world in the last three decades. The United States, even at the present time, is very derelict in making explorations in foreign countries for the benefit of its citizens and the conservation of its industries, but if we would lead the world, we must change our policy. Japan is the only country thoroughly awake to the need of foreign exploration. Her scholars are in every quarter of the globe, dozens of them, picking up every grain of information possible for use in the mother country. It is much to be regretted that we have not already adopted the same far-sighted and commendable policy.

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## A SEISMOLOGICAL NOTE

THERE seems to be rather widespread misunderstanding as to the way in which the velocity of seismic waves varies with the density of the medium in which they travel.

From the theory of elasticity it is developed that the velocity of longitudinal waves in an elastic medium is $\sqrt{\frac{\lambda+2\mu}{\varrho}}$ where $\lambda$ is Lame's compression constant, $\mu$ is the rigidity and $\varrho$ is the density. The velocity of transverse waves is $\sqrt{\frac{\mu}{\varrho}}$. For surface waves of the Rayleigh type the velocity is $0.92\sqrt{\frac{\mu}{\varrho}}$ where Poisson's constant is taken as 0.25.[1] In the Rayleigh wave the particle vibrates in an ellipse in a vertical plane which contains the direction of propagation. Uller[2] has also found theoretically a value for the velocity of surface waves which varies inversely with the square root of the density.

Now Angenheister[3] found a greater velocity under the Pacific than under Asia for both types of surface waves, the L and M groups. He also found for nearby earthquakes a greater velocity for the preliminary groups for an under-sea path. Tams[4] and Visser[5] have also found the L group to have a greater velocity for sub-oceanic paths. Gutenberg[6] found for the Chilean earthquake a greater velocity in the M group for a Pacific path than for a path under South America, the Atlantic and Europe. He found the velocity of the L group to be independent of path. But it is important to notice that the phase of very long waves identified by him as the L group, and checked by the writer, are of greater velocity than the group which has usually been identified as L. Thus it is apparently not the group identified as L by other investigators, as Gutenberg suggests. The new velocity is 4.35 to 4.4 $\frac{\text{km}}{\text{sec}}$. For oceanic paths Angenheister found a still greater velocity for L but a lesser velocity for continental paths.

It seems established then that for at least part of the surface waves the velocity under the Pacific is greater than the velocity under continents.

Some writers have cited this increase of velocity under the Pacific as evidence that the density is there greater than under the continents.[7]

But from this increase alone the conclusion would be that of a less density beneath the ocean, since the velocity varies inversely with the square root of the density. It is only when we compare with gravitational measurements which indicate a greater density for ocean bottoms that we are forced to conclude that the greater velocity of seismic waves beneath the Pacific should be explained, as we explain the velocity increase with depth in the earth, by an increase in the elastic constants $\lambda$ and $\mu$ which more than compensates for the increase in density.[8]

Thus we see that the increased velocity of seismic waves beneath the Pacific can not be cited as an evidence of greater density beneath oceans than beneath continents.

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## THE TREATMENT OF WART DISEASE OF POTATOES WITH SULPHUR

IN the "Annals of Applied Biology," XII, 2, 1925, a paper was published by Roach, Glynne, Brierley and Crowther entitled "Experiments on the Control of Wart Disease of Potatoes by Soil Treatment with Particular Reference to the Use of Sulphur." In 1922

[1] G. Angenheister, "A Study of Pacific Earthquakes," *New Zealand Journal of Science and Technology*, Vol. 4, No. 5, 1921; also J. H. Jeans, "The Propagation of Earthquake Waves," *Proc.* Royal Soc. London, A, Vol. 102, 1923.

[2] Karl Uller, *Annalen der Physik*, Folge 4, 56, 1918, S. 463.

[3] *Op. cit.*

[4] E. Tams, *Centralblatt für Mineralogie, Geologie und Paläontologie*, Jahrgang, 1921, 2, S. 51.

[5] S. W. Visser, "On the Distribution of Earthquakes," Batavia, 1921.

[6] "Das Erdbeben in der chilenischen Provinz Atacama am 10. November, 1922," Veröffentlichungen der Reichsanstalt für Erdbebenforschung in Jena, heft 3, 1924.

[7] N. H. Heck, "Earthquakes of 1925," Bulletin of the Seismological Society of America, Vol. 15, No. 2, June, 1925, page 107; also Alfred Wegener, "The Origin of Continents and Oceans," English translation, Methuen and Co., Ltd., London, 1925, page 35.

[8] Angenheister, *op. cit.*