

treacle, and the thinner it got the faster it would go round ; so that if we multiplied together the number of revolutions in a second, and the number of square millimetres in the cross-section of the vortex-ring, we should always get the same product, not only in all parts of the ring, but through all time. . . . Thus far Helmholtz, examining into the consequences of supposing that a fiction, serving to represent the actual properties of liquids at rest, holds good also in the case of motion. Here steps in Sir William Thomson with a brilliant conjecture. The ultimate atom of matter is required to be indestructible, to have a definite mass and definite rates of vibration. A vortex-ring in a perfect liquid is indestructible, has a definite mass and definite rates of vibration. Why should not the atom be a vortex-ring in a perfect liquid? If the whole of space were filled with an incompressible frictionless liquid in which vortex-rings once existed, at least some of the known phenomena of matter would be produced. Why should it not be possible in this way to explain them all?" Clifford himself, however, suggests the theory that, since it is probable that an electric current exists wherever an atom is found, an atom may be an electric current.

The authors of "The Unseen Universe" object to the supposition that atoms are vortex-rings generated out of a perfect fluid filling all space, on the ground that the origination of an atom out of a perfect fluid must have involved a breach of continuity; in other words, a direct act of creation, not of development. To meet this *scientific* objection, they suggest that the universal fluid out of which the atom has been developed is an imperfect one and not absolutely frictionless. The consequence, however, of even an infinitesimal amount of friction would be that the vortex-motion would not go on for ever; in other words, that the material atom itself is not indestructible, but may have been evolved by a natural process out of the unseen, and may eventually so return again into the invisible. "In fine," say these authors, "if we suppose the material universe to be composed of a series of vortex-rings developed from an invisible universe which is not a perfect fluid, it will be ephemeral, just as the smoke-ring which we develop from air, or that which we develop from water, is ephemeral, the only difference

being in duration, these lasting only for a few seconds, and the others it may be for billions of years. Thus we come to the conclusion that the available energy of the visible universe will ultimately be appropriated by the invisible; and we may now perhaps inquire, at least as a possibility, whether the separate existence of the visible universe will share the same fate, so that we shall have no huge, useless, inert mass existing in after ages, to remind the passer-by of a form of energy and a species of matter that is long since out of date and functionally effete. Why should not the universe bury its dead out of sight?"

A beautiful poem by J. T. Trowbridge, in a recent number of the *Atlantic Monthly*, which has evidently been inspired by such speculations, thus powerfully refers to this tremendous process of dissolution:—

"And I pondered—'Change is written
Over all the blue, star-litten
Universe;—the moon on high there, once a palpitating sphere,
Now is seamed with ghastly scissures,
Chilled and shrunken, cloven with fissures,
Sepulchres of frozen oceans and a perished atmosphere.

"Doubtless, 'mid yon burning clusters
Ancient suns have paled their lustres,
Worlds are lost with all their wonders, glorious forms
of life and thought,
Arts and altars, lore of sages,
Monuments of mighty ages,
All that joyous nature lavished, all that toil and
genius wrought.

"So this dear, warm earth, and yonder
Sister worlds that with her wander
Round the parent light, shall perish; on through
darkening cycles run,
Whirling through their vast ellipses
Evermore in cold eclipses,
Orphaned planets roaming blindly round a cold and
darkened sun!

"This bright haze and exhalation,
Starry cloud we call creation,
Glittering mist of orbs and systems, shall like mist
dissolve and fall,
Seek the sea whence all ascendeth,
Meet the ocean where all endeth:
Thou alone art everlasting, O thou inmost soul of
all!"

This return of the visible universe into the invisible is the substratum of the special theory of future existence advanced by the authors, in order to meet the materialistic objection that consciousness cannot be supposed to survive the disorganization of the