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Landslide theories

A possible explanation for long-runout landslides ("When Mountains Fall," SN: 8/29/92, p.136) has occurred to me. A large avalanche may set up intense vibrations in the ground, facilitating the flow of rock fragments.

I don't know if this phenomenon has a scientific name, but it is easy to see that vibrations can help rock fragments flow. Place gravel on a board that has a small incline and then vibrate the board. The gravel will start to flow.

This mechanism also makes testable predictions. It predicts that the size of the runout depends not only on the size of the avalanche, but also on the ability of the underlying earth to transmit or dampen vibrations.

David Petry
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Assuming that many landslides, like the Alaskan slide pictured on the cover, are triggered by large earthquakes, isn't it likely that the energy of the earthquake itself shaking the ground would account at least in part for the great distances covered? Landslide material might be able to travel indefinitely over an essentially flat surface with a slope of only a few degrees, so long as that surface is vibrating from a major earthquake.

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Depending on its form and quantity, water could act as a lubricator of landslides. Water on land sites could be in the form of dew, streams, recent rain, or ice and snow and could be trapped in the rock itself. In liquid form, water would be a decent lubricator, but a thin layer of vaporized water would work even better.

The mass of rock and other material resting on the "slip face" is at the point where an initiating event such as an earthquake could begin the slide. The mass might be great enough to cause vaporization in key points, and Melosh's acoustic energy might initiate or contribute to vaporization. This thin layer of heated and possibly expanded gas may provide the needed lubrication for the landslide. The continued acoustical energy output, along with the mass flow over new water sources, may offset the loss of gas through the flow.

Fredrick J. Terriere
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Has any physicist examined the possibility that the immense amount of kinetic energy being converted to thermal energy is too great to be dissipated in the time involved? In such cases, friction between materials becomes incapable of exerting its usual dampening effect, much as brake failure can result from overheated brake drums. Even in the case of ice and snow, the conductivity and short time involved could be critical: It would explain the correlation of longer runouts with increasing mass.

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These are all ideas that landslide researchers have discussed in the past. At present, it is not clear whether any of these effects plays an important role in making large slides so mobile.
— R. Monastersky