has progressed, and it is because he is still (and rightly) dissatisfied with the answers given that he continues to advance.

There may conceivably be a limit to the acquisitions and interpretations of a finite mind; but man is as yet so evidently in his infancy mentally, psychically, and even politically, that we are in no immediate danger of knocking our heads against that possibly predestined barrier to profitable inquiry Nor do I for one believe that any such barrier exists. There is manifestly an Unknown, but I should hesitate to describe it as the Unknowable.

A. WYATT TILBY.

Howstean, Frinton, Essex.

I AM very glad to accept Mr. Tilby's disclaimer. I did indeed associate his evolution of consciousness with a certain theory of "emergence" made famous in an address to the Psychological Section of the British Association last year. I did not mean to suggest that Mr. Tilby's theory was obscurantist or dogmatic.

THE REVIEWER.

Transparency of Liquids and Colour of the Sea.

IN an earlier note in NATURE (Nov. 24, 1921, vol. 108, p. 402) I pointed out that the scattering of light in its passage through a liquid resulting from the local fluctuations of density, the magnitude of which is given by the Einstein-Smoluchowski relation, should enable its transparency to be determined for the parts of the spectrum in which it does not exercise selective absorption. It should be mentioned that in making an experimental test of this point, account has also to be taken of the scattering resulting from the anisotropy of the molecules and that there is an important difference between this and the scattering due to density-fluctuations. The orientation-scattering is almost completely unpolarised and is therefore distributed symmetrically in all directions. The density-scattering is polarised and is twice as intense longitudinally as in a transverse direction.

The coefficient of extinction resulting from the joint effect of both types of scattering can be calculated theoretically if the compressibility, refractive index, and the ratio of the components of polarisation in the transversely-scattered light are known. Taking the case of benzene as an example, the coefficients of extinction calculated for the 5461 and 4358 lines of the mercury spectrum, which fall in regions in which there is no selective absorption, are respectively 0·00022 and 0·00060. These values agree very closely with the recent experimental determinations of Martin, and form a striking confirmation of the theory. There is little doubt that the observed transparency of many other liquids will similarly be found to be in agreement with theory when accurate data are available.

The case of water is of special interest. Of all ordinary liquids it is the one for which the coefficient of scattering is smallest, and is therefore most affected by traces of selective absorption. There is an absorption band which is clearly marked up to 0·5 μ, and it is possible that traces of it extend into the blue region of the spectrum. For the 4358 line, the coefficient of extinction calculated theoretically is 0·00006 and Martin's observed value is 0·00012. It seems probable that a little farther out in the violet, the transparency may agree more closely with that derived from the theory of scattering.

The newer data now available enables a quantitative test to be made of the theory put forward by me in a recent paper (Proc. Roy. Soc., April 1922) that the blue colour of the deep sea arises from the molecular scattering of sunlight in water, the thickness of the effective layer being determined by the attenuation of the sun's rays as they penetrate into the liquid. The tentative calculations made in that paper have now been revised. The table shows the theoretical albedo of ocean water expressed in terms of the equivalent scattering by dust-free air at normal temperature and pressure.

ALBEDO OF OCEAN WATER.

Wave-length in μ.	0·658	0·602	0·590	0·578	0·546	0·499	0·436
Equivalent kilometres of air	0·5	0·7	1·8	2·8	5·2	7·0	15

It is evident from these figures that the blue of the sea would be much more saturated than the blue of the sky, which is the standard of comparison. The height of the homogeneous atmosphere being 8 kilometres, the sea would be about half as bright as the zenith sky on a clear day. This agrees well with the photometric determinations made by Luckiesh during aeroplane flights over deep ocean water in the Atlantic (*Astrophysical Journal*, vol. 49, 1919, p. 129). Luckiesh makes it clear that the greater part of the observed luminosity of water viewed perpendicularly really arises from light diffused upwards from within the water. His determinations thus appear to furnish a quantitative proof of the theory which attributes the colour of the deep sea to molecular scattering of light.

C. V. RAMAN.

210 Bowbazar Street, Calcutta.

Telescopic Observation of Atmospheric Turbulence.

IN his recent contribution to meteorology, "Physics of the Air" (U.S. Weather Bureau, Washington), Prof. Humphreys refers, in chapters 11, 12, and 14, under the general headings of "Wind Layers" (p. 219), "Wind Billows" (p. 221), "Barometric Ripples" (p. 228), and "Special Cloud Forms" (p. 296), to the demonstration by Helmholtz (translated by Cleveland Abbe, "Mechanics of the Earth's Atmosphere," Smithsonian Institution, 1891) that "adjacent layers of air differ abruptly from each other in temperature, humidity, and density, and therefore may and often do glide over each other with . . . a wave-producing effect." Prof. Humphreys proceeds, of course, to associate these demonstrations with the problems of atmospheric turbulence.

May I be allowed to point out, however, that it is *not* the case, as stated by Prof. Humphreys (p. 219), that "these air waves are *seen* only when the conditions of humidity at the interface are . . . just right" for the condensation of visible clouds—I speak from the experience of personal observations covering, intermittently, a period of upwards of twenty years. These "Wind Billows" or "Air Waves" of Helmholtz's demonstrations are always readily visible in the absence of clouds. The various directions of their flowings, and the order of their temporary stratification, are accurately legible by the method I employ of a projected telescopic image of the sun for the purpose of their observation. The "cautious aviator," instead of succumbing to the idea that he needs must fly in the face of "unknown danger," should know that the early stages of turbulence are—if only the sun is unclouded—at all times conspicuously and spontaneously recognisable by this very simple method of observation.

CATHARINE O. STEVENS.

The Plain, Boar's Hill, Oxford, August 9.