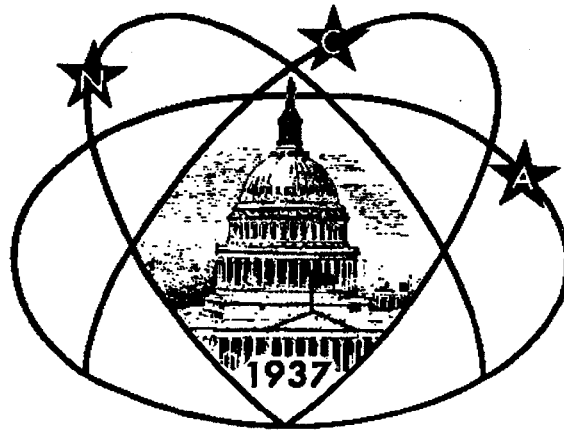


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Francois Schweizer to Discuss Galactic Mergers and the Hubble Sequence of Galaxies

By Wayne H. Warren Jr.

The next meeting of the National Capital Astronomers will be held on February 5, 1994 at 7:30 PM in the Bunim Room of the Clinical Center (Building 10, floor 9) at the National Institutes of Health. At this meeting, we are pleased to have Dr. Francois Schweizer of the Department of Terrestrial Magnetism of the Carnegie Institution of Washington to tell us about his research work on galaxies and what the implications of that work may be for interpretation of the Hubble sequence of galaxy types.

Over the last decade or so, we have learned that collisions and even mergers of galaxies, formerly thought to be rare phenomena, may actually be rather commonplace. In fact, there is an increasing amount of evidence to indicate that mergers of all kinds of galaxies have occurred rather frequently in their histories. There are also indications that mergers may influence galaxy types and that, e.g., two galaxies of types other than elliptical may merge to create an elliptical galaxy. If mergers are more frequent than previously thought and galaxy types are changed or certain types are formed primarily or exclusively from mergers, then it may be that the Hubble sequence

of galaxy types, previously thought to be an age sequence, actually depends instead on a galaxy's history of mergers.

Dr. Francois Schweizer earned his M.S. degree in Switzerland, then entered a 1-year study program at the University of California, Berkeley, after which he stayed in Berkeley to earn his Ph.D. degree. He then took a postdoctoral position at Hale Observatories in Pasadena, which was followed by 6 years as a staff astronomer at the Cerro Tololo Inter-American Observatory in Chile. Dr. Schweizer then returned to the U.S. to take a staff position at the Carnegie Institution of Washington's Department of Terrestrial Magnetism, where he has been since.

Come and join Dr. Schweizer and other NCA members to learn about galaxy mergers and how they may affect the classification of galaxies into a logical sequence. Dr. Schweizer has already observed with the Hubble Space Telescope and may be able to tell us how the repaired instruments will affect his studies of galaxy mergers, perhaps by allowing us to actually detect and identify a merger as it is occurring.

February Calendar

The Public is Welcome!

Tuesdays, February 1, 8, 15, and 22, 7:30 PM - Telescope making classes at Chevy Chase Community Center, Connecticut Avenue and McKinley Street, NW. Information: Jerry Schnall, 202/362-8872.

Fridays, February 4, 11, 18, and 25, at 7:30 PM - Telescope making classes at American University, McKinley Hall Basement. Information: Jerry Schnall, 202/362-8872.

Fridays, February 11 and 18, 8:30 PM - Open nights with NCA's Celestron-14 telescope with Bob Bolster, 6007 Ridgeview Drive, south of Alexandria off Franconia Road between Telegraph Road and Rose Hill Drive. Call Bob for details 703/960-9126.

Saturday, February 4, 1994, 5:30 PM - Dinner with the speaker at La Panetteria Ristorante Italiano (4921 Cordell Avenue, Bethesda) before the monthly meeting. Reservations are for 5:30PM sharp.

Saturday, February 4, 1994, 7:30PM - Dr. Francois Schweizer will speak on "Galactic Mergers and the Hubble Sequence of Galaxies." Meeting will be held in the Bunim Room at the National Institutes of Health. For directions, refer to map and description on back page.

