

■ **Schnabel responds:** Bruce Schulte's letter argues that reducing instrumental noise by a factor of 1.5 does not increase the volume of space from which an event can be detected by a factor of $1.5^3 \approx 3$. The information given by Johanna Miller, however, is correct.

For gravitational-wave observatories, both signal and noise sources are usually quantified in terms of signal and noise amplitudes, not in terms of powers as is common for receivers of electromagnetic waves. Thus the signal strength is proportional to the strain of spacetime caused by a gravitational-wave event and is inversely proportional to the observer's distance from the source. The square root, which Schulte's letter mentions, is thus already included in figure 2 of the PHYSICS TODAY story. Note that the y -axis is labeled GEO600 NOISE (relative strain) per square root Hz. Miller's text also provides the value for the achieved noise reduction in power. It was 3.4 dB, which corresponds to a factor of 2.2, whose square root is 1.5.

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Checking numbers on CO₂ forcing

Although I am no more a climate scientist than Robert Adair is, when I saw his letter (PHYSICS TODAY, March 2012, page 8) nearly dismissing carbon dioxide's role in global warming, I couldn't help checking his numbers. Because of what I was taught as an astronomer who once studied planetary physics, I was struck by his paragraph comparing Earth's surface mean energy transfer of 492 W/m² to the present CO₂ forcing of "only" 1.6 W/m². What's relevant, of course, is solely the effect of the differential heating represented by the extra 1.6 W/m², not at all whether there is a much larger total number to compare it with. That comparison seems to be a misleading justification for Adair's claim that "CO₂ forcing leads directly to only a fraction of the 0.8 °C global temperature increase in the past century."

Just assume that the extra 1.6 W is distributed throughout a column of water a square meter in cross section and a mile deep (and that may overestimate the relevant Earth-average surface thermal inertia). You'll find that the heating exceeds 0.7 °C per century,

in nice agreement with the conclusions of "radical" climate scientists about the CO₂ greenhouse effect.

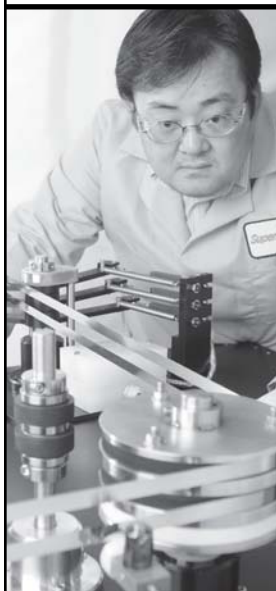
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Resistivity in ordinary and strange metals: A clarification

My Quick Study "From black holes to strange metals" (PHYSICS TODAY, June 2012, page 68) mentioned that the resistivity of an ordinary metal varies quadratically with temperature. I was specifically referring to the contribution from electron-electron interactions; that is the quality that can be directly compared with strange metals, whose resistance is thought to be due to electron interactions. Most ordinary metals receive many contributions to the resistivity and, indeed, the part due to electron-electron interactions may not be dominant until very low temperatures.

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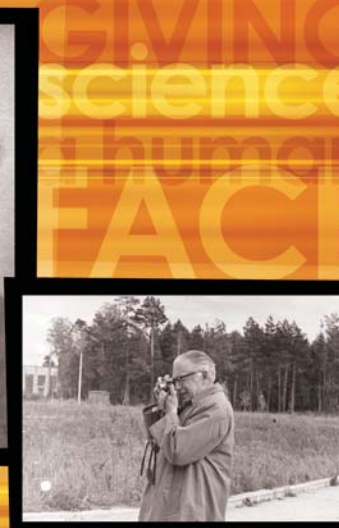
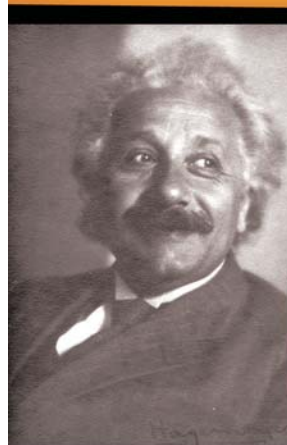
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