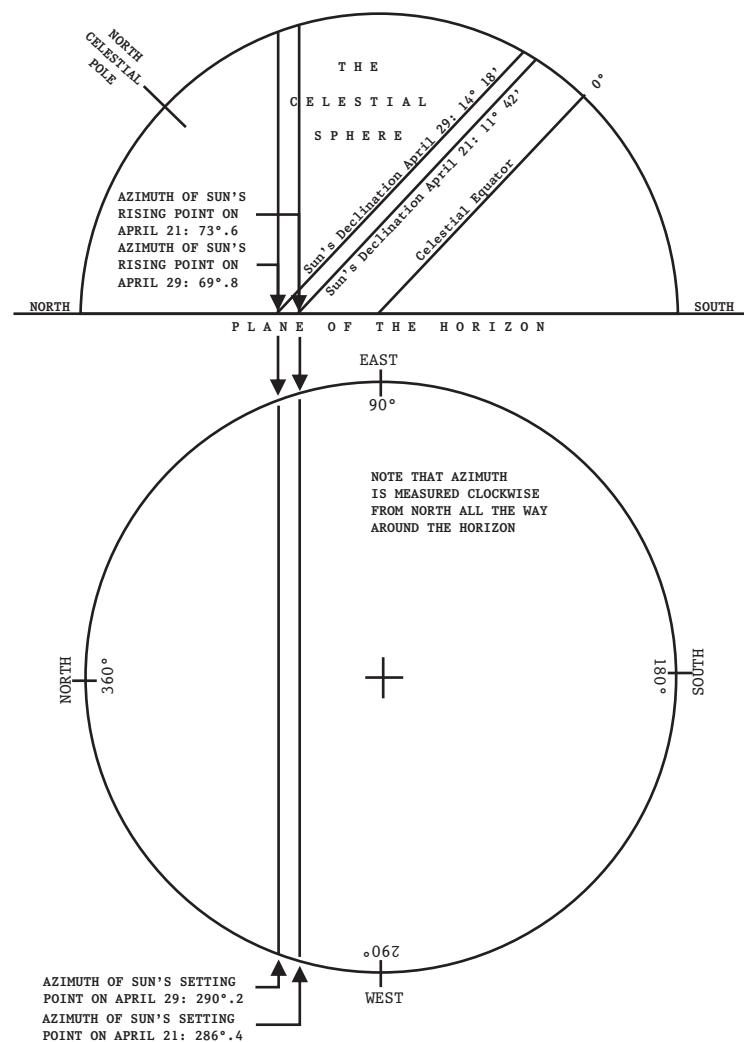


Figure 1

WHERE WILL THE SUN RISE? (Continued)

Next determine the declination of the sun (or any other celestial object) for the date in question, obtainable from The Observer's Handbook. Declination is plus (north) or minus (south) of the Celestial Equator and is expressed in degrees of arc. Again, use a protractor to measure the distance and mark the point on the edge of your semi-circle,

Draw a line from that point down to the horizon, making sure that you keep it parallel to the equator. Where it touches the horizon is the **rising point**.

Directly below your "horizon" and "Celestial Sphere", draw a complete circle. This circle represents your horizon plane as seen from above. The radius of this circle should be the same as for the semi-circle representing your "Celestial Sphere." Mark the four cardinal compass points: North, South, East, West.

From the "rising point" on the line representing your horizon plane, drop a line down to and through the circle. Where this line intersects the edges of the circle are the rising and setting points relative to yourself as observer. You can measure the azimuths of these points with a protractor. If you have constructed your diagram carefully and accurately, your final result will be reasonably close to actuality.

Mathematical Solution

By Walter MacDonald

The azimuth (Z) of the sun at sunrise or sunset is given by:

$$Z = \arccos \left[\frac{\sin d}{\cos \emptyset} \right] * \quad (1)$$

where Z is measured east of North before noon and west of North after noon, d is the sun's declination, and \emptyset is the Observer's latitude.

