

Origin of the Black Hole

The priority for the concept of the black hole (January, page 30) must be claimed, it seems, for the fantastic novelist from Vienna, Gustav Meyrink (1868-1932), a former banker. In his formerly well known collection *Des deutschen Spiessers Wunderhorn* (The German Philistine's Enchanted Horn) (Munich, 1913) we find a story "The Black Ball."

A group of sages from Sikkim in the Himalayas travels through Europe and demonstrates glass tubes filled with a white powder, probably iodides. Whenever one thinks hard enough next to a tube, the object of one's thoughts appears within the tube. Thus fabulous Indian scenery, beautiful women and other good things are seen.

In the end, however, a professional army officer tries his luck. Thereupon there was some curious noise, and a black velvety sphere appeared. "The thing made the impression of a yawning hole, and indeed it was nothing else than a hole . . . Anything that bordered on it was forced to fall into it, was transformed there likewise into Nothing, and disappeared without a trace." This was even the fate of the officer's sabre, with which he touched the sphere. So gradually the whole world will be swallowed by the Black Hole, and this will be the end of the world.

The Indian sages regretted having travelled West, and so having risked the world that had been created by Brahma, maintained by Vishnu, and attacked by Siva.

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Physics 400 years ago?

The present stagnation in high-energy physics, and perhaps in physics in general, can be best understood by historical analogy. If the present mechanisms for funding research and for publication of scientific information had existed 400 or so years ago when the laws of planetary motion were being discovered, *The Physical Review* would have been full of such papers as "A Ten Epicycle Fit to the Orbit of Mars" and "A Fifteen Epicycle Fit to the Orbit of Jupiter." Copernicus and Kepler may well have had their papers rejected by the referees as being contrary to present scientific knowledge or as simply "too speculative."

The astronomical telescope would not have been invented yet, and it is doubtful that Galileo would have been able to

obtain funding for the development of such an unconventional device. However, the Astronomical Exploration Commission (AEC) would be spending 250 million thalers on the National Astrolabe Laboratory (NAL), which would consist of an astrolabe one mile in diameter and its supporting equipment. While younger astronomers would complain that the expenditure of such an enormous sum on a single piece of equipment was depriving them of support and even of employment, the populace would be reassured by the "leading" (that is, well funded) astronomers of the day that such a device was absolutely necessary for the progress of planetary science since it would enable one to determine the position of a planet to a thousandth of a second of arc and hence determine the parameters in the epicycle fits to five more decimal places. Several years later, Isaac Newton, an undergraduate at Cambridge, having heard that there are no jobs in physics would decide to go to law school.

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Roentgen at Giessen

Your correspondent, Harald W. Straub, correctly points out in your July issue (page 62) that Roentgen discovered x rays at Wurzburg and not at Giessen. However, Roentgen was a professor at Giessen for six years (1879-85) before going to Wurzburg, and Giessen is sufficiently proud of the association to have erected a monument to Roentgen in the city park.

The monument is made of steel rods

and a block of stone, designed to suggest the passage of x rays through matter. The accompanying snapshot was made in June 1971.

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Measuring G

In his review on past attempts to measure G , J. W. Beams (May, page 35) failed to mention a resonance method due to Josef Zahradnicek (Phys. Zeits. 34, 126, 1933) which I believe is of importance not only for the completion of the review but mainly because it is the first published method where accumulative effects of the gravitational action between masses is used.

Briefly, Zahradnicek's apparatus comprises two coaxial torsion balances. One, the outer balance, is an inverted U-shape beam supported at its midpoint by a steel suspension wire; at the lower terminals of the inverted U-beam, heavy lead weights are attached. The other, inner balance, is smaller and its axis lies vertically below that of the former. Its beam is a light horizontal bar with small equal lead spheres at its ends and is supported at its center by a fine torsion wire. Each of the balance suspensions carries a small mirror so that oscillations may be recorded photographically on a drum camera. The rest positions of the balances are adjusted to be in the same vertical plane.

The two balances are coupled by gravitational forces between the lead weights and, in particular, the small balance will be markedly affected by the much larger outer balance. The experimenter adjusts the period of the outer balance until resonance occurs; that is, when the amplitude of the small balance compared with the larger one is a maximum. The amplitudes and the logarithmic decrement of the inner balance determined by the photographic record, together with measurable dimensions including the moment of inertia of the small balance and its period in the absence of the outer balance, allow the calculation of G . Zahradnicek's value (1932) was:

$$G = 6.659 \pm 0.02 \times 10^{-8} \text{ cm}^3 \text{ gm}^{-1} \text{ sec}^{-2}$$

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The author comments: In my paper entitled "Finding a Better Value for G ," only a relatively brief and incomplete history of the various methods of measuring G was attempted. As a result, just a few of the experiments described in the rather voluminous literature on the subject could be discussed. I certainly agree with Pascual