identical with the disposition of atoms suggested by Sir William Bragg for the molecule of benzene" (Challenor and Ingold, Trans. Chem. Soc., 1923, 2068), it will scarcely be maintained that Dr. Turner's suggestion of a possible stable para-linkage in diphenyl derivatives introduces any essentially novel consideration to the question of the structure of these compounds. I also referred in my letter to the remarkable behaviour of diphenyl towards ozone, mentioned by Dr. Turner, as well as to certain other noteworthy properties of the compound.

It should perhaps be pointed out that although, as Dr. Turner states, the formula considered by him contains four asymmetric carbon atoms, it would be incorrect to suppose that it therefore demands the existence of a correspondingly large number of stereoisomeric forms of 2 : 2′-derivatives of diphenyl. For the respective distributions of the groups attached to the pair of asymmetric carbon atoms in either benzene nucleus are not mutually independent, so that only one asymmetric atom in each nucleus is effective as a source of stereoisomerism.

In conclusion, I need scarcely say that experiments on the isomerism in question are being actively prosecuted in this laboratory, and are by no means limited to 2 : 2′-derivatives of diphenyl.

J. KENNER.
The Chemical Department, The University,
Sheffield, September 25.

Waves and Quanta.

THE quantum relation, energy $= h \times$ frequency, leads one to associate a periodical phenomenon with any isolated portion of matter or energy. An observer bound to the portion of matter will associate with it a frequency determined by its internal energy, namely, by its "mass at rest." An observer for whom a portion of matter is in steady motion with velocity βc, will see this frequency lower in consequence of the Lorentz-Einstein time transformation. I have been able to show (*Comptes rendus*, September 10 and 24, of the Paris Academy of Sciences) that the fixed observer will constantly see the internal periodical phenomenon in phase with a wave the frequency of which $\nu = \frac{m_0 c^2}{h\sqrt{1-\beta^2}}$ is determined by the quantum relation using the whole energy of the moving body—provided it is assumed that the wave spreads with the velocity c/β. This wave, the velocity of which is greater than c, cannot carry energy.

A radiation of frequency ν has to be considered as divided into atoms of light of very small internal mass ($< 10^{-50}$ gm.) which move with a velocity very nearly equal to c given by $\frac{m_0 c^2}{\sqrt{1-\beta^2}} = h\nu$. The atom of light slides slowly upon the non-material wave the frequency of which is ν and velocity c/β, very little higher than c.

The "phase wave" has a very great importance in determining the motion of any moving body, and I have been able to show that the stability conditions of the trajectories in Bohr's atom express that the wave is tuned with the length of the closed path.

The path of a luminous atom is no longer straight when this atom crosses a narrow opening; that is, diffraction. It is then *necessary* to give up the inertia principle, and we must suppose that any moving body follows always the ray of its "phase wave"; its path will then bend by passing through a sufficiently small aperture. Dynamics must undergo the same evolution that optics has undergone when undulations took the place of purely geometrical optics. Hypotheses based upon those of the wave theory allowed us to explain interferences and diffraction fringes. By means of these new ideas, it will probably be possible to reconcile also diffusion and dispersion with the discontinuity of light, and to solve almost all the problems brought up by quanta.

LOUIS DE BROGLIE.
Paris, September 12.

The "Concilium Bibliographicum."

IN the commentary added to my letter concerning the "Concilium Bibliographicum" which appeared in NATURE of June 30, p. 880, some doubts were expressed regarding the continuous appearance of its cards. May I be permitted to emphasise again that our cards are issued and delivered as heretofore to our subscribers.

Another publication of the Concilium is the "Bibliographia Zoologica," of which volumes 30 and 31 have been published and vol. 32 will be sent out shortly, indicating definitely that this zoological bibliography is not a new undertaking of the Concilium.

No doubt it is a rather complicated question to decide whether or not this zoological bibliography in book form is a duplication of the "Zoological Record." It must be recalled that apart from completeness, promptness, and accessibility, carefulness and the procedure in the arrangement of the bibliographical work play a very important rôle. Indeed, as for every application of scientific procedure, it is not only the tools but also the degree of ability to use them which governs the appreciation of those who have to work with them. One works better with one method, another is more adapted to the use of another. To all these points have to be added as important factors the influence of different education and local tradition.

In making a plea for a co-operation between the "Zoological Record" and the bibliographical service of the Concilium, a condition which unquestionably could be of real value to the zoological world, the writer wishes to suggest that these various important points of internal character be seriously considered.

When it was decided in 1921 to continue the book-form of the "Bibliographia Zoologica," the material to be published was so extensive that it was impossible to treat the whole animal kingdom in every volume. But this is certainly not a misfortune, for it is evident that a bibliography of titles has not only an immediate value, but also represents to a great extent a source for continuous reference.

J. STROHL,
Director of the "Concilium
Zurich. Bibliographicum."

Long-range Particles from Radium-active Deposit.

IN the letter which appeared in NATURE of September 15, p. 394, under this heading, by Dr. Kirsch and myself, there are two errors which obscure the sense of our communication. The maximum range of the H-particles expelled from silicon should read 12 cm., the corresponding number for beryllium being 18 cm., instead of vice versa. The last sentence should read: "Our results seem to indicate that an *expellable* H-nucleus is a more common constituent of the lighter atoms than one has hitherto been inclined to believe," the word in italics being omitted in the printing.

HANS PETTERSSON.
Göteborgs Högskola, Sweden.

[The transposition of the values 12 cm. and 18 cm. was the fault of our printers; and we much regret it. The omission of the word "expellable" was due to the authors, who did not include the word in their letter. Two separate proofs of the letter were sent to Dr. Kirsch at Vienna, but neither was returned.—EDITOR, NATURE.]