IS THE HIGGS MECHANISM KEEPING A GOOD λ DOWN?

Particle physicists have learned to accept the "God particle"[1]—the Higgs boson—as a mediator in the phase transitions that govern the electroweak asymmetries. The Higgs is thought to be a manifestation of vacuum energy that also provides the driving force in the inflationary phase of the universe.

Cosmologists have accepted an early inflation as a useful concept for explaining the flatness and causal connectedness of the present universe. While some of them look to the Higgs postulate as the controlling mechanism in the expansion of the universe, others—more phenomenologically inclined—have resurrected Einstein's cosmological constant λ as a significant term in the Friedmann equations that describe the dynamics of the expanding universe. The Higgs field and λ have their root in the same phenomenon, namely the energy of the quantum vacuum.

The prevailing Higgs mythology seems to have led many cosmologists to simply set λ to zero without regard to the consequences for the age and the density of the universe. The resulting "standard model" usually comes up with ages that are too low and densities that are too high compared with observations. In recent years, some nonstandard models[2–4] have been offered that use the high value (75–90) of the Hubble constant and do not seem to require nonbaryonic dark matter. Oddly enough, one of these models[4] leads to about the same unorthodox age (33×10^9 years) of the universe as the high-density model with which Edward Harrison[5] has recently challenged the "standard" model.

Even if Harrison's model may have been offered only as an exercise to foster "a cautious attitude toward current cosmological belief," it illuminates the inconsistencies in many current descriptions of the state of the universe. Of course, in the absence of a viable theory of quantum gravity we do not know how to link the cosmological constant to the Higgs field. Just the same, it appears worthwhile to adopt the phenomenological approach by building Friedmann models with both a zero and a nonzero cosmological constant that may be compared and falsified by observation.

What factors limit our ability to falsify such models? Why do most cosmologists suppress λ in favor of Higgs?

References

1. L. Lederman, *The God Particle*, Houghton Mifflin, New York (1993).
2. G. Efstathiou, W. Sutherland, S. Maddox, Nature **346**, 705 (1990).
3. M. Fukugita, F. Takahara, K. Yamashita, Y. Yoshi, Astrophys. J. **361**, L1 (1990).
4. D. Liebscher, W. Priester, J. Hoell, Astron. Astrophys. **261**, 377 (1992).
5. E. Harrison, Astrophys. J. **405**, L1 (1993).

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Detecting Isotropy: To *c* or Not to *c*?

The NASA–Jet Propulsion Laboratory–Caltech experiment on the isotropy of c cited by Timothy P. Krisher (July 1993, page 15) is identical in principle to experiments reported in 1963 and 1964 by researchers at MIT[1] and in 1972 by R. Cialdea.[2] Particular note is taken of the Cialdea experiment since A. A. Tyapkin[3] showed that effort to be a *non sequitur*, because all such experiments, and there have been several others, yield a null result through the second order resulting from time dilation.

In an era of shrinking Federal research budgets it would seem inappropriate to add a sixth layer of expenditure, as proposed by JPL, that at best would further confirm the finding of Tyapkin.

References

1. T. S. Jaseja, A. Javan, J. Murray, C. H. Townes, Phys. Rev. Lett. **10**, 165 (1963); Phys. Rev. **133**, A1221 (1964).
2. R. Cialdea, Lett. Nuovo Cimento **4**, 821 (1972).

3. A. A. Tyapkin, Lett. Nuovo Cimento **7**, 760 (1973).

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KRISHER REPLIES: The JPL experiment is indeed similar in spirit to that of R. Cialdea, but *not* to the earlier MIT experiments (which involved the comparison of laser cavities). However, there are three distinctions:

▷ The JPL experiment uses atomic frequency standards instead of lasers.

▷ The frequency standards are separated by several kilometers instead of only a small distance (less than 2 meters).

▷ Greater sensitivity is now possible.

A. A. Tyapkin's conclusions were refuted by Reza Mansouri and Roman U. Sexl (see the second paper of reference 1).

The relevancy of the JPL experiment, and certain others, was addressed in a detailed analysis performed by Clifford M. Will[2] (which evidently went unread by E. W. Silvertooth, although I cited it in my previous letter). We are only seeking funds sufficient to perform the experiment at its full potential; the technology has already been developed at JPL under other programs. The main improvements planned are to replace the hydrogen masers with more stable trapped-ion standards, to isolate and correct sources of systematic error and to allow the Earth to rotate for 100 days or more to maximize the sensitivity of the experiment.

References

1. R. Mansouri, R. U. Sexl, Gen. Relativ. Gravit. **8**, 497 (1977); **8**, 515 (1977); **8**, 809 (1977).
2. C. M. Will, Phys. Rev. D **45**, 403 (1992).

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Refereeing Reform Recommendations

In his satirical letter (June 1993, page 15) Mark Azbel points out that "bad, irresponsible referees are the single most hazardous thing to any [author]." This judgment is confirmed by the 1989–1990 report of a review panel for *Physical Review Letters*, which states that authors gave a grade of C+ to the quality of refereeing. Moreover the panel reports that the time delay from receipt to acceptance of articles submitted to *PRL* is up to *twice* that of most competing journals. The report points out that the reason for this delay at *PRL* is that the editors of competing journals (such as *Physics Letters* and *Europhysics Letters*) are all *active in basic research* and consequently they are also capable to adjudicate. Therefore the review panel suggested that the divisional associate editors start to play a more active role in the refereeing process. However, since this recommendation was made there is no evidence that any improvement has taken place.

I believe that this failure is due to the fact that the divisional associate editors are generally involved only at the end of the review process, and then only when an appeal has been filed. (I understand that this is not the case for papers in particle physics, which are treated differently because *PRL* has had strong competition in this field from other journals and consequently has implemented requests for improvements.) I propose that in all fields (not just in particle physics) the divisional associate editors be involved at the very start of the review process and that they take a central role in selecting referees as well as in reviewing their reports. To avoid excessive work the number of divisional associate editors should be increased, and they could be rotated more often. In many cases the divisional associate editors could determine whether a paper satisfies the special *PRL* criterion of "broad interest" and decide promptly whether it should be sent to a referee or be rejected without further review. As a bonus, I expect that over the years this procedure would lead to a more responsible attitude on the part of referees, because their reports would become known to some of their peers.

At the turn of the century the chief editorial overseer for *Annalen der Physik* was Max Planck, who succeeded Hermann von Helmholtz, while the editor of the journal was Wilhelm Wien.[1] Ultimately the quality of a journal is determined by the caliber of the editorial staff.

Reference

1. J. L. Heilbron, *The Dilemmas of an Upright Man: Max Planck as Spokesman for German Science*, U. Calif. P., Berkeley (1986).

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THE EDITOR OF *PHYSICAL REVIEW LETTERS* REPLIES: Michael Nauenberg raises a number of concerns that I share. However, his letter does not

continued on page 80