



## BLACK HOLES - AND A NEW COSMOLOGY



John Eisele

Dr. John Eisele will speak on quantum cosmology at the June 12 meeting of the National Capital Astronomers.

The solutions of Dirac's relativistic wave equation require an invisible, multilayered laminar flow of negative energy fermions to pervade most of the Dirac vacuum. To satisfy Pauli's exclusion principle, it usually is assumed that the density of matter in this "negative sea" is both infinite in coordinate space and uniform in phase space. It is hypothesized, however, that turbulent current of matter in the negative energy-state flow has observable effects that include black-hole filling, which provides a mechanism for the continual creation of matter, sans antimatter, at a rate compatible with a steady-state universe.

Beyond the black hole, matter and angular momentum in the core of a neutron star are removed from the positive-energy state by a mass URCA process. It is postulated that the extreme violence of gravitational collapse acts as a huge syringe to inject expended matter back into the Dirac vacuum. Two opposing turbulent flows are produced in the negative sea, which are spin-polarized and very intense. These jets are responsible for the strong radio emissions in the vicinity of pulsars and quasars. The picture of the universe that evolves is cyclic in character. Seemingly, on the macroscopic scale, matter is destroyed; and on the microscopic scale, matter is continually created. Gravitational collapse acts as a pumping mechanism to drive the process, and vacuum fluctuations serve as its regulating mechanism. The two mechanisms cooperate and communicate through the Dirac vacuum. This picture does not violate conservation of matter or energy, and requires neither antigravity nor matter-antimatter symmetry throughout the universe.

### NRL RESEARCH PHYSICIST

NCA Vice-president John Eisele is a consultant in the Satellite Techniques Branch of the Applications Research Division, Naval Research Laboratory. He is working on applying nuclear spectroscopy to ocean science.

Dr. Eisele received his Ph. D. in physics from Ohio State University in 1959. He helped to design the nuclear reactor for the aircraft carrier Enterprise, and has written four books dealing with quantum mechanics, mathematics, and space science. Our speaker has taught at Ohio State, Pittsburgh, Berkeley, Texas A. and M., and the University of Maryland where he is now a staff member.

The speaker will provide lucid introductions to and general background material for his topic.

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Note: The lecture is the second Saturday this month.

NCA JUNE CALENDAR

Friday, June 4, 11, 18, 25, 7:30 P.M.--Telescope making class at McKinley Hall, American University; also Fridays same time and place throughout the summer. Call Jerry Schnall, 362-8872.

Saturday, June 12, 6:15 P.M.--Dinner with the speaker at Bassins, 14th and Pennsylvania Avenue, N.W. No reservations required.

Saturday, June 12, 8:15 P.M.--Meeting of NCA at Department of Commerce Auditorium, 14th and D Streets, N.W. John Eisele will speak on "Quantum Cosmology." Minutes of the last meeting will be read; NCA awards won at science fairs will be presented.

Friday, June 18, or Saturday, June 19.--Star party. If clouded out both nights, June 25 and 26 are the respective alternate dates. Meet at Chevy Chase Library, 8005 Connecticut Avenue near East-West Highway, at 8 P.M. Rides will be available to the Travilah Elementary School, Travilah Road in Gaithersburg. Sponsored by Md.-D.C. Juniors. Call Jean Radoane at 434-0443 for information.

Saturday, June 26, 9:00 P.M.--"Observing the Skies" program at the Rock Creek Nature Center, Military and Glover Roads, N.W. conducted by Bob McCracken. NCA members can help by bringing portable telescopes.

Group observing at the NCA 5-inch refractor. For those not having key passes, arrangements may be made in advance by calling Larry White at 461-9681.

July

Saturday, July 17 and 31, 9:00 P.M.--"Observing the Skies." See June 26.

NCA AWARDS WON AT SCIENCE FAIRS

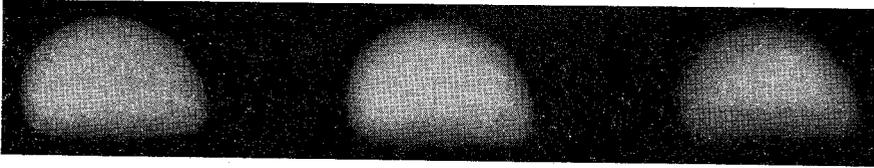
These junior and senior high school students have been awarded one-year junior memberships in NCA together with subscriptions to Sky and Telescope for having the best astronomy exhibits at the five county science fairs:

Douglas Antonio, 5814 Rumford Drive, New Carrollton, Md.  
Dana Browne, 7111 Xavier Court, McLean, Va.  
Frank Delalla, 204 Kirby Hill Road, Oxon Hill, Md.  
Hugh Gallagher, 6041 North 18th Street, Arlington, Va.  
James Muddiman, 8503 Thomas Drive, Manassas, Va.  
Michael Peck, 6016 Larkspur Drive, Alexandria, Va.  
Russell Wheeler, 6308 Thomas Drive, Springfield, Va.

