☆ STAR DUST

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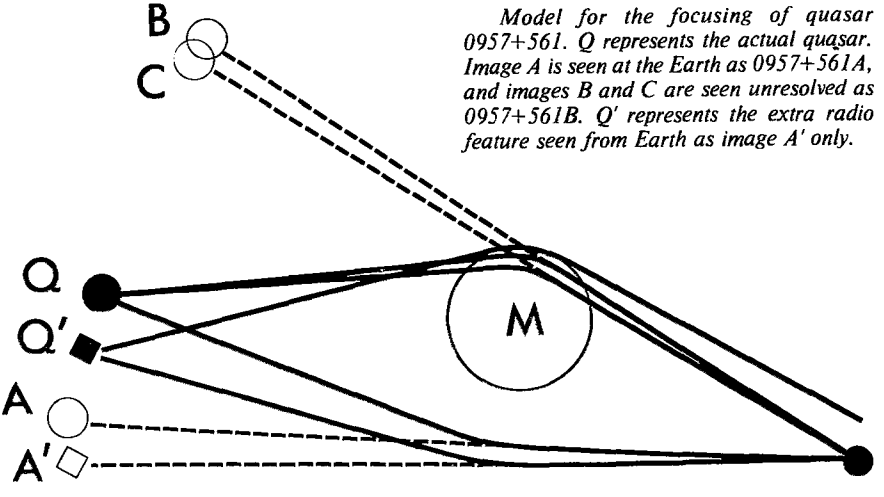
Gravitational Focusing? p.42

Palomar 5 meter telescope image of the double quasar 0957+561A and B (center of photo.) Quasar A is the upper (Northern) component. The separation is 6 arc seconds. Extra features were seen at radio wavelengths a few arc seconds to the upper left of quasar A. Superimposed on quasar B is the image of a galaxy which is the brightest member of a rich cluster partly visible in the picture. (Courtesy of Hale Observatories.)



Model for the focusing of quasar 0957+561. Q represents the actual quasar. Image A is seen at the Earth as 0957+561A, and images B and C are seen unresolved as 0957+561B. Q' represents the extra radio feature seen from Earth as image A' only.

SUMMER CALENDAR

Friday, August 1, 8, 15, 9:30 PM — Observing with the NCA 14-inch telescope with Bob Bolster, 6007 Ridgeview Drive, south of Alexandria between Franconia Road and Rose Hill Drive. Call Bob at 960-9126.

Friday, August 1, 8, 15, 22, 29, 7:30 PM — Telescope-making classes at American University, McKinley Hall basement. Information: Jerry Schnall, 362-8872.

Tuesday, August 5, 12, 19, 26, 7:30 PM — Telescope-making classes at Chevy Chase Community Center, Connecticut Avenue and McKinley Street, NW. Information: Jerry Schnall, 362-8872.

Friday, August 8 — Sunday, August 10 — Field trip. See page 43.

JUNE LECTURE

Dr. Michael F. A'Hearn of the University of Maryland addressed the final National Capital Astronomers meeting of the 1979-1980 season, on spectrophotometry of comets.

He presented evidence that implies basic similarity of composition and behavior among most comets, their variety of appearances notwithstanding. Although bright comets can be studied in detail, it is necessary to observe faint comets as well to draw general conclusions.

A'Hearn reviewed the characteristic features and behavioral patterns of comets and presented spectral evidence relating them.

There are two types of comet tail: (1) the dust tail, composed of slowly moving solid particles extruded from the coma by solar radiation pressure, and (2) the rapidly changing tail of fast-moving ions pushed directly away from the Sun. The tail may extend 1/2 au, but it is generated by the erosion of only a few meters of material from the surface of a 1-km nucleus which is too small to be observed directly. The coma is the halo of gases surrounding the nucleus. it is spectrophotometry of the coma that indirectly yields information about the nucleus.

Most comets appear to have been formed from the same gaseous nebula that produced the Sun and planets, and thus contain clues to the conditions that prevailed when the solar system was formed. They tend to congregate in the Oort cloud, a large group of comet nuclei some 50,000 au from the Sun. Gravitational perturbations from passing stars appears to be the mechanism that ejects comets out of this cloud into the typical highly eccentric orbit that brings it close enough to the Sun to form a tail.

