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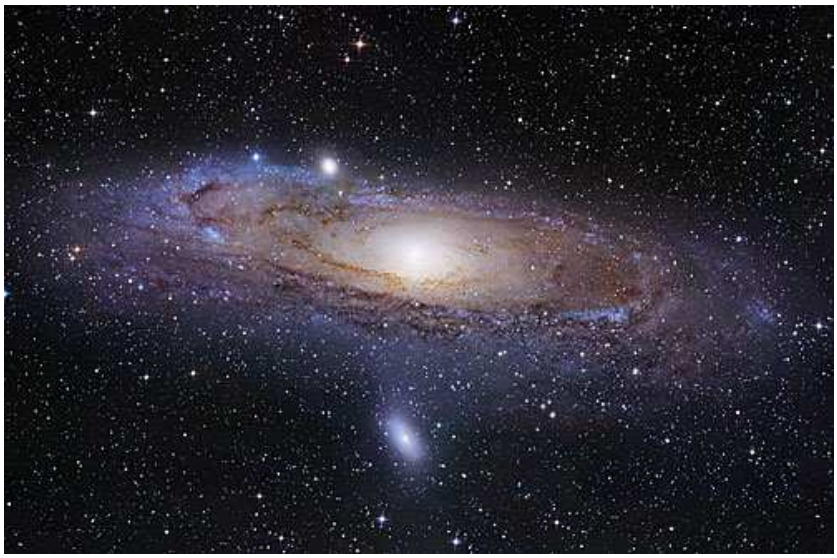

The Andromeda Galaxy. Photo by Robert Gendler.

Universe is twice as bright as previously thought

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The Universe is actually twice as bright than was previously thought, according to research conducted by an international team of astronomers.

Dr Simon Driver from the School of Physics and Astronomy at the University of St Andrews has discovered that dust is obscuring approximately half of the light that the universe is generating.

'For nearly two decades we've argued about whether the light that we see from distant galaxies tells the whole story or not,' said Dr Driver. 'It doesn't; in fact only half the energy produced by stars actually reaches our telescopes directly, the rest is blocked by dust grains.'

While astronomers have known for some time that the universe contains small grains of dust, they had not realised the extent to which this is restricting the amount of light that we can see. The dust absorbs starlight and re-emits it, making it glow. They knew that existing models were flawed, because the energy output from glowing dust appeared to be greater than the total energy produced by the stars.

Dr Driver explained, 'You can't get more energy out than you put in so we knew something was very wrong. Even so, the scale of the dust problem has come as a shock—it appears galaxies are generating twice as much starlight as previously thought!'

The team combined an innovative new model of the dust distribution in galaxies developed by Dr Cristina Popescu of the University of Central Lancashire and Prof Richard Tuffs of the Max Plank Institute for Nuclear Physics, with data from the Millennium Galaxy Catalogue, a state-of-the-art high-resolution catalogue of 10,000 galaxies assembled by Driver and his team.

Using the new model, the astronomers could calculate precisely the fraction of starlight blocked by the dust. The key test that the new model passed was whether the energy of the absorbed starlight equated to that detected from the glowing dust.

'The equation balanced perfectly,' said Dr Cristina Popescu, 'and for the first time we have a total understanding of the energy output of the universe over a monumental wavelength range. With the new calibrated model in hand we can now calculate precisely the fraction of starlight blocked by the dust.'

The universe is currently generating energy, via nuclear fusion in the cores of stars, at a whopping rate of five quadrillion Watts per cubic light-year—about 300 times the average energy consumption of the Earth's population.

'For over 70 years an accurate description of how galaxies, the locations where matter is churned into energy, form and evolve has eluded us. Balancing the cosmic energy budget is an important step forward,' said Dr Driver.

After carefully measuring the brightness of thousands of disc-shaped galaxies with different orientations, the astronomers matched their observations to computer models of dusty galaxies. From this they were able to calibrate the models and, for the first time, determine how much light is obscured when a galaxy has a face-on orientation. This then allowed them to determine the absolute fraction of light that escapes in each direction from a galaxy.

Dr Driver explained the discovery that only half of the visible starlight gets out, while a mere 10