'Dark matter' doubters not silenced yet

by Bend_Weekly_News_Sources

AstroÂ-noÂ-mers have beÂ-lieved for decÂ-ades that most of the matÂ-ter in the cosÂ-mos is unÂ-seen. It beÂ-trays itÂ-self only through its gravitaÂ-tÂ-ional pull on visÂ-iÂ-ble obÂ-jects, whose moveÂ-ments are ofÂ-ten hard to exÂ-plain withÂ-out this â€œdark matÂ-ter.â€•And the past year has seen inÂ-creasÂ-ingly bold claims that asÂ-troÂ-noÂ-mers have â€œprovedâ€• the stuffâ€™s exÂ-istÂ-ence.DeÂ-spite that, thereâ€™s a core of doubtÂ-ers who areÂ-nâ€™t goÂ-ing away. Many of them are stickÂ-ing by an alÂ-terÂ-naÂ-tive theÂ-oÂ-ry that holds that tweakÂ-ing our unÂ-derÂ-standÂ-ing of graÂ-vity could exÂ-plain things betÂ-ter than inÂ-vokÂ-ing some unÂ-seen subÂ-stance unÂ-like any we know. This HubÂ-ble Space TelÂ-eÂ-scope comÂ-posÂ-ite imÂ-age shows a ghostÂ-ly "ring" of preÂ-sumed dark matÂ-ter in the galÂ-axy clusÂ-ter Cl 0024 17. It was called one of the strongest pieces of evÂ-iÂ-dence to date for the exÂ-istÂ-ence of dark matÂ-ter, an unÂ-known subÂ-stance that perÂ-vades the uniÂ-verse. (CredÂ-its: NASA, ESA, M.J. Jee and H. Ford [JHU])

