Dark matter gets a chance to shine

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AN ENTIRELY new type of star could be shining brightly at the heart of our galaxy. Instead of burning nuclear fuel like the sun, this star would be powered partly or wholly by dark matter.

"We call them 'dark-matter burners'," says Igor Moskalenko of Stanford University in California. "If they exist, they would look highly unusual, pumping out more light than expected from their mass."

Dark matter is the unseen stuff that is thought to account for about 90 per cent of the mass of galaxies. One popular theory of dark matter says that it is made of weakly interacting massive particles, or WIMPs. A candidate WIMP is a predicted particle called a neutralino, which would concentrate at the heart of galaxies, attracted by the gravity of the supermassive black holes there. "Stars orbiting within a few light years of the black holes will sweep up and burn a huge number of WIMPs," says Larry Wai of the Stanford Linear Accelerator Center.

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Deep in the core of such stars, WIMPs will collide and annihilate in a flash of gamma rays and other particles. "This will provide a new source of energy to supplement a star's normal heat source," says Moskalenko.

Wai and Moskalenko urge astronomers to search the centres of galaxies for stars punching above their weight in luminosity. They think that the best chance of finding a dark-matter burner is to observe white dwarfs, stellar embers that are no longer generating internal heat from nuclear fusion. Dark matter could provide the fuel for an unexpected rekindling, giving such stars a luminosity several hundred times that of the sun.

White dwarfs that swing in and out on highly elliptical orbits about a supermassive black hole would be the ones to watch. "The white dwarf would fluctuate in brightness dramatically, flaring up close to the black hole, where there are a lot of WIMPs to fuel it, and fading farther away, where there are few dark matter particles," says Moskalenko.

All this, of course, assumes that WIMPs exist. Moskalenko and Wai believe that testing their idea will in any case help determine the quantity and nature of these dark-matter particles at galactic centres.

David Merritt of the Rochester Institute of Technology in New York, an expert on supermassive black holes, thinks that the duo's idea would work only if a black hole forms via a spherically symmetrical accretion of matter. Only then would there be a high concentration of dark matter around the black hole. Merritt believes, however, that a supermassive black hole is more likely to form by an asymmetrical process such as the merger of binary black holes. "In this case, the expected dark matter density near the galactic centre would be orders of magnitude lower and insufficient to boost the luminosity of stars significantly," he says. ●

THIS WEEK 22 YEARS AGO

The birth of the cellphone

Cellular radio arrives in Britain in January. Although there are well over a quarter of a million conventional radio telephones installed in vehicles in Britain, cellular radio promises a superior service. The new technology will connect callers through the public telecommunications network, uncluttered by interference and with little risk of the conversation being overheard. Subscribers will not need to queue for hours until a channel is free and no one will be restricted to making only outgoing calls.

In Chicago, 5000 people signed on in three months for the new commercial system. Subscribers there found that the new system saved time, money and frustration. It has changed their lifestyle. No longer do they arrive at the office to find a stack of written messages and calls to return. Instead, they take and make the calls while commuting to work.

Journalists have already made calls on the new system in the Euston area of London using a transmitter on the nearby Telecommunications Tower, and there is currently unsatisfied demand in London. Indeed, the fear is that there may not be enough bandwidth to accommodate all those who wish to subscribe, although that has not discouraged the two rival service suppliers, Cellnet and Vodafone, from rushing to be first on the market. Competition between the two is starting to look like desperation.

Small business will be the big users of the new technology, because a single-person company can keep in touch with customers on the move. It is obvious that cellular radio is a business tool, not a consumer toy.

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