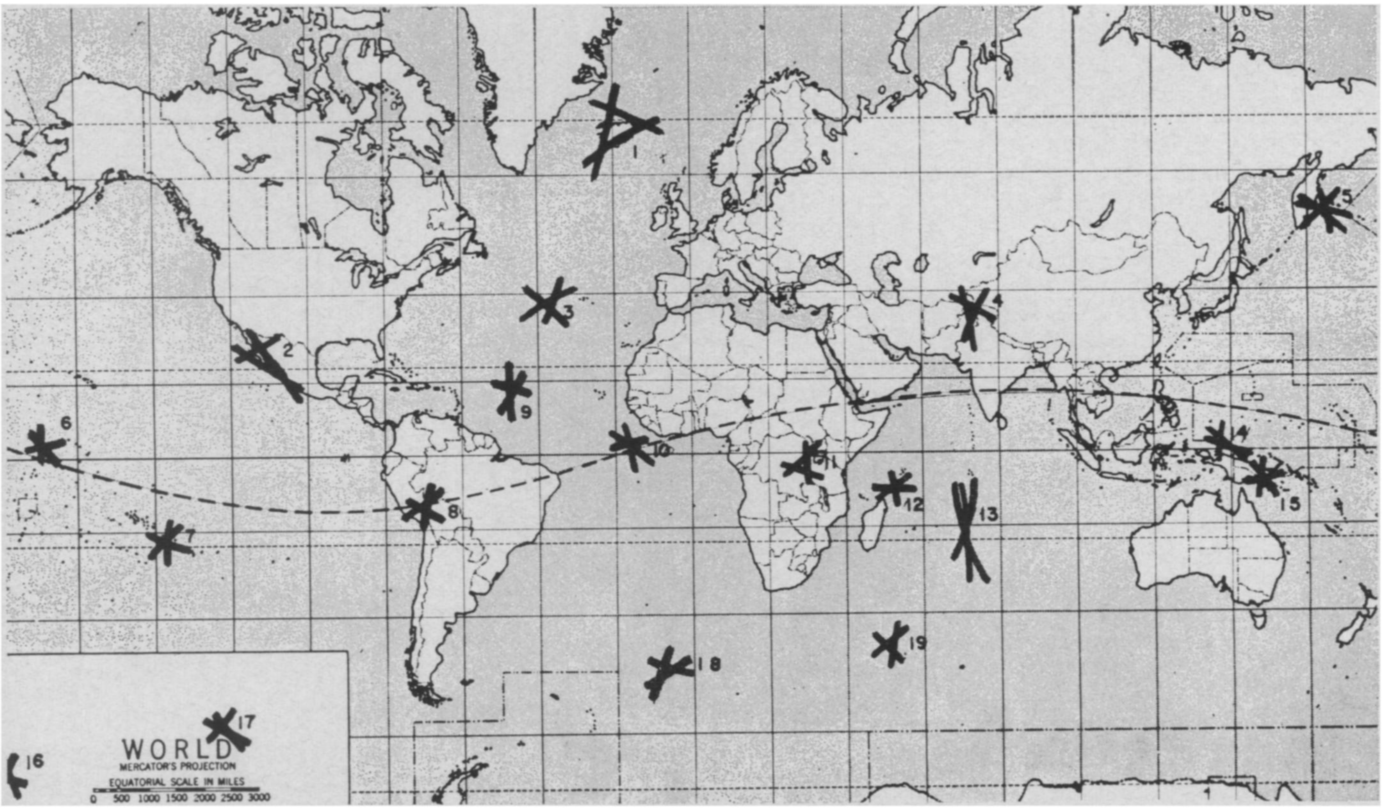

The 19 intersections of the 16 Rouse Belts mark the strongest earthquake zones and give birth to a new theory.

'The E=mc² of solid earth theory'

A simple proposition wraps up earthquakes, metal deposits, gravity and the magnetic field at once

Few things make the average scientist happier than a neat set of data that can tie a wide range of phenomena into one trimly manageable package. Last week, two geochemists at the Colorado School of Mines in Golden announced what may be one of the most unifying ideas in any field in years.

If true, the hypothesis may prove valuable to disciplines ranging from geology and geophysics to oceanography and astronomy. It began with a graduate student's musings about earthquakes, but has rapidly grown to take in such diverse features of the earth as variations in its magnetic and gravitational fields, the shape of its island chains and the locations of rich metal deposits. It may also be related to continental drift, the periodic reversal of earth's magnetic field and the wandering of the magnetic poles.

Earthquakes by and large never move straight up and down. Instead, they strike up at earth's crust at an angle. What started the hypothesis was doctoral candidate George E. Rouse's observation that the deep quake zones around the planet—called Benioff zones—all seem to lie at surprisingly similar angles of about 60 degrees. Wondering why this should be so, he decided to see what would happen if he projected the Benioff zones into imaginary planes passing all the way through the globe.

Using a $1.50 toy globe, Rouse began his first circle at a point of relatively mild seismic activity in Chile. To his surprise, the completed circle also passed through a very active zone in Turkey, the site of a recent quake in the Pyrenees Mountains between France and Spain and another seismically active spot in Venezuela. Intrigued, he drew 15 more circles, beginning at different deep quake zones, and a striking conclusion appeared: Not only was the plane of every circle tangent to the outer core of the earth, but where the planes emerged, they coincided with the Benioff zones of other quake areas, and with volcanic and other seismic areas.

