said to occur between living persons at a far distance from one another, by attributing them to an unknown power which was long ago named 'telepathy' by one of the founders of the Society for Psychical Research.

Dr. Tillyard, in his review of the "History of Spiritualism" in NATURE of July 31, says that psychical research purports to be the scientific study of what are called "super-normal phenomena"; and divides this study into two parts, calling the first 'physical,' the second 'mental.' In the mental part, however, are included practically all the various phenomena' known generally under the term 'spiritualistic.' Seeing that the present discussion has been mainly concerned with these phenomena, I desired to make it quite clear that I was dealing only with that department of psychical research which was concerned with such phenomena as may be strictly called 'ghostly.'

Touching Dr. Tillyard's call upon me to explain what 'trance' is, I reply that I do not know. But although he says he does not know the difference between trance and sleep he knows more than I do about this matter, for he states in NATURE of Aug. 28 that "Usually the medium is in deep trance and knows nothing of what is occurring." I have seen several 'occult' cases in which strange phenomena have occurred during a period when the medium, often invisible but sometimes not so, has been stated to be in trance, and have heard first-hand accounts of many similar cases. But I have never known or heard of any independent examination being made to test the medium's alleged condition. The phenomena produced at séances with trance mediums play an important part in the exhibitions of 'super-normal phenomena,' the reports of which excite popular curiosity and pervade the journalism of to-day.

BRYAN DONKIN.

I CAN find in Sir Arthur Conan Doyle's letter in NATURE of October 16 no explanation or withdrawal of his grave but, as I have shown, entirely untrue accusation that a statement that I made about him in the issue for September 25 was a "pure invention" on my part.

A. A. CAMPBELL SWINTON.

40 Chester Square, S.W.1,
October 16.

MAY I add to—and I hope end—my correspondence with Mr. Campbell Swinton by saying that I regret that I used the term "pure invention" in alluding to one of his statements, since his conclusion was a natural one with the information which he then had at his disposal.

ARTHUR CONAN DOYLE.

October 21.

The Electrical Charges from Like Solids.

THE uncertainty as to the charges arising on insulating solids when rubbed together has ever provided perplexities for the investigator and pitfalls for the lecturer. I have shown in previous papers (*Proc. Phys. Soc.*, 1915, and *Proc. Roy. Soc.*, 1917 and 1926) that a clean solid, say glass, may have entirely different qualities according to the previous treatment of the surface. Ordinary dirt, adsorbed films, temperature change, and, in particular, strain left on the surface by the rough pressure of other solids, are variables which vitally influence surface electrification.

In the present brief note I want to direct attention to the charges found when two *like* solids are rubbed or struck together. Ebonite is very convenient for the purpose. Two rods of this substance are cut from the same sheet and mounted with sealing wax in glass tubes which serve as handles. The free ends of the ebonite are thoroughly but *lightly* scraped with a razor blade and then boiled for a few seconds in water. After drying and cooling, the ebonite surfaces are ready for use. They behave as follows:

(1) Placing the rods across one another, one (A) is rubbed down the other (B). We find A charged $-^{ve}$, $B+^{ve}$. Discharge the rods over, *not in*, a flame. Rub B down A. We find B charged $-^{ve}$, $A+^{ve}$. Thus the rods are identical in behaviour, the 'rubber' in each case becoming $-^{ve}$, the 'rubbed' $+^{ve}$.

When the surfaces behave alike, as above, we call them 'standard.'

There is a real distinction between 'rubber' and 'rubbed,' a much smaller area of the former than of the latter taking part in the rub; and of the two, the rubber attains at the rubbing point a higher temperature. Hence, the rubber is more likely to yield and be greatly strained under the tangential forces applied in friction.

(2) Continued rubbing brings about a change of effect; the rubber, gradually losing its strong $-^{ve}$ quality, becomes first neutral and then more and more $+^{ve}$. When in the neutral condition, the rubber may be $-^{ve}$ or $+^{ve}$ according as the rub is light or heavy. Also at this stage it is sometimes possible to obtain one charge, say, $+^{ve}$, from a direct stroke, $-^{ve}$ from a reverse.

(3) By continuing the rubbing, the rubber becomes definitely $+^{ve}$ and remains so for the actual surface rubbed even after days of inaction. I propose to call the new state of surface, produced by rubbing, the 'strained' state.

(4) The strain can be removed by boiling the rods in water for a few seconds or more, according to the amount of strain. If both rods are considerably strained, it is possible by boiling each in turn for short periods to make first one, then the other $-^{ve}$, until finally both are restored to the pristine standard state of no strain. It should be remarked that after boiling the rods are allowed to cool before rubbing.

(5) If the rods have been brought by rubbing to the intermediate state (see (2) above), suppose one rod, A, is slightly $+^{ve}$ to B. Then warming A makes it $-^{ve}$ to B. Next, warming B makes it $-^{ve}$ to A again. The rise in temperature of the surface need be only, say, 50°, and can be done by the heat from a carbon glow lamp.

(6) Sharp glancing blows of one rod on the other, whether the surfaces be standard or strained, give rise generally to contrary, *but unequal*, charges on the rods. The sum total charge is $-^{ve}$. If these impacts are oft repeated the sum total charge may be very great, and each rod may be $-^{ve}$.

In all these experiments the charges are considerable and can be easily observed with a sensitive gold-leaf electroscope.

The above behaviour of ebonite is found also with like specimens of caoutchouc, celluloid, shellac, resin, sealing wax, paraffin wax, charcoal, sulphur, glass, mica. I have found no exceptions to the rule, but that remarkable solid, caoutchouc, reveals its idiosyncrasies, in triboelectricity as in other well-known phenomena, thermal and elastic. In caoutchouc the rubber has a $+^{ve}$, not a $-^{ve}$, tendency due to rise in temperature.

Each material must be rendered standard as defined in (1) above, but the dual process of scraping and boiling, adopted with ebonite, is clearly not universally applicable.

From the above experiments three general principles, which I think are new, emerge:

(*a*) *Really identical surfaces charge one another according to a definite rule* (*Expt.* 1).