1. April 21

$$\begin{aligned} \emptyset &= 44^{\circ}14' = 44^{\circ}.2 && \text{(given)} \\ d &= 11^{\circ}.7 && \text{(from the 1990 Observer's Handbook)} \end{aligned}$$

$$Z = \arccos \left[\frac{\sin 11^{\circ}.7}{\cos 44^{\circ}.2} \right] = 73^{\circ}.6 \quad \text{for Sunrise}$$

$$\text{or } 360^{\circ} - 73^{\circ}.6 = 286^{\circ}.4 \text{ for Sunset}$$

2. April 29

$$d = 14^{\circ}.3 \quad \text{(from 1990 Observer's Handbook--value interpolated)}$$

$$Z = \arccos \left[\frac{\sin 14^{\circ}.3}{\cos 44^{\circ}.2} \right] = 69^{\circ}.8 \quad \text{for Sunrise}$$

$$\text{or } 360^{\circ} - 69^{\circ}.8 = 290^{\circ}.2 \text{ for Sunset.}$$

So during Astronomy Week, the sunrise and sunset points both move $3^{\circ}.8$ northward.

* SEE NOTES (next page)

NOTE: The formula is derived from the “Astronomical Triangle” in spherical astronomy:

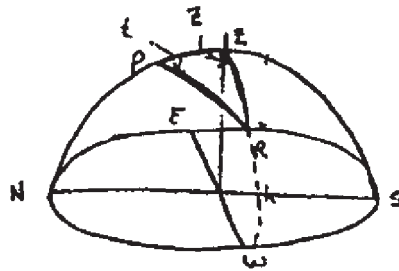


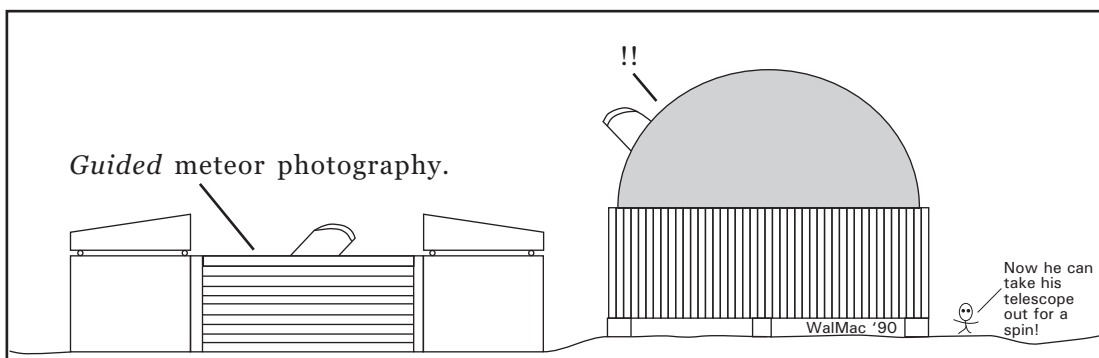
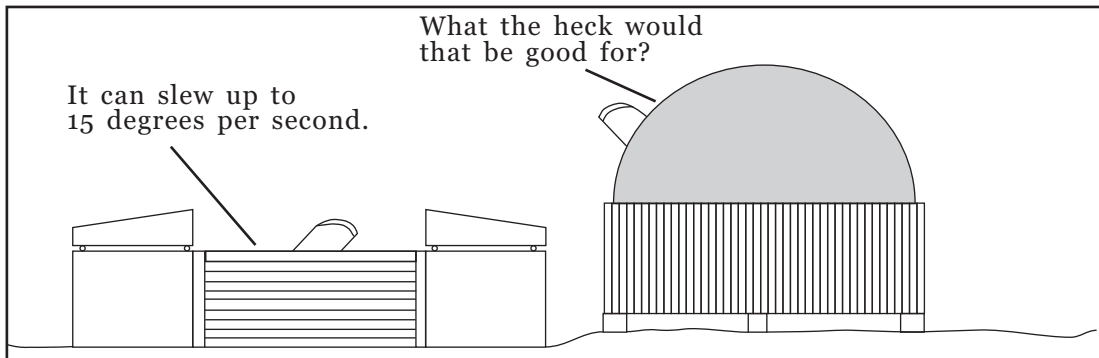
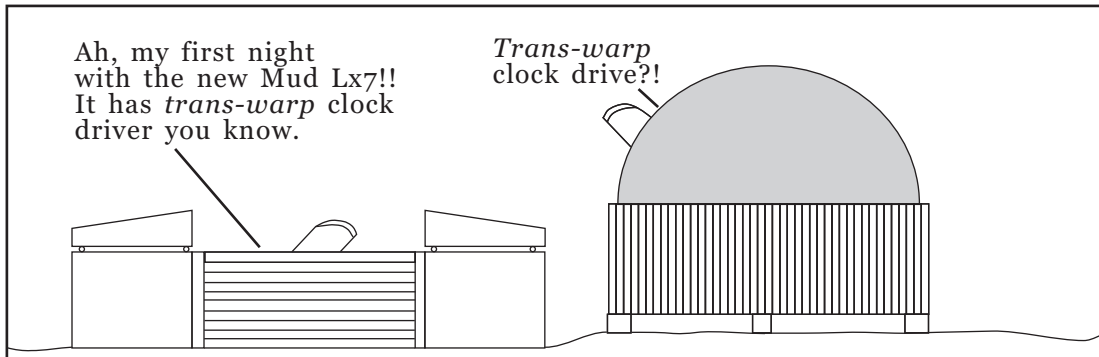
Figure 2

