

to do so, they may keep their bodies alive for ever; they must only let the "supply equal the loss." We submit that Mr. Wettstein's main position is not only in accordance with all our actual knowledge, but the only possible philosophical position. We are compelled to postulate the indestructibility of the substance of which the universe consists, but this necessarily implies the transiency of the various forms which that substance assumes in the process of evolution. If we are not fully entitled to dogmatize in saying that "Out of a nebula we came; into a nebula we shall return," because there are suns that have become dark, dead bodies instead of turning into clouds of gas, and because there are streams of meteorites that may be either the *débris* of a shattered world or the materials for a new one, at all events we cannot assert that any world can go on collecting cosmic materials "for ever" or "grow indefinitely." Such a theory necessarily implies that some one world must eventually accumulate around its centre the whole substance of the universe, and thus put a stop to all further evolution, including its own "indefinite growth." It is equally difficult to admit the validity of the notion that our sun "may still go on for ever, . . . if the supply equals the loss," for it is palpable to any observer that the supply of "coarse matter" in the inter-stellar spaces is extremely variable, and that it would be impossible to maintain an even balance between supply and loss.

Mr. Wakeman opposes the notion that "what has a beginning must necessarily have an end," as implied in the phrase "worlds are born and die." He says:

"The notion that the sun cannot [grow older indefinitely] is a biological analogy from plants and animals which does not apply at all to the universe or to solar systems. . . . The *DIE* idea is absurd, except when used to describe the ceasing of the life-process of some microbe plant or animal. The attempt to biologize the universe so as to 'introduce death' into it is simply absurd."

This, of course, is but a corollary of the preceding notion. But, amid a mass of semi-comic sentences intended to overwhelm Mr. Wettstein, Mr. Wakeman fails to avoid bearing testimony to the fallacy of the thesis he is supporting. After speaking of the sun as a "noble young star," he says:

"Under the law of correlation and 'supply and demand,' we bet on the sun FOR EVER, or *until* it catches the star Lyra, which is also on the fly, being pulled, pushed, or floated, and which it may overtake and appropriate by 'benevolent assimilation,' and thus commence a more wholesale and still grander 'for ever.'"

This prognostication is given on the authority of Prof. Newcomb's article in *McClure's Magazine*, July, 1899. It is almost needless to point out that these ideas of growth and change, 'benevolent assimilation,' and so on, are totally subversive of and contradictory to the ideas of permanent stability previously enunciated. If our sun is a "young" star, what will it be when it is an "old" one? If we say it is young, and will grow old, why object to such terms as "born" and "die," simply because they are used instead of "beginning" and "end"? Then we might ask Mr. Wakeman what he thinks the process will be when the sun—our "noble

young star"—shall possibly overtake the star Lyra? Could it be fitly described as "gradual appropriation"? Will Prof. Newcomb tell us how the "gradual appropriation by benevolent assimilation" of the star Lyra by our sun will fit his theory of the permanent stability of the solar system? Is our solar system the only permanent one in the universe? Are we not getting back to the Mosaic cosmogony and geocentricism? Professor Newcomb will probably tell us what meaning we are to attach to the word "gradual" when applied to the collision of two such bodies as our Sol and Lyra, with their attendant planets. "Gradual assimilation!" And will our earth and its fellow planets be still "permanently stable" when the two suns have made their junction? As we said at first, we have no intention of discussing the Nebular Hypothesis, nor do we propose to dogmatize upon the subject. At the same time, when theories are advanced on the strength of the names of prominent scientific men or of reputable periodicals, it is but right that they should be discussed in the light of what knowledge and logic we possess, and not blindly accepted on even the highest authority. In this view, it is rather depressing to find a man in Mr. Wakeman's prominent position, after putting forward such self-contradictory ideas with so much assumption and dogmatism, meekly requesting "Mr. D. K. Tenney to give the truth about them and their bearings,"—[the photographs of nebula referred to by Prof. Serviss]. He would have done well had he obeyed his own decision at this point, when he says: "We shall wait until we get the actual truth from him or Prof. Serviss, or some other source." He would have saved himself from some of the dangers inherent in dogmatism on subjects beyond human knowledge.

After thus denouncing Prof. Serviss's theory, and in place of it supporting Prof. Jacoby's theory of the "permanent stability" of the solar system, Mr. Wakeman cites John Stuart Mill as recommending that, "if you must have hypotheses, there is no sense in making them pessimistic, especially against the facts." We doubt if Mr. Mill ever uttered a sentiment like this in such crude shape, but even if he did, the fact only proves that small minds have no monopoly of the utterance of foolish aphorisms. The remark is open to the radical objection, that the pessimistic appearance of a certain theory is chiefly a question of the point of view. The first requisite of a hypothesis is, that it shall be in accord with all known facts; even if so, it is not necessarily true; but it is clear that, if true, a hypothesis can only be pessimistic if viewed from a false standpoint. Mr. Wakeman, in his verbose discussion of the Nebular Hypothesis, puts before us two hypotheses,—the indefinite growth of worlds and their combination or assimilation, and the permanent stability of the solar system. Now, without any further discussion of these two hypotheses, we may say definitely that they are mutually destructive. Even if we permit ourselves to admit that one of them might be true, both cannot possibly be true. Probably both are false. But what sense is there in applying the term "pessimistic" to any such hypothesis? To a pious