Observatoire National, Paris, XIVe, or to the undersigned.

They should arrive not later than the beginning of March.

R. A. SAMPSON,
President, International Time Commission.
Royal Observatory, Edinburgh,
December 10.

Experiment and Philosophy.

THIS letter is a dogmatic rejoinder to nobody in particular.

There is a wise Scots saying which warns us against showing half-done things to " bairns and fules." It ought to hang as a text by the bedside of every scientific researcher, with a note appended that " bairns " is to be glossed " non-scientific thinkers and the educated public." The Great Educated Public thirsts, very properly, for knowledge ; but it loves best, if it can, to get the wine of learning all raw from the presses, dispensed by the vintners themselves, and to suck it up through the sweet straw of analogy. Of late years there has been a remarkable indulgence of this crude taste for " the last word in science " ; and one immediate result has been that a good many metaphysically-minded folk have hastily engorged certain possibilities, perceived and put forth by men of science to be further tested by men of science, but forming draughts too heady and unmatured for the novice. Dazzling themselves with the tentative speculations of science, such pseudo-philosophers comfortably conclude—see them at it in any of the current reviews—that, after all, the scientific method can now be proved (with the aid of its own results !) to be merely argument in a circle.

So : all is well ; the lamb of mysticism can now lie down with the lion of science, for the poor lion is exposed as nothing but a cud-chewing ruminant. Surely it is time that the lion gave a gentle roar or two, if only as a salutary reminder to the lamb who skips up bleating for more room than the lion is ready to concede ?

The root of the trouble seems to lie in this : that non-scientific people are in such impetuous haste to " know " (as they are pleased to call the process of " being informed ") that they will not understand the need to wait patiently for years—in large questions, for centuries—before suspicions now private to first-hand inquirers can be turned into public assertions. " Here's the latest," they seem to say ; " let's have it ; fling away what went before it and what went to make it." Yes ; and fling away *this* latest, too, in a little while, so soon as real science shall have caught up with it and have made it a trifle dull and *démodé* because surer and better-balanced ; and fling away, at the ghost of a permissive hint, whatever may any more obscure the glorious verities of untutored guessing. " How much better and finer it is (besides being much less trouble) to be able at last to ignore, as of old, the figments of science ! (Of course, we don't mind using soap, we don't mind telephoning to our doctor to come quickly in his car to diagnose and cure our ailments, or to the surgeon to save our lives and minds—*these* scientific figments we tolerate, for we *like* them !) "

All this would not matter very much—the unlearned will perhaps know better in a few generations—if it were certain that it will not prejudice experimental science. But we buy a book purporting to teach the experimental man of science the inwardness of his business ; we expect, perhaps, a helpful exposition of Whitehead's sane, lucid, and logical " Pan-physics," or else the elements of logical inference ; but we get a confounding blend of two or three universes of discourse, an ambitious and premature synthesis of the only partially-analysed, which leads the working human reader into a barren and impotent finality.

The motto of this journal, Wordsworth's sentence, surely abides, nor can it be wrested from its meaning by crying (with the materialists of last century) that Nature includes all mind. No experimenter holds, in his inmost soul, the converse ; namely, that mind includes all Nature, has indeed created it ; nor will he admit, for generations still to come, that our real knowledge yet suffices to probe the vast theorems that our hurrying philosophers broadly accept as already settled. Of those lugubrious thinkers, those reactionaries whose claim once again is *Totam Asiam peragrare*, and who seek to cast three hundred years of patiently-won lore into the melting-pot, to gain the Indies out of the crucible : of these none are experimenters. They are like the jaded urban hero in the story, whose regeneration depends on his coming " close to the green and growing earth " ; they have attenuated honest sense-facts by unremitting abstractions to the nth degree ; they have lost the last touch with reality.

The working man of science at least has his feet well planted in the solid ground of observation ; and if the soaring philosophers accuse him, on the contrary, of having his head too tightly embedded in that same ground, let him at all events show them that his protruding extremities nevertheless have not lost the power of vigorously kicking.

THOMAS HOBBES, Junior.

A pp' Group in the Arc Spectrum of Zinc.

ONE of us (R. A. S.) in a study of pp' groups in atomic spectra, which will be published in full later, has observed that in many two-valence-system spectra the frequency of the first pp' group is nearly a mean between the frequency of the first line of the principal series of singlets in the spectrum and the first line of the principal series of doublets of the once more ionised atom.

The rule holds for the pp' group in cadmium given by Ruark (*J.O.S.A.*, vol. 11, 1925, pp. 199) where we have

Cd I, $1S - 2P$	$v = 43691$
Cd I, $2p_1 - 2p_1'$	$v = 44088$
Cd II, $1s - 2p_1$	$v = 46618$

We were accordingly led to apply this rule to zinc where an exactly analogous group to that in cadmium was easily located.

The complete cadmium group as given by Ruark is :

λ.	Int.	v.	Classification.
2329·27	10R	42918·6	$2p_2 - 2p_1'$
2306·61	5R	43340·3	$2p_1 - 2p_0'$
2267·46	5R	44088·6	$2p_1 - 2p_1'$
2239·86	5R	44631·7	$2p_0 - 2p_1'$

$$\Delta p_1 p_2 = 1170 \cdot 1, \quad \Delta p_0 p_1 = 543 \cdot 1$$
$$2p_1' = -2206 \cdot 6 \text{ cm.}^{-1}.$$

The group is anomalous in that only four lines appear instead of six lines as in a normal pp' multiplet, but the classification is fixed by the known Zeeman pattern of the line $2p_1 - 2p_0'$.

In zinc we find a similar group of four lines which we have classified as follows. The wave-lengths of Eder are used.

λ.	Int.	v.	Classification.
2104·34	2	47505·7	$2p_2 - 2p_1'$
2096·88	2	47674·7	$2p_1 - 2p_0'$
2087·27	2	47894·0	$2p_1 - 2p_1'$
2079·10	2	48082·2	$2p_0 - 2p_1'$

$$\Delta p_1 p_2 = 388 \cdot 3, \quad \Delta p_0 p_1 = 188 \cdot 2$$
$$2p_1' = -4629 \text{ cm.}^{-1}.$$