

Astronomy

Ron Cowen reports from Columbus, Ohio, at a meeting of the American Astronomical Society

Shedding new light on a luminous galaxy

Last year, British astronomers reported the serendipitous discovery of the brightest object ever observed in the universe—a distant galaxy that has an infrared luminosity more than 100 trillion times that of the sun at all wavelengths (SN: 6/29/91, p.406). At the time, co-discoverer Michael Rowan-Robinson of Queen Mary and Westfield College in London and his colleagues speculated that either a dust-shrouded quasar or powerful bursts of star formation could account for the galaxy's record-breaking brightness.

Two new studies appear to favor the star formation model. They suggest that light from massive, brightly burning stars, which are born and die at a furious pace, may fuel galaxies just as effectively as a quasar. But Eric E. Becklin, an astronomer at the University of California, Los Angeles, notes that such rapid-fire star production—the equivalent of 1,000 stars exploding as supernovas each year—“is way off the scale of star formation” detected in any other galaxy and may not represent the true nature of this infrared-bright body, dubbed IRAS F10214+4724.

Using a millimeter-wave radio telescope in Granada, Spain, Philip Solomon of the State University of New York at Stony Brook and his colleagues found that the infrared galaxy emits strong radio signals from carbon monoxide—a telltale sign of star formation. The strength of the signals indicates that most of the mass of this galaxy, unlike that of most known galaxies, consists of interstellar gas rather than stars.

Another team, which had previously detected carbon monoxide emissions, now reports that the galaxy emits radio signals from atomic carbon. Robert L. Brown and Paul A. Vanden Bout of the National Radio Astronomy Observatory in Charlottesville, Va., say their findings also hint that IRAS F10214+4724, as now viewed, represents a primeval galaxy in which some giant gas clouds are still collapsing to form stars and starbirth has only recently begun.

Rowan-Robinson says the jury is still out on the power source fueling the luminous body, which may lie some 13 billion light-years from Earth. Both starbirth and radiation from a dust-shrouded quasar may contribute significantly to the galaxy's infrared brilliance, he says.

Molecular gas in the Milky Way

For the first time, researchers have detected molecular gas at the extreme fringes of the Milky Way. Using a millimeter-wave radio telescope mounted on the roof of a campus building, Seth W. Digel and Patrick Thaddeus of the Harvard-Smithsonian Center for Astrophysics in Cambridge, Mass., found that clouds of carbon monoxide—a tracer of molecular hydrogen gas—extend along the outskirts of the disk-shaped Milky Way, 100,000 light-years from the galaxy's center. Surveying the galaxy with the same instrument, Thaddeus and Harvard-Smithsonian colleague Thomas M. Dame found that carbon monoxide also extends 1,000 light-years above and below our galaxy's thin disk.

Although astronomers knew that sheets and filaments of atomic hydrogen reach as high as 3,000 light-years above the Milky Way, it appeared that molecular gas extended no higher than 350 light-years. Dame speculates that the higher-altitude gas he discovered originated in the disk and was pushed upward by stellar winds or supernova explosions.

The molecular clouds found by Digel and Thaddeus at the outskirts of the Milky Way have about the same width and mass as those near the sun. But the outlying clouds appear much fainter in light emitted by carbon monoxide, suggesting that they are cold and do not form massive stars. Digel says he plans to investigate whether the molecular clouds have too low a density to make stars or whether some unknown process prevents starbirth there.

Behavior

Subway perils and psychosis

Most New York City subway riders tell interviewers that they regularly take measures to avoid being intentionally pushed onto the subway tracks. Although such incidents occur rarely, they have increased in frequency since 1986, and most of the offenders involved are psychotic and homeless, according to a report in the June ARCHIVES OF GENERAL PSYCHIATRY.

Transit police usually know which of the homeless mentally ill people who live in New York City's subway system commit crimes, assert psychologist Daniel A. Martell of New York University School of Medicine and psychiatrist Park Elliott Dietz of the University of California, Los Angeles. An outreach program run by the transit police finds alternative shelter for some of the homeless mentally ill who take refuge in the subway, but policymakers need to consider strategies for providing psychotic subway-dwellers with mental health care and hospitalization when needed, Martell and Dietz contend.

The researchers identified 36 individuals who, acting alone, pushed or attempted to push their victims—none of whom they knew—onto the subway tracks between 1975 and 1991. Of that number, 25 were referred for psychiatric evaluation and treatment, as was one gang member who pushed someone onto the tracks. Among those referred for psychiatric evaluation, the average annual number of offenses more than doubled—to 2.5 incidents per year—between 1986 and 1991, the scientists note. During that time, the annual frequency dropped markedly among offenders receiving no psychiatric evaluation.

Martell and Dietz located criminal and mental health records for 20 of the 26 offenders referred to psychiatrists. At the time of the offenses, 19 experienced psychotic symptoms—such as hearing voices that exhorted them to commit the crime—and 13 were homeless. Most offenders had a history of psychiatric hospitalization and several prior arrests and convictions, often for violent crimes.

Half of the offenders referred to psychiatrists had killed or seriously injured their victims, the researchers say.

Encouraging 'snooze' for depression

Several recent studies suggest that depressed people displaying biological markers of disturbed sleep—such as early onset of rapid eye movement (REM) sleep and a diminished amount of deep sleep, as indicated by electrical activity in the brain—reap few benefits from psychotherapy. However, a new report suggests that a popular form of psychotherapy for depression works just as well whether or not patients exhibit signs of sleep difficulties.

Psychologists Anne D. Simons of the University of Oregon in Eugene and Michael E. Thase of the University of Pittsburgh School of Medicine studied 53 severely depressed people who completed a 16-week course of cognitive-behavioral therapy, which focuses on altering negative attitudes and actions. By the end of the therapy sessions, 30 participants had achieved full recovery, 17 had partially recovered and six showed no improvement. Abnormalities in REM onset, the amount of deep sleep and other sleep measures did not cluster in any of the three groups, Simons and Thase assert in the June JOURNAL OF CONSULTING AND CLINICAL PSYCHOLOGY.

Sleep abnormalities continued to show no relation to the effectiveness of cognitive-behavioral therapy up to one year after sessions concluded, the researchers note. But 11 patients who fully or partially recovered and then suffered a renewed bout of depression during the follow-up year tended to have a later, not earlier, onset of REM sleep, compared with those who maintained their improvement.

Nevertheless, the researchers contend that biological signs of disturbed sleep do not appear to brand depressed outpatients as unsuitable for cognitive-behavioral therapy.