One such modified-graÂ-vity theÂ-oÂ-ry has been â€œreÂ-markably reÂ-silienÂ-t,â€• wrote asÂ-tronÂ-oÂ-mer Stacy McÂ-Gaugh of the UnÂ-iversÂ-ity of MarÂ-yÂ-land in ColÂ-lege Park, Md. in the Aug. 3 isÂ-sue of the reÂ-search jourÂ-nal SciÂ-ence. That theÂ-oÂ-ry, known as ModÂ-iÂ-fied NewÂ-toÂ-nian DyÂ-namÂ-ics or MOND, was proÂ-posed in 1983 by the IsÂ-raeÂ-li physÂ-iÂ-cist MordeÂ-hai MilÂ-grom.AsÂ-troÂ-noÂ-mers have susÂ-pected dark matÂ-terâ€™s exÂ-istÂ-ence since the 1930s, when the Dutch asÂ-tronÂ-oÂ-mer Jan Oort found that gaÂ-laxÂ-ies didÂ-nâ€™t conÂ-tain nearly enough visÂ-iÂ-ble mass for their own gravitaÂ-tÂ-ional force to hold them toÂ-gethÂ-er. Oort sugÂ-gested there must be more, unÂ-seen matÂ-ter.ReÂ-searchÂ-ers still havenâ€™t been able to find it. But sevÂ-erÂ-al cosÂ-moÂ-loÂ-gÂ-iÂ-cal theÂ-oÂ-ries sugÂ-gest parÂ-tÂ-iÂ-cles that could form it. And evÂ-iÂ-dence for it has been mountÂ-ing, acÂ-cordÂ-ing to many asÂ-troÂ-noÂ-mers.A year ago, reÂ-searchÂ-ers claimed that â€œproofâ€• of dark matÂ-ter could be found in a stupÂ-enÂ-dous crash beÂ-tween two galÂ-axy clusÂ-ters. The event had wrenched apart â€œdarkâ€• and â€œnorÂ-malâ€• matÂ-terâ€”which norÂ-mally hang around close toÂ-gethÂ-erâ€”letting asÂ-troÂ-noÂ-mers deÂ-tect each sepÂ-aÂ-rateÂ-ly. The dark matÂ-ter was again deÂ-tectaÂ-ble through its graÂ-vity, they said, which subtly alÂ-ters the paths of light rays from gaÂ-laxÂ-ies in the backÂ-ground.OthÂ-er siÂ-mÂ-iÂ-lar findÂ-ings apÂ-peared more reÂ-centÂ-ly, in the June 1 isÂ-sue of The AsÂ-tÂ-roÂ-physÂ-iÂ-cal JourÂ-nal. This time reÂ-searchÂ-ers usÂ-ing NASAâ€™s HubÂ-ble Space TelÂ-eÂ-scope said they found a huge, ghostly â€œringâ€• of dark matÂ-ter in a galÂ-axy clusÂ-ter called Cl 0024 17, five bilÂ-lion light-years from Earth, again thanks to a colÂ-liÂ-sion. NASA billed the findÂ-ing as some of â€œthe strongest evÂ-iÂ-dence yetâ€• for dark matÂ-ter.Yet probÂ-lems keep cropÂ-ping up, McÂ-Gaugh wrote. A study in the May 10 isÂ-sue of SciÂ-ence found that the biÂ-zarre gravitaÂ-tÂ-ional efÂ-fects atÂ-tribÂ-utÂ-ed to dark matÂ-ter were showÂ-ing up even where they werenâ€™t exÂ-pected to unÂ-der dark matÂ-ter theÂ-oÂ-ry itÂ-self. ModÂ-iÂ-fied graÂ-vity theÂ-oÂ-ryâ€”acÂ-cordÂ-ing to which graÂ-vity is stronger on inÂ-terÂ-gaÂ-lacÂ-tic scales than the standÂ-ard laws of graÂ-vity sugÂ-gestâ€”exÂ-plained the puzÂ-zle neatÂ-ly, he wrote. The SciÂ-ence stuÂ-dy, by FrÃ©dÃ©ric BourÂ-naud, of the AIM LabÂ-oÂ-rÂ-aÂ-toÂ-ry in Gif-sur-Yvette, France, and colÂ-leagues, exÂ-amÂ-ined a â€œdÂ-warf galÂ-axÂ-yâ€• that had formed from a largÂ-er galÂ-axÂ-yâ€™s ejected deÂ-bris in a crash. ComÂ-putÂ-er simÂ-ulaÂ-tÂ-ions had found that only norÂ-mal matÂ-ter should be ejected in these colÂ-liÂ-sions; yet in conÂ-flict with this, the dwarf galÂ-axy seemed to conÂ-tain the same proÂ-porÂ-tions of dark matÂ-ter seen elseÂ-where. This sugÂ-gests the â€œdark matÂ-terâ€• thereÂ-in is just some hidÂ-den form of orÂ-diÂ-nary atoms, reÂ-searchÂ-ers saidâ€”not the unÂ-faÂ-milÂ-iar, exÂ-otÂ-ic subÂ-stance that asÂ-troÂ-noÂ-mers traÂ-diÂ-tionÂ-ally posÂ-tuÂ-late most dark matÂ-ter is, based on sevÂ-erÂ-al theÂ-oÂ-retÂ-iÂ-cal conÂ-sidÂ-eraÂ-tÂ-ions. ConÂ-venÂ-tionÂ-al modÂ-els hold that of the 27 perÂ-cent of the unÂ-iverse that conÂ-sists of matÂ-ter, more than 98 perÂ-cent is unÂ-seen; about five-sixths of that in turn is nonÂ-baryÂ-onic, meanÂ-ing not orÂ-diÂ-nary atoms.BourÂ-naud proÂ-posed the stuff in the dwarf galÂ-axy is just hard-to-see hyÂ-droÂ-gen. The findÂ-ings may â€œpose an exÂ-isÂ-tenÂ-tial criÂ-sis for nonÂ-baryÂ-onic,â€• or exÂ-otÂ-ic, dark matÂ-ter, McÂ-Gaugh wrote. On the othÂ-er hand, awkÂ-wardly for MOND, cerÂ-tain galÂ-axy clusÂ-ters still seem not to have enough mass even afÂ-ter that theÂ-oÂ-ry is

apÂ-plied. So â€œMOND apÂ-pears to reÂ-quire dark matÂ-ter itÂ-selfâ€”a consideraÂ-ble emÂ-barÂ-rassÂ-ment for a theÂ-oÂ-ry that seeks to supÂ-plant the need for invisÂ-iÂ-ble mass,â€• McÂ-Gaugh wrote.MOND reÂ-search conÂ-tinÂ-ues, though itâ€™s less popÂ-uÂ-lar than dark matÂ-ter studÂ-ies. ArxÂ-iv.org, an onÂ-line repositoÂ-ry of physÂ-ics paÂ-pers, lists 12 paÂ-pers with MOND in the tiÂ-tle for this year to date, four of which are acÂ-ceptÂ-ed for pubÂ-licaÂ-tÂ-ion in sciÂ-enÂ-tifÂ-ic jourÂ-nals. By comÂ-parÂ-iÂ-son there are 39 paÂ-pers with â€œdark matÂ-terâ€• in the tiÂ-tle. FuÂ-ture exÂ-peÂ-riÂ-ments could find dark matÂ-ter in the labÂ-oÂ-rÂ-aÂ-toÂ-ry, if it exÂ-ists: physÂ-iÂ-cists beÂ-lieve the Large HadÂ-ron ColÂ-lider, a parÂ-tÂ-iÂ-cle acÂ-celÂ-erÂ-aÂ-tor to be built near GeÂ-neÂ-va, might do so. â€œReÂ-gardÂ-less of how these exÂ-peÂ-riÂ-ments play out, there is clearly a great deal of funÂ-daÂ-menÂ-tal physÂ-ics left for us to learn,â€• McÂ-Gaugh wrote.

Courtesy World Science staff

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