

# SCIENCE NEWS®

The Weekly Newsmagazine of Science

A Science Service Publication  
Volume 125, No. 19, May 12, 1984

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Subscription Department  
231 West Center Street, Marion, Ohio 43302

Subscription rate: 1 yr., \$27.50; 2 yrs., \$47.50;  
3 yrs., \$67.00. (Foreign postage \$5.00 additional per  
year.) Change of address: Four to six weeks' notice is  
required. Please state exactly how magazine is to be  
addressed. Include zip code. For new subscriptions  
only call (1) 800-247-2160. Printed in U.S.A. Second  
class postage paid at Washington, D.C. Title  
registered as trademark U.S. and Canadian Patent  
Offices. Published every Saturday by SCIENCE  
SERVICE, Inc. 1719 N St., N.W., Washington, D.C.  
20036. (202-785-2255)  
ISSN 0036-8423

## Letters

### Light thoughts

In Dietrick Thomsen's customarily excellent article "Gravitational Refractions" (SN: 3/10/84, p. 154), the penultimate paragraph refers to the slowing effect of gravity on the passage of light. This stirs up several questions on which you or some of your readers might be able to enlighten me.

- Light from any very remote source should have been considerably slowed by gravity of various intervening bodies. How much, if any, of the Red Shift could this account for?
- The velocity of light in a vacuum,  $C$ , is considered to be a universal constant. What determines or limits  $C$ , as we measure it, to its value of about  $3 \times 10^{10}$  cm/sec? If one assumes that the velocity of light, as measured, is limited by "something," might not this something be a "universal" or a somewhat more local gravitational field?
- When the universe was very young and dense, would not  $C$  have been considerably different than we measure today? Could this relate to observations of superluminal ex-

## This Week

- 292 Gene Defect Linked to a Common Dwarfism
- 292 A telltale bridging when kidneys ail
- 292 Virus hunter's guide
- 293 Recovered comet on track for rendezvous with ICE probe
- 293 Jungle jaws: Giant bee rediscovered on Indonesian islands
- 294 A hot time in the old lava fields
- 294 Gathering string in the cosmos
- 295 Ozone and light accelerate corrosion

## Research Notes

- 296 Biomedicine
- 296 Chemistry
- 297 Earth Sciences
- 297 Science & Society

## Articles

- 298 Swimming for the Good Life
- 300 Even Apples Get the Bruise

Cover: In the pursuit of the better crunch and in the battle against bruises, food scientists have concocted a whole kitchen of technologies that measure the texture of this Rome Beauty and other apples. (Photo courtesy of International Apple Institute)



## Departments

- 291 Letters

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pansion? In other words, perhaps permissible velocities of expansion, and of light, are greater out there on the "fringes" than we reckon.

- Much as the passage of a relatively slow, heavy particle through a medium (e.g., a spherical ball falling through a liquid) sets up a transverse vibration of the bead, could the passage of a photon through the medium of a gravitational field (or an electromagnetic field) initiate the vibrations we perceive as the wave nature of light?

I appreciate your excellent and occasionally light-hearted coverage of developments in the sciences. Keep it up.

H. C. Moyer  
Homewood, Ill.

*The full general relativistic statement is that the speed of light is a constant in a vacuum that is free of gravitational fields. The number is what it is. It is given to us by the universe, and we have no explanation for its value. We can imagine a universe in which it would be some other number, but we don't live there.*

*Gravitational redshift and retardation are re-*

*lated but separate effects. Redshift happens only as the light is emitted. Retardation and bending can happen anywhere in passage. In a dense universe with strong gravitational fields the speed of light would be less than the vacuum, field-free value.*

*The wave-particle duality is part of the essential nature of light (as it is of electrons, protons, etc.). It does not depend on what things pass through.* —D.E. Thomsen

### Light error

I'm sure most readers caught the mistake concerning the decibel scale in the article "Heterodyning with Light" (SN: 4/21/84, p. 253). Each 10 decibels (not each decibel) means a tenfold improvement in receiver sensitivity.

Therefore, the reported improvement in sensitivity by 10 or 30 decibels means an improvement by a factor of 10 to 1,000 in receiver sensitivity. These are impressive results, but not THAT impressive!

David Workman  
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MAY 12, 1984

291