From a consideration of this triangle, the following formula may be obtained:

$$\cos Z = \left[\frac{\sin d - \sin \phi \sin h}{\cos \phi \cos h} \right] \quad (2)$$

At sunrise or sunset, $h = 0$ and (2) simplifies to (1).

The Celestial Observer



INTERNATIONAL DARK-SKY ASSOCIATION

3545 N. Stewart, Tucson AZ 85716 U.S.A.

How To Talk To Your Neighbor Who Has A Bad Light

Here's a typical Scenario: Your neighbors have just installed a dusk-to-dawn 175 mercury vapor light fixture, because they are worried about security. You can see what happened: they went down to the discount supply house and said "Give me the brightest, cheapest outdoor lighting fixture you have." And that's exactly what they got, paying "only" \$29.95 (maybe even less). They brought it home, and hung it up. Now it's splattering light everywhere, including into your lawn and in through your windows. They have their blinds drawn, of course, because they can't stand the glare either.

What did they get? A very bright light, with very little light control and lots of glare. It produces lots of light trespass, light pollution, and energy waste. They probably now have a "feeling of security." Real security is likely not to be any better than before.

Here's some ideas on what to do: First and always, be tactful and understanding. Don't argue. Do your homework first. Be well prepared. Understand the essence of the energy facts given below, and of what makes a good security light. Know the local costs of electricity, in KWH's. Know if there is a local lighting control ordinance, and, if so, the details of what is included, what enforcement is being done, who was involved, etc. Look around for the availability of good security lighting fixtures, and how much they cost. Facts are not enough, however. Emotions and perceptions are there all the time. Personal relations are very important and are in play all the time.

Approach them in a friendly way. They are worried about their security and safety. They tried to do something about it. Maybe they saw an ad from the utility company, or elsewhere, touting these specific lights. Maybe they got a "good deal" from the power company. Maybe they just didn't know what to do, but thought that adding a lot of light would help. Don't tell them, particularly in an unfriendly way, to shut off their light because it bothers you. They won't, and you will likely have hardened their position.

Make positive approaches. Help them solve their problems. Offer alternatives. Be flexible to the local needs. Ask for their advice also, in solving your problem. Most people really like to be helpful, when they can. Let them know how, Be prepared to compromise, but always keep the overall goal in mind. You want and need dark skies, and no light trespass. You also want a secure and safe nighttime environment, just as they do. You want to help the country save energy and money. Show that you care, for all of those things in general, and for your sky, and for them.