Several spectral lines are observed in the coma, including those from CN, C_2, Na, C_3, CH, NH, and OH. These radicals indicate the presence of water, ammonia, and carbon dioxide or carbon monoxide in the nucleus, all of which were predicted in the early 1950's by Fred Whipple, but so far there is no evidence of methane, which Whipple also predicted. The mechanism of line formation is almost pure fluorescence, which greatly simplifies computation of predicted spectra. Such computed spectra agree very well with observed spectra, and the fact that coma emission lines disappear when they coincide with solar absorption lines also tends to confirm the fluorescence model. Observations of the rates of ion production also tend to confirm that

THE COVER: MULTIPLE QUASARS — SPLIT BY GRAVITATIONAL LENS?

Five components of this quasar have been detected by radio. In *Nature*, 26 June 1980, Weymann et al. announce the discovery of a triple QSO, another probable result of a gravitational lens. Further references in cited literature.

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TREXLER PLANS NCA FIELD TRIP

National Capital Astronomers members are invited to participate in a high-altitude, dark-sky field trip with the NCA 14-inch telescope, to the Briery Branch Spruce Meadow site on the Shenandoah Mountain during the weekend of August 8, 9, 10. Camping and ground fires are permitted when safe. A small a-c generator is available, but no sanitary facilities or water; bring food, water, telescopes, and camp gear. Motels are available in the Harrisonburg area. Come when you wish; the C-14 will be available for your use all three nights. Camera T-rings will be provided for Cannon, Nikon, Olympus, and Pentax; bring others if needed.

If you plan to come, please call Jim or Fran Trexler, H: (301) 839-3490, O: 767-3305 between 3 and 6 August, so you might be notified if the trip is canceled.

For a map and details, send a stamped self-addressed envelope to Jim Trexler, 5609 Ottawa Street, Oxon Hill, MD 20021.

NCA WELCOMES NEW MEMBERS

John G. Cormack & Family
10263 Gainsborough Road
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the radicals whose lines are observed are produced from the above-listed molecules in the nucleus. The mechanism for ion production is UV solar radiation causing dissociation of the vaporizing ices from the nucleus.

Comets' orbits have been observed to deviate from the orbit defined by gravitation alone. These non-gravitational perturbations are probably caused by reaction forces from expansion of vaporizing material, consistent with computed models. At about 1.5 to 2.5 au, solar radiation is insufficient to vaporize significant amounts of water ice; spectral-line emission should cease. Actually, C_2 does stop at the predicted distance, indicating that it is linked to water vaporization, but CN does not stop, which indicates that it results from vaporization of CO or CO_2.

Differences in gas-to-dust ratios produce markedly different physical appearances among comets, but they all behave the same in CN, C_2/C_3, and

EXCERPTS FROM THE IAU CIRCULARS

1. May 18 — Maza and Gonzalez, University of Chile, discovered a supernova of 17th magnitude in MGC -3-34-61 in Virgo.

2. May — H. E. Bond, Louisiana State University, reported that the central star in the planetary nebula Abell 46 in Lyra has been found to be an eclipsing binary with an orbital period of 11h 19m. Observations made with the 90-cm reflectors at Kitt Peak and L. S. U. show a primary minimum 1.4 magnitudes deep. Only one other planetary nebula is known to have a close binary nucleus.

3. June 13 — Carlos Torres, University of Chile, discovered a comet (1980e) of 15th magnitude in Sagittarius on exposures made at the Cerro el Roble station.

4. June 13 — J. Maza, University of Chile, discovered a supernova of 18th magnitude in an anonymous galaxy in Centaurus on a plate taken by C. Torres.

5. June 17 — B. E. Westerlund, European Southern Observatory, La Silla, reported that quasi-stellar object 3C446 had undergone an outburst, increasing in brightness from 18th magnitude to 14.9.

OH production, so the abundances do not vary much with dust-to-gas ratio. About the only substantially different observation is that CO^+ is strong in dusty comets and very weak in gassy comets. A spaceprobe rendezvous with a comet nucleus for direct observation is needed to learn the significance of this one difference.

Although not much is known of the structure of the nucleus, its chemical composition is fairly well known. This evidence tends to indicate that the nebula from which the solar system was formed was relatively homogeneous, but this is a weak suggestion based on incomplete knowledge.

Although several future satellite programs are scheduled for comet observations, ground-based observations are also needed of magnitudes of the nucleus and coma, high-resolution measurements of angular nuclear size, and appearances of haloes and rays. Detailed knowledge of the nuclear structure must await a future spaceprobe rendezvous. mmt

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