Einstein's Constant under the Planck Microscope

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As Haug has shown in a long series of papers, Newton's gravitational constant [4] is almost for sure a composite constant, see [1, 2, 3]. What is this exotic animal that is meters cubed divided by kg and seconds squared ($m^3\ kg^{-1}\ s^{-2}$)? It is difficult to get any intuition from the gravitational constant alone, except from understanding that it is a constant we can measure empirically and use to get Newton's formula to match actual observations. Newton's gravitational constant is a composite constant that consists of the more fundamental constants: $G = \frac{l_p^2 c^3}{\hbar}$, where l_p is the Planck length [5], $\hbar$ is the reduced Planck constant, and c is the well-known speed of light as measured with Einstein-Poincaré synchronized clocks. By looking at big G as a composite constant, we can break it down into its more fundamental parts, all of which can be measured without any knowledge of big G. Some may protest, claiming that it is essential to know big G in order to find the Planck length. However, this is incorrect, as proven by [3].

This means we also can rewrite Einstein's constant in a more intuitive form. Einstein's constant is given by

$$\kappa = \frac{8\pi G}{c^2} \approx 1.866 \times 10^{-26} \text{ m kg}^{-1} \tag{1}$$

Rewritten this gives

$$\kappa = \frac{8\pi \frac{l_p^2 c^3}{\hbar}}{c^2} = \frac{8\pi l_p^2 c}{\hbar} = \frac{8\pi l_p}{m_p} \tag{2}$$

Since $m_p = \frac{\hbar}{l_p}\frac{1}{c}$, we also need to know the Planck constant and the speed of light in addition to the Planck length to find Einstein's constant. We can easily measure The speed of light, and the Planck constant can also be found totally independent of big G by the Watt Balance, see [6], for example.

It is also interesting to see that the Einstein constant multiplied by the Planck pressure simply is

$$\kappa \rho_p = \frac{8\pi l_p}{m_p}\frac{m_p}{l_p^3} = \frac{8\pi}{l_p^2} \approx 9.62166 \times 10^{70} \text{ m}^{-2} \tag{3}$$

Further, Einstein's cosmological constant is the Einstein constant multiplied by the vacuum pressure and can be written as

$$\Lambda = \kappa \rho_{vac} = \frac{8\pi l_p}{m_p}\rho_{vac} \tag{4}$$

where some have suggested that the vacuum pressure is approximately 5.26×10^{-27}kg m^{-3}.

Still, there is great deal of disagreement around Einstein's cosmological constant. For years it was considered Einstein's biggest blunder. In more recent times it is assumed to have a small value due to the some vacuum energy pressure. Only time will tell if this new way of looking at Einstein's constant can be useful in gaining a better understanding of the cosmos. Our best guess is that the cosmological time is infinite, that is to say the universe has always been and always will be, so this means we are in no hurry to prove our points.

References

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