NCA extends its thanks to the members who gave their time to judge the astronomy exhibits at the science fairs (two judges at each): Bob Wright, John Lohman, Wolfgang Schmidt, Jerry Schnall, James Krebs, William Marihugh, Fred Cornelius, William Pala, Bill Winkler, and Richard Muniz.

1971 ELECTION RESULTS

At the annual business meeting of NCA on May 15, George Gould, John Alexiou, and John Legowik were nominated for president, vice-president, and trustee, respectively, by petition of the members to oppose the Nominating Committee's slate announced in the April Star Dust. Elected were: Pres., William Winkler; Vice-Pres., John Eisele; Sec., Estelle Finkel; Treas., Chas. Shepard; Trustee, Worth Crowley; Sergeant-at-arms, Lawrence Torrence. These officers will begin their terms July 1. The president thanks all of those who assisted at the meeting, and those who ran for office.



Venus (0019 UT, 25 Feb. 1969). Bill Winkler made the red (left), white (center), and near-UV (right) views by darkroom filtration of his HS Ektachrome original. 8-inch  $f/98$  reflector.

#### GUM NEBULA--LARGEST OBJECT IN OUR GALAXY

Dr. John Brandt, Chief Solar Physicist at Goddard Space Flight Center, spoke about research on the Gum Nebula, easily the largest one known in the Milky Way Galaxy, at the May meeting of NCA.

This nebula has been measured in hydrogen-alpha light to cover  $90^\circ$  by  $40^\circ$ , and seems to have originated in a supernova at the location of the present Vela pulsar, near the Gum Nebula center. A widely accepted theory places the supernova explosion in 9000 B.C. This theory suggests an initial energy source of  $10^{52}$  ergs for the Gum Nebula; only a supernova can supply it. Dr. Brandt has begun to enlist the aid of archaeologists to confirm this theory by using clues from ancient artifacts. Estimates give the brightness of the event as equal to a quarter-moon, magnitude -10. The unusual nebula at present does not appear to be expanding. Studies of it will increase our understanding of the gross structure of the interstellar medium and perhaps lead to an explanation of the amount of ionization in the galactic plane.

Dr. Brandt showed photographs of prehistoric Indian pictographs found in the southwestern United States, of the moon and a very bright object nearby now thought to be the Gum Nebula.

#### IMPORTANT EQUATIONS IN ASTROPHYSICS - III

Over much of the electromagnetic spectrum, many astronomical bodies may be considered to be "black bodies," perfect absorbers and radiators of incident radiation. The surface temperature of such bodies is given by

$$T = \left( \frac{E}{\sigma} \right)^{\frac{1}{4}}$$

where  $T$  is temperature on the Kelvin scale,  $E$  is the total electromagnetic energy radiated, and  $\sigma$  is the Stefan-Boltzmann constant.

That is, the surface temperature is found by taking the square root of the quantity inside the brackets twice in succession.

#### CURRENT RESEARCH NOTES

##### Major Advances in Very Long Base Line Interferometry

Using simultaneously the Haystack Hill, Mass., and Goldstone, Calif., radio telescopes separated by 3900 kilometers, resolution of  $1.5 \times 10^{-3}$  seconds of arc has been achieved in observing quasar 3C 279. Early data make interpretation somewhat uncertain but some investigators now believe that 3C 279 is

really two point sources separated by 20 light-years and 3 billion light-years from the earth. Separation of the two courses appears to have increased by 10 percent in four months. Two other interpretations are (a) a clump of electrons orbiting a central body, and (b) two extended objects closer together. (Science, April 2, 1971)

ASTRONOMICAL LEAGUE-ALPO CONVENTION

The Astronomical League and the Association of Lunar and Planetary Observers will convene jointly at Memphis, Tennessee, August 18-22. The Memphis Astronomical Society will be host on the campus of Southwestern College. Activities include a visit to the College's observatory, and a banquet aboard the Memphis Showboat followed by an observing session on a sandbar. Registration before August 1 is \$2 individual, \$3 couple, \$4 family; after that, add a dollar. Housing accommodations with central air conditioning and semi-private bath are available on the campus for \$5 per person per night. Banquet excursion costs \$7.50. Send all reservations to William J. Busler, 441 South Reese Street, Memphis, Tennessee 38111.

NEW MEMBERS

Welcome to Arthur Hausner and family, 10525 Calumet Drive, Silver Spring, Maryland 20901. Telephone 593-3626.

\* S T A R D U S T  
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