With 16 circles, in fact, Rouse found he had included most of the major seismic features of the globe; five more brought the total to over 90 percent. With the original 16 circles, there are 19 points on the globe at which three circles intersect. "All but five of these trisections occur at zones of major seismic or volcanic activity," says Dr. Ramon E. Bisque, a professor of geochemistry who is now helping Rouse with his research. "Most of the others are in ocean areas that could be or have been active."

Three of the multiple intersections are on continents. One is near Tashkent, Russia, and another north of La Paz, Bolivia—the two most active deep continental earthquake zones in the world, Dr. Bisque says—while the third is in the volcanic Mountains of the Moon region of east-central Africa.

Colorado School of Mines

Rouse, the world and Dr. Bisque.

The significance of the Rouse Belts began to grow when a member of the School of Mines' metallurgy department got a look at the circles and noted with some surprise that they pass through many of the world's major deposits of heavy metals. Since then, Rouse and Dr. Bisque have found that the circles also echo maps of the varying intensity of earth's magnetic and gravitational fields. "Every damn thing we looked at seemed to match," says Dr. Bisque happily.

Another old mystery that has been bothering scientists for years, according to the researchers, also fell right into the Rouse Belt deductions. Mountain ranges, ridges on the ocean floor and island chains all tend to lie in curved lines, Dr. Bisque says. "Everybody knew that, but nobody knew why. But they fit the belts too."

The theory seems almost too neat to be real. What can such a diversity of things have in common, that they should all fit so nicely on one set of lines? The most likely explanation, the Colorado team believes, is that they all are reflections of what is happening at the earth's core. The scientists theorize that the interplanetary magnetic field causes the heavy iron core of the earth to try to rotate on a slightly different axis from the rest of the globe. This creates stress between the core and the mantle surrounding it, which produces mixing of the soil and rock of the mantle with the core's metals.

The stresses of this mixing then would spread out from the point of contact between mantle and core, producing the planes along which earth tremors and volcanic disturbances spread. The metal deposits match because they would rise from the core in molten form to follow the stress lines. The magnetic field matches because of its relation to fluid motions from the core, and the gravitational field would be tied in with the changes in the distribution of the planet's mass. The islands and mountains curve right along with everything else, the theory holds, since they are simply surface effects of the radiating seismic waves.

Again, a neat theory—but almost too much so. If it holds up it is likely to prove valuable to everyone from companies hunting riches on the ocean floor to investigators trying to predict quakes in advance.

Dr. Bisque is a geochemist, however, not a geologist, and Rouse's doctoral thesis is completely unrelated to the subject (if anything can be said to be unrelated to such an all-encompassing hypothesis). So the idea will surely have to run the scientific gauntlet.

One possible chink is Rouse's basic assumption—that the deep Benioff zones do indeed descend at 60-degree angles. There is evidence that many deep quake zones are at much shallower angles, perhaps as low as 40 degrees. That makes no difference, however, according to Dr. Bisque. Even if Rouse was completely wrong, his assumption merely directed him in the placing of the planes. The fact remains that they are nevertheless tangent to the core, and a great number of observed effects do coincide with them.

Another puzzle, which Dr. Bisque admits, is that if the core is in liquid form, as many geologists believe, it may not produce enough force, when it turns against the mantle, to cause stresses all the way up to the surface.

But the theory has its strong proponents. "This may," says Dr. Linn Hoover, executive director of the American Geological Institute, "be the $E=mc^2$ of solid earth theory."

TECHNOLOGY GAP

Europe seeks causes at home

In a recent five-year period, sparked by a rapid growth rate in research-based industry, U.S. investments in Europe doubled. The return flow of European investment in the U.S., starting from a level half as high, increased only 24 percent.

It is a trend that has century-old roots. But as recently as 18 months ago, Western Europeans, increasingly uncomfortable under pressure from the technological behemoth across the Atlantic, coined the term "technology gap" to describe the phenomenon. And ever since—until last week—they have been probing the U.S. in search of some mystique of science policy or research organization to explain the phenomenon.

Now, after months of research, an exhaustive study of U.S. science policy and a series of confrontations and meetings with a Presidential committee on this politically sensitive subject, the search for a mystique has come to an end; the technology gap has gone the way of the other ultrasimplistic terms that, on examination, necessarily fail to explain complex phenomenon.

Last week the science ministers of the European members of the Organization for Economic Cooperation and Development returned to their capitals from a meeting in Paris armed with fresh insights—six months in the making and requiring, perhaps, as many years or more for implementation.

They found in the U.S. no centralized science policy, in contrast to their own relatively rigid structures. They found highly mobile, highly motivated researchers, well supported privately as well as publicly, in a broad range of research environments and a massive market for technological innovation, a market unfragmented by national boundaries or traditional inhibitions to creativity—all in contrast to what they see at home.

"If anything came out of the so-called technology gap discussions," says a member of the U.S. delegation to the string of meetings, "it was a new look at Europe's own fragmented economy and research structure, by the Europeans themselves."

"They're not only coming around," says another. "They've already come."

Though the OECD science ministers won't admit it, and U.S. officials won't take credit publicly, the Europeans have by and large accepted U.S. explanations of disparities in research utilization among nations, and the U.S. view that only Europe itself can do