Smithsonian Sky Watchers' Report

Non-technical information recording on astronomical events, objects, and phenomena in the Washington, D.C. region's sky. Updated weekly.
202/357-2000

Sky & Telescope's "Skyline"

Moderately technical information recording on latest in space technology, astronomy, and related sciences. Updated weekly, or sooner if necessary.
617/497-4168

Recent Progress in the Control of Light Pollution and a Global Network of Automatic Telescopes

by Wayne H. Warren Jr.

The January 8, 1994 NCA meeting was held in the Bunim Room of the National Institutes of Health. At this meeting, NCA members and guests were pleased to have Dr. David L. Crawford of the National Optical Astronomy Observatories/Kitt Peak National Observatory to describe the work of the International Dark-Sky Association (IDA) and its attempt to control light pollution of our environment and his more recent project to set up a global network of small and intermediate sized automatic telescopes for doing photometry and, perhaps eventually, spectroscopy via remote operations.

Dr. Crawford began his presentation by asking if anyone in the room had seen a dark sky lately; in fact, had any of us ever seen a truly dark sky? He related a tale of having attended a meeting of regional Chicago area astronomy clubs that was held at their "dark-sky" site, which turned out to be too bright for many types of common observing -yet, this was their so-called dark-sky observatory. We can certainly attest to an example that he used of people in the Washington area who observed from their back yards some years ago, then had to travel five miles, ten miles, now 80 miles from the city to find anything like a dark sky. These unfortunate changes have become a way of life over the last several decades and will only become worse if something isn't done to reverse the trend. An excellent example of the problem is the fact that we have

all been bothered by the phenomenon of glare, which, along with energy waste and excessive lighting costs, can all be characterized as light pollution. So, it is not only astronomers who are bothered by excessive and inefficient lighting, since everyone has at one time or another been adversely affected by glare. Dr. Crawford describes himself as an evangelist; i.e., one who has a cause and is determined to convince everyone else that he is right. Since decreasing light pollution not only eliminates glare and energy waste, but also promotes darker skies while saving large quantities of raw materials and money, in this case, he is indubitably right, so it is not too difficult to convince people of this. The problem is that there are presently not enough light pollution evangelists to go around, so more people must be found to actively participate in the education of the public and of lighting professionals. This problem of energy waste is not only national, but is, as we later saw on many of the spectacular slides that he showed, a major international problem as well, and one that adversely affects the economics of many nations that can ill-afford to throw away the money involved. He used as an example a fairly straightforward calculation (to be found on an IDA Information Sheet about mercury fixtures) showing that 1-2 billion dollars are spent annually in the USA alone to light up the night sky.

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Dr. Crawford then discussed the possibility that the reason we haven't detected any extraterrestrial civilizations is that advanced civilizations self-destruct in only a few hundred years because they treat their environments so badly, a major contributor to this treatment being a great waste of energy by bad lighting. Since the cure of this problem actually results in the saving of a lot of money, if we can't solve this environmental problem, how can we ever expect to solve any of the many others that we have?

Fortunately, many people, particularly those in the lighting industry, are beginning to realize that glare is never conducive to good visibility. In fact, glare is symptomatic and is never associated with good lighting; i.e., if one can sense glare, then the lighting is not efficient. And why do we have all the glare? To waste money? No, to help us see at night in almost all cases, with a few notable exceptions like advertising, oil-field emissions, fish and squid attraction techniques, etc. Why do we have the light pollution problem?

It is certainly correlated with population growth and increased stress in our modern society, but increased lighting can be shown to correlate positively with increased stress and rising crime (for which the incidence is much greater in our lighted cities). Does this then show that more lighting is responsible for our higher crime rates? Of course, this is not a cause and effect situation, but the positive correlation does produce some serious thinking about the light pollution problem. As with many other things (except maybe funding for astronomical research), and lighting in particular, more is not usually better; i.e., lighting is best when just the right amount is available.

Another reason why we have so much light, according to Dr. Crawford, is a lack of awareness about what good lighting is.