Here are two specific issues you can discuss with them, to help win them over:

1. The Energy Issue, and Cost Savings: When new, the 175 watt mercury vapor lamp puts out 8000 lumens (a lumen is a measure of the amount of light produced by a lamp), declining in light output with time. The mean lumen output (after some years of use) is about 7000 lumens. That amount of light output compares approximately to a 400 watt incandescent lamp, a 100 watt high pressure sodium lamp, or a 55 watt low pressure sodium lamp. (See IDA Information Sheet No. 4)

These lamps use considerably different amounts of energy to produce the same amount of light. When energy costs were very low, not that many years ago, it made little difference. Now, however, it does make a difference, especially when you consider how many of these lamps are in use in an urban area, or in the United States. There are many other lighting installations wasting light as well, with their use of inefficient lighting fixtures. (See IDA Information Sheet No. 26)

The cost to the country of all this wasted light is over One Billion Dollars a Year. (See IDA Information Sheet No. 26) And all this wasted light and energy is doing nothing to promote safety, security, or a better life at night. It is merely lighting up the sky, causing glare (glare never helps visibility), and offending neighbors. None of the Billion Dollars is being used to light the ground, or to provide safety and security. The glare and confusion and clutter caused by the bad lighting are definite factors in accidents and losses caused by such accidents. This also costs the nation too much money and pain. As individuals, we must do what we can to stop such waste.

2. Real Safety vs. Perceived Safety: The 175 watt dusk-to-dawn may give the illusion of safety, because it's so bright, but it is really counterproductive to good vision. The criminal can bide in the glare or in the harsh shadows from such poor lighting (Look around near one; see the deep shadows? Imagine you are a criminal. Can you hide easily? Can you see easily? Can the owner?) The light used should be of such a nature that the owner can see.

So what to do? Here are two suggestions. Other good ideas are possible too, with conscious thought about the issues. Remember that quality lighting is only one facet of good security, and no lighting system, no matter how good, will ensure security. But quality lighting will offer a much better chance than will poor lighting, which may, in fact, help the criminal.

A Use a low wattage (18, or 35, or 55 watt) low pressure sodium light source, in a good (well shielded) fixture. The fixture should control the light output so that it goes only where needed, not into a neighbor's yard or windows, or up into the sky. There is lots of light (a good 35 watt LPS fixture will put out more useful light than the 175 watt dusk-to-dawn; even an 18 watt one will probably do a better job, at one tenth the energy cost). There is essentially no glare at all. One is not blinded, one can see. There is essentially no light trespass or sky glow produced. There are no dark, deep shadows for criminals to hide in. Visibility is the goal, and these quality LPS fixtures offer excellent visibility. There are also some excellent well shielded HPS fixtures.

B. Use an infrared sensor spotlight fixture. The spotlights only come on when the sensor senses movement. Any intruder will be scared off by the sudden turn-on of the spotlights. You are alerted by the light coming on (you can buy fixtures which will also sound an alarm inside the house, if you want the added security). What could be better? This type of fixture is a great security lighting system: effective, quality lighting. (Be sure that the fixture is mounted under the eave, so that there's no wasted light, and point the light beam where it's needed, not into your neighbor's yard.)

The infrared sensed lights are widely available, in stores or by mail order. The cost ranges from about \$20 to over \$100, depending on the quality and who is selling them. They are easy to install (just mount them, plug them in, and adjust them) and use. The LPS fixtures are harder to find, as few know of their existence. Ask for them at the local lighting suppliers. Insist on them. With such demand they will start stocking them. If all else fails, buy them by mail from a Tucson lighting supplier.

The quality LPS fixtures will certainly cost more than the 175 watt mercury, especially in an area where few are sold. But even if they cost \$120, they save lots of energy and money. For example, 175 minus 35 watts is 140 watts, times 4100 hours per year, yields 574 KWH saved per year. At 8 cents per KWH, that is \$46 dollars saved per year compared to the mercury. So the payoff period to replace a mercury with an effective lighting fixture is \$120 divided by \$46 or about two and a half years. If one considers the cost of the mercury fixture, say \$30, then it's $\$120 - \$30 = \$90$ extra cost, and \$90 divided by 546, or a payoff period of only two years. The spotlight solution also has a very fast payoff period, of course. Very few energy savings concepts have shorter payoff periods than replacing ineffective security lights with better ones.

