that divides the bed of the heart-shaped Sea of Serenity can be easily traced. Anyone who has undertaken the preparation of a stereograph with the pencil or pen, knows how very difficult it is to avoid the production of roughness in the combined image at places where smoothness is desired. No two impressions from the same type can be taken that will not present some inequalities when stereoscopically examined, and no two groups of type representing the same sentence can be so accurately adjusted as not to betray imperfection when subjected to this searching test."

For this statement regarding the moon, I was subsequently criticized by an English writer, well known in astronomical circles, who considered it to be extravagant. The test furnished by the photographs of Jupiter is probably even more delicate than that afforded by photographs of the moon's minor inequalities of surface. The observation of "W. J. H." is certainly very interesting. By experiments made in 1882 I found that a plane binocular image became noticeably convex or concave when the pair of diagrams under examination were so disposed as to produce an angular retinal displacement of only 47" (*Philosophical Magazine*, October 1882). By comparing the photographs of celestial objects whose distance is known, it may be possible yet to show that the minimum displacement measured in 1882 is really not quite a minimum. W. LE CONTE STEVENS.

22 Universitätsstrasse, Strassburg, Germany, February 4.

### Notable Palæolithic Implement.

DURING the last five or six years I have lived at Dunstable, and many persons in the neighbourhood now know that I notice old things a little. The consequence is that various objects are now and again presented to me for purchase. These things are mostly no good—common fossils, pieces of "petrified water," shells, coins of the Georges, &c., but at times something worth notice comes to hand.

Late last autumn a number of stones of no value were brought to me; amongst them was a good, flattish, sub-triangular, Palæolithic flint implement which had been picked up in 1830 by a farmer named William Gutteridge on Dallow Farm, near Luton—the late Mr. Gutteridge's own land. The implement had been preserved by the farmer as a curious natural stone, and he had affixed a label to it with locality and date. The person of whom I secured the stone knew nothing of stone implements. I soon ascertained the name and date to be correct from a relative of the late William Gutteridge. In 1830 the Gutteridges had held Dallow Farm for over 150 years.

Dallow Farm is in the valley of the Lea, and three-quarters of a mile west of the river at Luton. The ground is, I think, about 50 feet above the Lea, and from 400 to 450 feet above the Ordnance datum, but the heights on the large-scale Ordnance map are here insufficient. I have never found a Palæolithic implement at Luton, but I have picked up a few drift flakes there, and found a good number of Palæolithic implements a few miles off.

The Dallow Farm Palæolithic tool was found by Mr. Gutteridge seventeen years before M. Boucher de Perthes published his discoveries in France (1847), and eleven or twelve years before he began to notice such objects.

The famous Gray's Inn implement was found in 1690; Mr. Frere's discoveries were made at Hoxne in 1800; the Dallow Farm implement comes next in 1830; and the Godalming implement (Evans, "Stone Implements," p. 529) about 1842.

Dunstable. WORTHINGTON G. SMITH.

### Stereom.

AMONG wants long felt, at least by animal morphologists, is some word that shall express for Invertebrata the idea that the word *bone* expresses for Vertebrata. Words such as *skeleton*, *shell*, *test*, and *carapace* express the whole structure, not the substance of which it is made. Words such as *nacre* and *stereoplasm* express some particular form of hard substance strictly defined from a physical or morphological stand-point. *Sclerenchyma* is the only word that has yet been used in anything like the required sense; but that is confined to corals, and, from its affinity with *cœnenchyma* and the like, it is well that it should be so. Driven back on cumbrous periphrases, I therefore venture to suggest the adoption of the word *Stereom* (στερέωμα, that which has been made solid). This word was used by Aristotle ("De Anim. Part.," ii. 9) for the hard as opposed to the soft tissues of the body, and may, for the purposes of modern science, be thus defined: any hard calcareous tissue forming skeletal structures in Metazoa Invertebrata, and in Protozoa. F. A. BATHER.

February 9.

### Destruction of Fish by Frost.

IN regard to Prof. Bonney's letter of January 26 (p. 295), I would ask whether the fish were not killed by want of air due to the stagnancy of the water in the canal?

The moat here abounds in fish, and several holes were kept open for their sakes during the frost. The first partial thaw set our land-drains running. Where one of these began to pour a little water into the moat, though no fish had been visible since summer, now the largest pike and carp were seen crowding to the aperture, seeming to be gasping for air, and seeking the fresh flow. When the frost departed, scarce half-a-dozen fish—all small—were found dead. It would seem, therefore, that a very slight flow of fresh water would suffice to save fish from death. But this can seldom be wanting in any natural body of water, for few are even the tarns into which no brook runs. So such a cause of destruction can seldom have acted on a scale visible to a geological eye. E. HILL.

The Rectory, Cockfield, Suffolk.

## A DEDUCTION FROM THE GASEOUS THEORY OF SOLUTION.[1]

BEFORE passing on, let me briefly recapitulate the chief points in Van't Hoff's gaseous theory of solution and the experimental laws on which it it is based.

(1) In every simple solution the dissolved substance may be regarded as distributed throughout the whole bulk of the solution. Its total volume is therefore that of the solution, the solvent playing the part of so much space; and its specific volume is the volume of that quantity of the solution which contains 1 gramme of the substance. To avoid confusion, it is best to speak of this as the *specific solution volume* ($v$) of the substance. It is obviously in inverse ratio to the concentration.

(2) In every simple solution the dissolved substance exerts a definite *osmotic pressure* ($p$). This is normally independent of the nature of the solvent. It varies inversely as the specific solution volume (or directly as the concentration), and directly as the absolute temperature (T). We may then write for solutions, as we do for gases, the equation $p \cdot v = r \cdot T$, where $p$ and $v$ have their specialized meanings, and $r$ is a constant for each soluble substance.

(3) The *molecular solution volume* of all dissolved substances is the same if they are compared at the same temperature and osmotic pressure. If $m$ be the molecular weight, $m \cdot v = V$ is the molecular solution volume; and we can now write, as we do for gases, $p \cdot V = R \cdot T$, where R is the same constant for all substances.

(4) This constant R has the same value when the formula is applied to the dissolved state as when it is applied to the gaseous state itself.

(5) The gaseous laws, as I have stated them, are not absolutely true for dissolved matter in all circumstances. Dissociation often occurs, as it may occur in the process of vaporization, thus causing apparent exceptions. But apart from this there are and must be variations from the laws in the case of solutions of great concentration, just as there are in the case of gases and vapours of great concentration—for instance, in the neighbourhood of the critical point.

I wish now to ask your attention more particularly to

[1] Part of an address delivered by Prof. Orme Masson as President of Section B of the Australasian Association for the Advancement of Science, January 1891.



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