

**THE METAPHYSICAL  
WORTH OF THE  
ATOMIC THEORY**

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The Metaphysical Worth of the Atomic Theory by Francis Kennedy

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## ATOMIC THEORY.



By

**Dr. FRANCIS KENNEDY.**



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## THE METAPHYSICAL WORTH OF THE ATOMIC THEORY.

There are in general two possible questions concerning the validity of the atomic theory; firstly, that of its value to natural science—secondly, that of its value to metaphysics.

The former of these questions we shall not, on account of lack of space, here consider. Fechner, by his admirable defense of the atomic theory, has made such an examination superfluous, for he has gathered together in the most thorough and convincing manner all of the many grounds of the scientific atomic hypothesis.\* We therefore shall not attempt to enter into this question but, basing ourselves on Fechner, we shall rather presuppose the full validity of the scientific atomic theory.—Thus is the following to be considered neither a defense of nor an attack upon this hypothesis of science. Our problem arises as soon as the validity of the atomic theory is presupposed or proven and is thus a purely metaphysical one.

Having thus presupposed the truth of the atomism of science we turn from this our necessary starting point to the question proper. This falls into three minor problems—

I. As introduction and condition of what follows; what is the relation of metaphysics and science in regard to the atomic theory?

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\* "Physikalische und philosophische Atomenlehre" 1864.—See also Lotze "Streitschriften", Heft I, 1857, Cap. I., and Wundt "Logik", II. 1, 1894, Seite 429 ff., 513 etc., etc.

## I.

What is the relation of science and metaphysics to each other in regard to the scientific atomic theory?

The only relation between metaphysics and the scientific atomic theory which here concerns us is one of objective logic. Our question is that of whether any necessary metaphysical import is contained in this hypothesis.

Here at the very beginning certain difficulties arise which must be immediately considered, for such a question as the above can no sooner be asked than it is straightway denied that metaphysics and the atomic theory come into relation at all, or that the atom has any metaphysical significance. The grounds for such a denial are in general two, which we must consider separately.

In the first place it is customary to banish the atom from the realm of metaphysics by means of the conjuring word "auxiliary concept" (*Hilfsbegriff*), for if the atom be *merely* such, then metaphysics has no occasion to trouble herself about it.

Now it may first of all be doubted that the term auxiliary concept may with justice be applied to the atom, for the former is *essentially* a concept without an object: in other words could the existence of the atom be proved then the concept would no longer be merely auxiliary. But the problem of the existence of the atom is, as is evident and as we shall later attempt to prove, one for metaphysics alone, with which science has nothing to do. Therefore

whether the concept atom is to be considered merely auxiliary or not depends upon a metaphysical view of a purely metaphysical problem. It thus seems unjust to apply this term to the atom in so far as it is a product of pure science.

But it ultimately makes little difference to us whether this term be employed or not, for it in reality offers no solution to the problem that is essentially bound up in the atomic concept and for the following reason.

In the first place it must be pointed out that the concept is a necessary one, whatever else way be predicated of it. Science is driven to it with the necessity which reigns in her sphere and it is already implicit in her very starting point. This indeed is to be admitted generally.

But what concerns us more is that the concept whether auxiliary or not necessarily includes the characteristic of existence. Now it must in this connection be remembered that we are speaking of the atom only in so far as it is treated by science alone, and we mean to say that the concept thereof as such essentially includes the determination of existence. That this is true must immediately be seen from the fact that to science atoms are ever and always causes. This is certain for if they were not conceived as such they could serve no purpose of hers. It must moreover be observed that they are causes of such effects as can by no endeavor be classified as mere auxiliary concepts. But if the atom is to be conceived as a cause, the concept thereof certainly includes the characteristic of reality, for reality is a necessary determination of the concept cause.\*

It therefore matters little from our point of view whether the term "mere auxiliary concept" be applied to the atom or not. What concerns us is that it is a necessary concept which essentially includes the determination reality.

The second objection to our introductory question comes

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\* By this we do not, of course, mean to answer by one stroke the problem of the metaphysical existence of the atom, for this constitutes the central problem of our whole essay.



from a view of the world arising from the theory of knowledge. The epistemologist goes out from actual experience to determine the concept of possible experience. Working as he does on the purely conceptual aspect of experience, a tendency arises which, in a case like ours, seldom fails to make itself known; namely the spontaneous identification on the part of the epistemologist of the actual and possible in so far as they relate to experience.\* Or to be more exact, the former concept is taken up into the latter and thus disappears. The fallacy (for such it is) in its fullest form appears in the statement that whatsoever belongs to the concept experience belongs to experience. It is simply the failure to distinguish between the intuitive and conceptual aspects of experience. Now the epistemologist seems to have little difficulty in placing the atom or system of atoms under his concept of experience. Belonging thus to experience in general it would offer no special problem to metaphysics and she would be no more called upon to treat it than to treat any other object of experience.