We are raised to believe that light is a good thing, so obviously more light must be better, no matter what kind of light it is. Dr. Crawford referred to what he calls the "Third World Effect", although he stressed that this phenomenon is probably worse in countries like ours than in the third world. This is the fact that if people have done something that they want others to notice, then they pile on the light so that it can't be missed. We see this in the lighting of new buildings, often with sky pointing searchlights positioned on the ground. This has often happened in the third world when electricity becomes available for the first time and a government will light everything up to impress upon the people that the rulers have done a great thing for the country.

The goal of the IDA, then, is to educate people about the value of good lighting, among the benefits of which are darker skies, energy and cost savings, and improving visibility, which in turn makes the streets safer and more secure. It is curious that almost all of the arguments that presently concern environmental groups are daytime issues, even though night is half of the total time. The fact that astronomers are taking the lead in bringing out these issues may be thought of as what Dr. Crawford referred to as "the canary in the mine" effect. Astronomers are the most adversely affected by light pollution, just as the caged canary, taken down into a mine to alert the miners to the presence of toxic gases, dies enough ahead of time to give the humans a chance to escape before they are overcome too.

Although many may believe that space observatories represent a solution for astronomers, therefore eliminating the need for ground-based observatories, this is certainly not the case, not only because of the much greater expense of operating space-based telescopes, but also because the demand for telescope time far exceeds the availability of space platforms, plus many longer-term observational
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Attention All NCA Members!

NEW PROCEDURE FOR PAYING DUES

Starting this month all NCA dues payments should be mailed directly to the Treasurer, Jeff Norman. The secretary, Leith Holloway, will continue to send out the bills. Included in these bills will be directions and a mailing label for sending Jeff your dues, your renewal form and the expiration notice card from *Sky & Telescope* magazine if you subscribe through the NCA. All applications for membership in the NCA and dues checks should also be mailed to the Treasurer.

The reason for this change is to expedite the processing of your renewals and to avoid having your checks pass through the mails twice. If you have already sent your renewal check to Leith, don't worry; it will be forwarded to Jeff. During the transition to this new procedure, there will no doubt be a few minor problems, but in the long run the process will be more efficient. Thank you for your cooperation during this changeover.

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projects can only be undertaken as ground-based programs. We can also see the great accumulation of space junk over the last decade or so; hence, near-Earth space is now being polluted as well. Simple calculations show that in the short time of about 100 years, there won't be any operating satellites unless measures are taken to clear the orbital environment of this accumulating "junk." The solution to this problem, of course, is to spend a little more on each mission to bring the hardware down instead of just leaving it out there.

Dr. Crawford concluded that it is not difficult to convince people that there is a serious problem with light pollution that affects not only astronomers, but all of us. Obviously, something must be done. Solutions do exist -- it is just a matter of convincing the public and the lighting industry to implement these solutions. An example of what can be done is to be found in Tucson, where the Milky Way can now be seen from downtown. Even aside from astronomy, the city wins many awards for the quality of its lighting and for energy savings, so the entire population benefits from the application of these cost savings to other areas.

Dr. Crawford then showed a series of slides to demonstrate the problem and to illustrate good and bad lighting. The IDA has recently produced several new sets of slides to add to the two sets previously available. One set, consisting almost entirely of satellite imagery, shows clearly that light pollution is a problem throughout the inhabited world. Most notably, the brightness associated with oil fields, certain metropolitan areas, equatorial regions (slash burning), and fishing fleets in the Sea of Japan, is striking. These slide sets, various posters, and other materials are available from the IDA, 3545 N. Stewart, Tucson, AZ 85716 (Telephone (602)327-9331).

Dr. Crawford next described his more recent project to set up a global network of small and intermediate automatic telescopes. He began by pointing out that astronomy is one of the few sciences in which small instruments can do work at the frontier of research, even though large telescopes, space observatories, and large science projects are necessary for many studies as well. Both are really needed. Even a 1-meter or smaller telescope with a CCD photometer and other state-of-the-art instrumentation can do what it took the largest telescopes to accomplish only a decade or two ago. In fact, many amateur astronomers now maintain excellent facilities and have formed partnerships with professionals to take and interpret data, e.g., on variable stars, cluster photometry, and long-term projects that professionals can't work on because of the shortage of telescope time at major observatories.