For more information about the issues, contact the International Dark-Sky Association, at the address at the top of the Information Sheet. Other information sheets available from IDA also address the issues of energy savings, the 175 watt mercury dusk-to-dawn fixture, the operating efficiencies of different kinds of light sources, and other quality lighting issues. Join the cause of better lighting, and energy savings. We all can win. IDA is an incorporated non-profit organization.

KINGSTON CENTRE LIBRARY

. (1988). *Circumstellar Material - Late-Type Stars*. Proceedings of the Dunsink Bicentenary Symposium, Dublin 3-6 Sep. 1985, Dublin, Ireland.

Studies related to gas, dust and probable magnetic fields surrounding cool stars are reported..

Abell, George, (1964). *Exploration of the Universe*, Second Edition. Holt, Rinehart and Winston, New York, USA.

An introductory textbook of astronomy for readers without special training in science or mathematics.

Baker, Robert H. (1964). *Astronomy: *th Edition*. D Van Nostrand Co, Princeton, USA.

A textbook for two-semester introductory courses in astronomy at university level.

Birney, D Scott, (1974). *Modern Astronomy*. 2nd Edition. Allyn and Bacon, Inc, Boston, USA.

An introductory textbook.

Brandt, John C, and Maran, Stephen P, (1972). *New Horizons in Astronomy: Sample Chapters*. W H Freeman and Co., San Francisco, USA.

The textbook is written for a short survey course in astronomy for non-science majors.

Clotfelter, Beryl E, (1978). *Instructor's Manual to Accompany the Universe and its Structure*. McGraw-Hill Book Co, New York, USA.

The teacher's guide includes pedagogical suggestions, description of a highly recommended demonstration, literature references, and sample examination questions..

Covington, Arthur R, (1979). *Historical Background for the 1970 Absolute Calibration of Solar Flux*. Herzberg Institute for Astrophysics, Ottawa, Canada.

Developments leading up to the 1970 redetermination of the absolute flux at Goth Hill with a 4x3 ft. aperture pyramidal horn are reviewed.

Davies, Paul, (1981). *The Edge of Infinity*. Simon and Schuster, New York, USA.

The author charts the route to the physics of the future, which lies beyond the edge of infinity. At the so-called singularities, regions of overwhelmingly strong gravity, all physical laws and structures break down, spacetime is ripped open and matter may enter or leave the physical universe. Singularities lie at the centres of black holes and mark the creation and destruction of the universe.

Davies, Paul, (1978). *The Runaway Universe*. Harper & Row, New York, USA.

From the primeval fire and the big bang that generated space and time, the universe has been moving gradually toward disintegration and the ultimate catastrophe. The sun will burn out, the galaxies will turn into giant graveyards, and space-time will be overwhelmed as black holes swallow up whole stars and star systems and coalesce to form superholes..

Dixon, Robert A. (1975). *Teacher's Manual for dynamic Astronomy: Second Edition*. Prentice-Hall, Inc, Englewood Cliffs, USA.

The teacher's guide includes suggestions for the course, literature references, notes by chapters, answers to questions in the text and a comprehensive examination.

Edberg, Stephen J. and Levy, David H, (1985). *Observe - Comets. Guide to Cometary Studies*. Astronomical League, Washington, USA.

Projects and methods for both novice observers and advanced practitioners are described for observing equipment that ranges from unaided eye to a 16-inch telescope.

Field, George, and Verahur, Gerrit, (1978). *Cosmic Evolution: An Introduction to Astronomy*. Houghton Mifflin Co., Boston, USA.

The goal of this textbook is to convey qualitatively what is known about the evolution of the universe and its contents from the chaos of the primordial big bang to the current phase, in which intelligent life is emerging.