Now by making use of our former conclusion as to the relation of the determination existence to the atomic concept and by applying the just mentioned fallacy it would not be difficult to defend ourselves in respect to our introductory question concerning the relation of metaphysics to the atomic theory. For it would be easy to show, as is immediately apparent, that the atom, although necessarily conceived as existing, is not a member of *actual* experience and that therefore the above mentioned subsumption of the epistemologist and his deduction therefrom are false. This, as is evident, would suffice to prove that the scientific atom-system does constitute a special problem for metaphysics. We, however, wish to go one step further in the matter in order to show that the original mistake of the epistemologist is his subsumption

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\* Kant did of course make this distinction in his "Postulate des empirischen Denkens überhaupt". (Kritik der reinen Vernunft, 1787, S. 265 ff.)

of the concept atom or system of atoms under the concept *possible* experience; in other words we desire to prove that the atom is not an object of possible experience. If we can succeed in this, our end will evidently be accomplished.

Kant has shown that "was mit den formalen Bedingungen der Erfahrung (der Anschauung und den Begriffen nach) übereinkommt, möglich ist,"\* which is certainly a universally acceptable construction of the concept possible experience. Among these condition of experience the "System der Grundsätze"\*\*\* contains the following two:

a) "Alle Anschauungen sind extensive Grössen".

(*"Axiome der Anschauung."*)

b) "In allen Erscheinungen hat das Reale, was ein Gegenstand der Empfindung ist, intensive Grösse, d. i. einen Grad."

(*"Anticipationen der Wahrnehmung."*)

It would also be impossible to find any fault with these principles. We shall consider them separately.

a) If the atom as described by science, that is as existing in space, be an object of possible experience it must possess extension. But in the third part of this essay we shall seek to show, aided by Lotze, Hartmann and others, that the atom must be conceived as being punctual, that is unextended. This proof we are unfortunately, on account of the lack of certain material, compelled to defer but we direct the reader immediately to it. If this be so and the atom be unextended it is then not an object of possible experience.

b) In the second place, every object of experience which exists in space must have an intensive content. Now in the case in hand—that is in respect to an object in space—this intensive factor is sensation (*Empfindung*). Therefore the atom to be an object of experience must have a sensational content, as is otherwise evident.—Now according to

\* "Kritik der r. Vernunft", 2te Aufl., 1787. S. 265 ff.

\*\* In the "Kritik der r. Vernunft".

science herself, corresponding to every sensational factor of outer experience there must on the mechanical side be some equivalent physical term. According to the view of this mechanical sphere implicit in the atomic theory, this physical term is motion and can be nothing else.\* Therefore corresponding to every sensational element of outer experience there must exist, on the purely mechanical side, a certain quantum of motion. From this it is evident that there must always remain a certain quantum of motion in the purely mechanical sphere which cannot correspond to purely quantitative (mechanical) terms of experience but must have its equivalent in intensive (sensational) elements thereof. But the atom, as noticed, must, in order to fall within experience, have a sensational content.

In other words, the greatest quantum of motion possible within the limits of experience cannot be greater than the sum of motion in the purely mechanical sphere (= atomic system) as described by science, *minus* that quantum of motion which corresponds to the intensive factor of outer experience. But if this be so, the mechanical world of atoms as existing in the spacial interrelation described by science is not as such an object of possible experience.\*\*

According to the foregoing we may describe the atom as a necessary concept which includes existence as one of its essential determinations and which cannot be subsumed under the concept possible experience. Or in other words, from the standpoint of science, hyperempirical reality is a necessary attribute of the system of atoms.

If this be valid it is at once evident that we have justified the necessity of our initial question and that the

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\* Cf. Wundt, "Die physikalischen Axiome und ihre Beziehung zum Causalprincip", 1866. The first of these axioms is — "Alle Ursachen in der Natur sind Bewegungsursachen."

\*\* We must here repeat that we by no means wish to imply that this "system of atoms" does possess metaphysical reality. We desire only to show that the concept thereof cannot be subsumed under the concept possible experience.