covered with material that renders them almost indistinguishable from the stones and gravel in which they are found than if they were naked.

As regards the use of the peculiar hind legs in the Anomoura and *Dorippe*, perhaps the enclosed extract from a paper read by me on December 12 before the Chester Society of Natural Science may be of interest. It will shortly be published in vol. iv. of the Transactions of the Liverpool Biological Society.

ALFRED O. WALKER.

London, W., January 17.

"An interesting fact, illustrating the ingenuity shown by more than one species of Crustacea in concealing themselves, came under my notice last summer. Having dredged a number of Amphipoda, I placed them in a vessel of sea water till I could examine them. Among them I noticed what seemed to be a piece of dead weed swimming rapidly about and occasionally falling to the bottom. Examination with a lens showed that the piece of weed was carried by an Amphipod (*Atylus swammerdamii*), which grasped it by the two first pairs of walking legs (peræopoda). When it came to the bottom the animal concealed itself beneath the weed, which was much larger than itself.

"In connection with this habit of *A. swammerdamii*, it may be mentioned that another species, *Atylus falcatus* (Metzger), resembles the first-named minutely in every respect but one, viz. that the first peræopod has the claw (dactylus) immensely developed, while at the base of the next joint are two or three strong blunt spines or tubercles into which the point of the claw fits. This would appear to give the latter species a great advantage over its congener in grasping an object for purposes of concealment. It is a rare species, but I have met with a few specimens this summer: I am not aware of its having been recorded as British yet.

"In some of the Podophthalmata the same instinct has been observed, and especially among the Anomoura. All these have the last or hindmost pair of legs of a shrunken and apparently almost abortive form. They never appear to be used for walking, and are generally carried turned up on the back; but they are utilized by some species of curiously shaped, flat-bodied crabs (*Dorippe*) to carry the valve of a bivalve mollusk over their backs, under which they can squat and hide. From this it is an easy transition through various stages to the hermit crabs (*Paguridæ*), which ensconce themselves altogether in a univalve shell, and use the curiously abortive hind limbs to cling to the inside whorls. My friend Surgeon-Major Archer has seen crabs of the genus *Dorippe* protecting themselves (probably from the scorching tropical sun), at low tide, on the mud flats at Singapore, by carrying large leaves over their backs (Journal of Linn. Soc., vol. xx. p. 108)."

I CAN corroborate Mr. Ernest Weiss's remarks on the use of the modified legs of Dromia. A small one I had in an aquarium would, when the sponge was removed from the back, hunt about until it found something—a shell, a pebble, or even a dead fish—to replace the sponge. When there was nothing in the aquarium which it could seize, it was evidently in an unhappy condition.

With regard to foreign substances on other crabs, I have caught spider-crabs so completely covered with sponges as quite to hide their shape, and, until they moved, it was impossible to say what they were.

DAVID WILSON-BARKER.

Thought and Breathing.

WITH reference to Prof. Leumann's researches into the influence of blood circulation and breathing on mind life, referred to in NATURE of January 2 (p. 209), it is worthy of note that regulation and suppression of the breath (*Prānāyāma* or *Hatha-Vidyā*), is an all-important religious observance amongst Hindus.

It is one of the eight chief requisites of the Yoga philosophy, for attaining "complete abstraction or isolation of the soul in its own essence," and minute instructions exist for the exercise, which is adopted, apparently, as an immediate aid to deep meditation. Some of these instructions are quoted in Prof. Monier-Williams's recent work on Buddhism (p. 242), and he also quotes, in connection with this subject (p. 241), Swedenborg's opinion that thought commences and corresponds with respiration.

Swedenborg also says:—"It is strange that this correspondence between the states of the brain or mind and the lungs has not been admitted in science."

R. BARRETT POPE.

Brighton.

On the Effect of Oil on Disturbed Water.

HAVING seen the interesting article by Mr. R. Beynon on the above subject (NATURE, January 2, p. 205), shortly before leaving England, I propose to make a few observations on the theoretical aspect of the phenomena described by him.

The simplest case of wave-motion in a viscous liquid arises when two-dimensional waves are propagated in a liquid whose depth is so great in comparison with the lengths of the waves that the former may be treated as infinite. If at any particular epoch, which we may choose as the origin of the time, the form of the free surface is determined by the equation $\eta = Ae^{\iota mx}$, where $2\pi/m$ is the wave-length, its form at any subsequent time may be represented by $\eta = Ae^{kt+\iota mx}$, and the object of a theoretical solution is to find the value of k. The equation for determining k is given in the last chapter of my "Hydrodynamics"; and it is there shown that if the viscosity of the liquid be sufficiently small, k will be of the form $-\alpha \pm \iota\beta$, where α and β are *real positive* constants. Hence the equation of the free surface, in real quantities, may be written—

$$\eta = Ae^{-\alpha t}\cos(mx - \beta t) \quad . \quad . \quad . \quad . \quad . \quad . \quad (1)$$

which represents periodic motion whose amplitude diminishes with the time, and which therefore ultimately dies away, the rapidity with which the motion decays depending upon the magnitude of α. If, however, the viscosity be large, the solution changes its character, since in this case k is a *real negative* quantity, and the equation of the free surface becomes

$$\eta = Ae^{-\alpha t}\cos mx \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad (2)$$

which represents non-periodic motion, which rapidly dies away.

The phenomena discussed by Mr. Beynon are somewhat different from the special case of deep-sea waves, inasmuch as a thin film of a highly viscous liquid, viz. oil, whose thickness is very small compared with the wave-length, is spread over the surface of water, which is a liquid whose viscosity is so small, that it might probably be neglected altogether. The action of the wind would also introduce an additional complication; but the circumstance that the thickness of the oil is small compared with the wave-length, would, on the other hand, facilitate the calculations which would be necessary in order to obtain a theoretical solution. There can, however, I think, be little doubt that the free surface would be given by equations of the forms either of (1) or (2); where α is so large, that after a short time has elapsed after the film of oil has spread itself over the water, the amplitude of the existing motion would be small compared with that of the original motion.

A. B. BASSET.

Hôtel Beau Site, Cannes, January 11.

Luminous Clouds.

IN the correspondence that has taken place on luminous clouds, totally different classes of phenomena have been mentioned. There are *self-luminous* clouds entirely distinct from what I have termed "sky-coloured clouds," which latter, though by some deemed self-luminous, have been generally admitted to shine by reflecting the direct light of the sun.

The self-luminous clouds described by Mr. C. E. Stromeyer (p. 225) appear to have been a part of the aurora which was visible at the same time; but other correspondents have mentioned self-luminous clouds which have apparently not been of a truly auroral character, and the nature of these clouds seems not to be understood, and requires investigation; there may be various kinds of these and causes of their luminosity. I have myself not unfrequently seen what I call *irregular auroras*, which may be one form of what others call self-luminous clouds. They consist of bands which, unlike regular auroras, appear indifferently in all parts of the sky, and lie in any direction; they are usually much fainter than the Milky Way, and are always feebler near the zenith than near the horizon. The bands composing them are generally parallel, or nearly so, and 3° to 10° wide. They differ from ordinary cirrus in being, so far as I can judge, perfectly transparent, and also in moving extremely slowly, giving one the impression that they are much higher up in the atmosphere than cirrus. Their spectrum is