Such a network of fully automatic telescopes could be operated electronically from remote sites and the data transmitted via networks for reduction at home, while the telescopes themselves would be located in the better observing areas of the world. Of course, a small core of people would be needed to visit the telescopes periodically to maintain the equipment, while the remote observing would be done by anyone anywhere who participates in the project. Such observing would be very valuable for educational purposes because data could be taken and reduced at small colleges located in areas not normally having access to observatory facilities.

GNAT has been incorporated as a private, nonprofit group to write proposals for funding. The goal is to build a network that would provide 80% of the capabilities of a large observatory for 20% of the cost, astro-economics being of primary consideration. Tentative designs call for a general design incorporating an on-axis f/2 primary, an f/10 secondary, with perhaps a 1000 x 1000 CCD and side ports for a single-channel photometer, a fiber feed, and a television feed for local PR purposes. With the instruments permanently mounted on each telescope, the large amount of down time

for instrumentation changeouts would be eliminated.

To conclude, Dr. Crawford stated that he believes a network of uniformly designed, completely compatible automatic telescopes is such a great idea that, one way or another, it will happen. The challenge is to find the funding necessary to give the project a start. He estimates that such a network could be built for

about 15 million dollars, which would be enough to construct the network and provide half of the operating costs for the foreseeable future, the other half to be raised from the persons and organizations using the network.

We wish Dr. Crawford much success with both the IDA issues and the GNAT development, as their successes will most assuredly benefit all of us. We in the NCA have had several internal discussions about what we might do locally to assist with the light pollution problem, and several NCA members more actively pursued some of these issues by meeting with local lighting authorities. Individual members should consider what they can do within their local communities in the national capital area to help with this important problem. Perhaps we can form a working group within our organization to play a more active role by meeting with and educating the public and local lighting professionals.

We appreciate the time that Dr. Crawford has taken from his busy schedule to meet with us and discuss these interesting and worthwhile projects.

FOR SALE

Home-Dome 10 ft. diam. fiberglass observatory, never assembled, suitable for any location, exterior white, interior deep blue, 1 ft. high base ring, upgraded 16 roller rotation, 3 ft. wide viewing slot 0 -105, all parts and sealant, weatherproof, fits refractor up to 8 ft. Cassegrain up to 14 in. diam. Dob up to 18 in. List \$4250 Sell \$3650. Free delivery Wash-Baltimore area.

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National Capital Astronomers, Inc.

is a non-profit, public-service corporation for advancement of the astronomical sciences and is the astronomy affiliate of the Washington Academy of Sciences. For information, call NCA: (301) 320-3621.

SERVICES AND ACTIVITIES:

A Forum for dissemination of the status and results of current work by scientists at the horizons of their fields is provided through the monthly NCA Meeting. (See monthly *Stardust* for time and location.) All interested persons are welcome; there is no charge.

Expeditions frequently go to many parts of the world to acquire observational data from occultations and eclipses which contribute significantly to refinement of orbital parameters, the coordinate system, navigation tables and timekeeping. Other results of this work under continuing study include the discovery of apparent satellites of some asteroids, discovery of apparent small variations in the solar radius, and profiles of asteroids.

Discussion Groups provide opportunities for participants to exchange information, ideas, and questions on preselected topics, moderated by a member or guest expert.

Publications received by members include the monthly newsletter of NCA, *Star Dust*, and an optional discount subscription to *Sky & Telescope* magazine.

The NCA Public Information Service answers many astronomy-related questions, provides predictions of the

paths and times of eclipses and occultations, schedules of expeditions and resulting data, assistance in developing programs, and locating references.

Astronomical Telescope & Binocular - Public Seminar, for Selection, Use, and Care, held annually in November, offers the public guidance for those contemplating the acquisition of a first telescope, and dispels the many common misconceptions which often leads to disappointment.

Working Groups support areas such as computer science and software, photographic materials and techniques, instrumentation, and others.