Hodge, Paul, (1966). *The Physics and Astronomy of Galaxies and Cosmology*. McGraw-Hill book co., New York, USA.

The nature, evolution and properties of galaxies is covered and related to the general understanding of the universe, Essentially non-mathematical..

Jastrow, Robert, and Thompson, Malcom H. (1972). *Astronomy: Fundamentals and Frontiers*. John Wiley & Sons, New York, USA.

An introduction to astronomy, the subject is approached from the point of view of evolution of galaxies in time. It follows events that led from the explosive beginnings of the universe through the birth of innumerable stars and planets including the sun and the earth.

Johnson, Marin, (1959). *Astronomy of Stellar Energy and Decay*. Dover Publications Inc, New York, USA.

A general reader's outline of facts and theories about the life-history of stars, and a student's introduction to their radiation, steady or varying or catastrophic.

Levy, David H and Edberg, Stephen J, (1986). *Observe - Meteors, Meteors Observers Guide*. Astronomy League, Washington, USA.

This guide is aimed at the amateur astronomer who is interested in making night observations of meteors while at the same time recording useful data about the earth's immediate environment in the solar system.

Levy, David H (1984). *The Joy of Gazing - A Personal Guide for a New Observer: Second Edition*. Royal Astronomical Society of Canada, Montreal, Canada.

An observing field guide designed for the newcomer to amateur astronomy.

Pasachoff, Jay M. (1977). *Contemporary Astronomy*. W. B. Saunders and Co., Philadelphia, USA.

This book is written for students with no background in mathematics and physics and attempts to give a contemporary view of the state of astronomy.

Pasachoff, Jay M, (1978). *Astronomy Now*. W. B. Saunders Co., Philadelphia, USA.

Written for readers with no background in mathematics or physics, this textbook attempts a contemporary picture of the state of astronomy.

Pasachoff, Jay M. (1977). *Teacher's Guide to Accompany Contemporary Astronomy*. W. B. Saunders Co., Philadelphia, USA.

Complete set of aids for use with "Contemporary Astronomy."

Pasachoff, Jay m, and Kutner, Marc, (1978). *University Astronomy*, W B Saunders Co., Philadelphia, USA.

A textbook giving the contemporary state of astronomy and astrophysics and aiming for basic understanding of the topic.

Pasachoff, Jay M, and Kutner, Mark L, and Pasachoff, Naomi, (1977). *Student's Study Guide to Contemporary Astronomy*. W. B. Saunders Co, Philadelphia, USA.

This guide provides chapter-by-chapter comments on the material covered by "Contemporary Astronomy", gives many extra examples, and provides problems for self-testing.

Rosemergy, John C, (1977). *Celestial Horizons - a Concise View of the Universe*. Allyn and Baker, Inc, Boston, USA.

A textbook for beginning students of astronomy..

Safko, John L, (1985). *Instructor's Manual for Astronomy: the Cosmic Journey*. Third Edition. Wadsworth Publishing Co., Belmont, USA.

For each chapter in the textbook, the teacher's guide provides (a) answers to the problems in the text; (b) sample test questions.

Seeds, Michael A, (1985). *Instructor's Manual for Horizons: Exploring the Universe: A resource Guide*. Wadsworth Publishing Co, Belmont, USA.

The teacher's guide, intended to aid in designing a course, contains suggestions for course outlines, planetarium programs, chapter-by-chapter note, and a list of resources..

Smith, Elske, and Jacobs, Kenneth, (1973). *Introductory Astronomy and Astrophysics*. W. B. Saunders Co., Philadelphia, USA.

Covers the solar system; basic stellar characteristics; the structure and content of our galaxy; the universe.

Swihart, Thomas L, (1978). *Journey Through the Universe*. Houghton Mifflin Co., Boston, USA.

The purpose of this textbook is to present a fairly complete introduction to astronomy without burying the reader under an avalanche of detail, jargon, or erudition. Mathematics is used only sparingly.