

Nebular candles for galactic distances

If all galaxies had the same intrinsic brightness, it would be easy to measure distances to remote galaxies: Fainter galaxies would be farther away. But the universe isn't that simple. The brightness of galaxies varies considerably, making it difficult for astronomers to estimate galactic distances and, in turn, to deduce the age of the universe. What astronomers need is a "standard candle" — an astronomical feature, visible in distant galaxies, that has a well-defined, known luminosity.

One promising candidate is the planetary nebula. This glowing gas shell (which actually has nothing to do with planets) forms when a sun-like star runs out of fuel at its core and sloughs off its outer layers. Seen in a telescope, the shell appears as a bright ring. At certain wavelengths, the ring looks significantly brighter than any surrounding stars. Moreover, the brightest planetary nebulas seem to have roughly the same intrinsic brightness in all kinds of galaxies. Comparing the brightest planetary nebulas in distant galaxies with planetary nebulas in a nearby galaxy such as Andromeda should enable astronomers to work out the distance to the farther galaxies.

George H. Jacoby and Robin Ciardullo of the National Optical Astronomy Observatories in Tucson, Ariz., working with Holland C. Ford of the Space Telescope Science Institute in Baltimore, have now used the apparent brightness of planetary nebulas to obtain a new estimate of the distance to galaxies in the Virgo cluster. This large collection of galaxies plays a crucial role in studies of distant galaxies because it lies far enough away to show the effects of an expanding universe, yet near enough for astronomers to audition a variety of standard-candle candidates within its many types of galaxies.

As reported in the June 20 *ASTROPHYSICAL JOURNAL*, Jacoby and his collaborators measured the light emitted by 486 candidate planetary nebulas in six galaxies belonging to the Virgo cluster. In each case, they filtered out all light except those wavelengths characteristic of planetary nebulas, producing pictures that emphasized the planetary nebulas. They obtained similar distances for all the galaxies, arriving at an average of 48 million light-years from the core of the Virgo cluster to Earth. Moreover, the distances obtained for individual galaxies appear totally unrelated to the type of galaxy, supporting the assumption that the properties of a galaxy have little effect on planetary nebulas.

The result fits well with several, though not all, recent determinations of the distance to the Virgo cluster. "We believe that this is at least as accurate as any other distance determination for this cluster of galaxies," the researchers conclude.

By combining this distance with the speed at which the cluster appears to be moving, astronomers can estimate how fast the universe is expanding and how long the expansion has taken place. From their measurement, Jacoby and his colleagues deduce that the Hubble constant — which measures the expansion rate of the universe — falls between 75 and 100 kilometers per second, depending on how much of the Virgo cluster's overall motion results from local effects, such as the gravitational influence of nearby concentrations of mass, and what proportion represents the motion due to the expansion of the universe.

If correct, this estimate of the Hubble constant means the universe is younger than some researchers had thought, perhaps no more than 12 billion years old rather than as high as 20 billion years. But the uncertainties in the calculations are high enough that no definitive determination of the universe's age is yet possible.

Nonetheless, now that astronomers seem close to nailing down the distance to the Virgo cluster, the brightest galaxies within the cluster may, in turn, serve as standard candles in comparisons with clusters of galaxies even farther away.

Type As get a facial

Some researchers regard Type A behavior as a critical factor in promoting heart disease; others see it as irrelevant (SN: 1/23/88, p.53). Scientists in the former camp often cite enduring hostility and anger as particularly "toxic" Type A features.

So it comes as a surprise that Type A men are not distinguished from easygoing Type Bs by an abundance of angry or contemptuous facial expressions. Instead, Type As more often glare and look disgusted, report psychologist Margaret A. Chesney of the University of California, San Francisco (UCSF) and her colleagues in the May/June *PSYCHOSOMATIC MEDICINE*.

Nevertheless, glares and disgusted looks are probably indirect expressions of hostility, the researchers contend. These two facial patterns may help in identifying individuals prone to heart disease, they suggest.

Eye blinking, teeth clenching and other facial movements have been noted among Type A men, but Chesney and her co-workers are the first to measure Type A facial expressions systematically. Using criteria developed by UCSF psychologists Paul Ekman and Wallace V. Friesen, who participated in the research, the team analyzed facial movements videotaped during interviews of 24 Type A men and 24 Type B men.

Most volunteers were managers at an aerospace firm who had probably learned to monitor and suppress angry expressions, the scientists remark. But Type As made considerably more hostile comments about others during the interviews, as well as displaying more disgusted looks and glares. The researchers define "glaring" as lowering the brows, raising the upper eyelids and directing the gaze at another person.

In a long-term, ongoing study of men on the West Coast, directed by Chesney, hostile speech strongly predicts the eventual development of heart disease. Scientists do not yet know whether the Type As who utter hostile remarks while glaring and looking disgusted are at greatest risk for heart disease.

Menopause gets an emotional reprieve

For the vast majority of healthy, middle-aged women, menopause does not lead to emotional instability or psychological problems, according to a study in the June *JOURNAL OF CONSULTING AND CLINICAL PSYCHOLOGY*.

The new research contradicts recent findings, based on small samples of menopausal women seeking psychological treatment, suggesting that the end of menstrual cycling often leads to an excess of depression and distress.

Psychologist Karen A. Matthews of the University of Pittsburgh and her co-workers interviewed 541 premenopausal women in their 40s who were recruited through random mailings. Three years later, the researchers interviewed 69 participants who had ceased menstruating for at least one year, and another 32 who no longer menstruated and took hormone supplements. Menopausal women averaged 50 years of age.

The onset of menopause, they found, had no overall effect on a spectrum of psychological features, including anxiety, anger, depression, self-consciousness in public, feelings of stress, excitability, nervousness and bodily worries. Menopausal women were psychologically comparable to 101 age-matched women who continued to menstruate, the researchers assert.

However, menopausal women who did not take hormones became less introspective and experienced more hot flashes, they note. About one in five hormone users reported more worries about their bodies and a few other symptoms of distress after menopause, but this may be due to specific types of hormone therapy or to the women's preexisting psychological and biological characteristics, the scientists say.