Telescope-Making Classes teach the student to grind and polish, by hand, the precise optical surface that becomes the heart of a fine astronomical telescope.

NCA Travel offers occasional tours, local and world-wide, to observatories, laboratories, and other points of interest. NCA sponsored tours for comet Halley to many parts of the southern hemisphere.

Discounts are available to members on many publications, products, and services, including *Sky & Telescope* magazine.

Public Programs are offered jointly with the National Park Service, the Smithsonian Institution, the U.S. Naval Observatory, and others.

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Note: If you already subscribe to *Sky & Telescope*, please attach a recent mailing label. You may renew this subscription through NCA for \$22 when it expires.

Make check payable to National Capital Astronomers, Inc., and send with this form to:

Jeffrey Norman Apt. 717, 5410 Connecticut Avenue, NW, Washington, D.C. 20015.

The following information is optional. Please indicate briefly any special interests, skills, vocation, education, experience, or other qualifications which you might contribute to NCA.

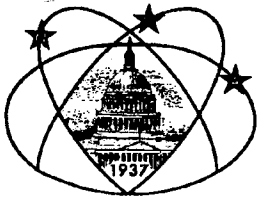
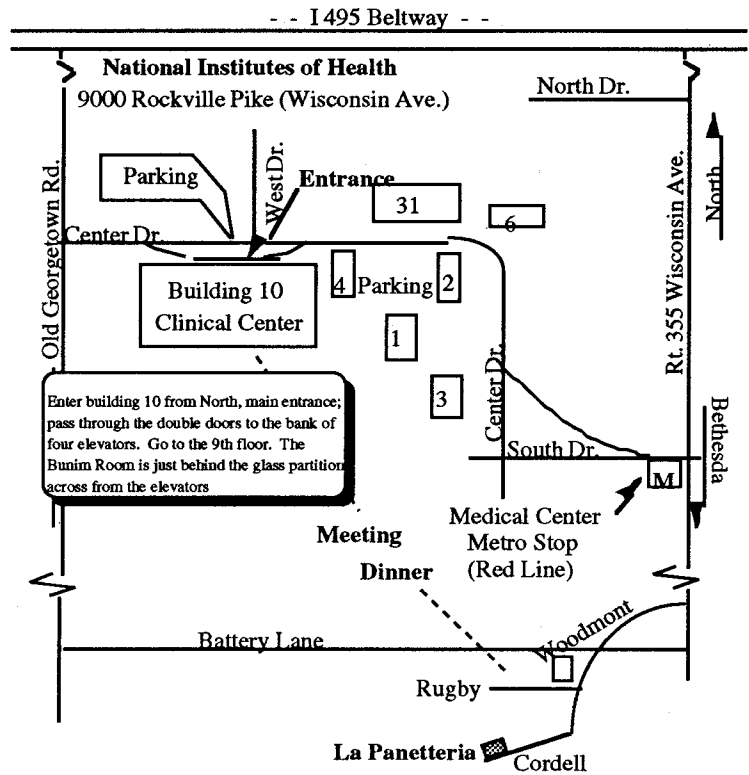
Thank you, and welcome!

Getting to the NCA Monthly Meeting

•Subway Riders - From Medical Center Metro Stop: Walk down the hill, pass the bus stops and turn right at the anchor (onto Center Drive). Continue uphill to building 10, the largest building on campus. Also, the J2 bus line connects the Bethesda (7:16 PM) and NIH (7:23 PM) Metro stops with Building 10 (7:25 PM).

•To La Panetteria: Take Wisconsin Avenue toward Bethesda and bear right onto Woodmont (or take the next right onto Battery Lane). Follow Woodmont to Cordell (2 blocks south of Battery) and make a right at the Thai Place Restaurant. La Panetteria is one block on the right (next corner, 4921 Cordell Avenue). There should be adequate parking on the street outside the restaurant. Seats are not guaranteed after 5:30.

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National Capital Astronomers, Inc.

If undeliverable return to
Leith Holloway, Apt. M-10
10500 Rockville Pike
Rockville, MD 20852-3331



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Dr. Wayne H Warren, Jr
8001 Brett Place
Greenbelt MD 20770-3001