it. When a cart with a butcher's man came into the place where the dogs were kept, although they could not see him, they all were ready to break their chains. A master-butcher, dressed privately, called one evening on Paris's master to see the dog. He had hardly entered the house before the dog (though shut in) was so much excited that he had to be put into a shed, and the butcher was forced to leave without seeing the dog. The same dog at Hastings made a spring at a gentleman who came into the hotel. The owner caught the dog and apologised, and said he never knew him to do so before, except when a butcher came to his house. The gentleman at once said that was his business. So you see that they inherit these antipathies, and show a great deal of breed.' "WILLIAM HUGGINS"

The unreasonable

MY attention has directed itself to a letter by Dr. Ingleby in your last number, containing two curious but inconsistent misrepresentations of my words, and therein something that, if the writer were not Dr. Ingleby, might be called an instructive instance of cynophatnism or doggimangerness—the behaviour of one who will neither understand a thing himself, nor allow other folk to understand it. As, however, the writer is Dr. Ingleby, I feel sure that a less cursory contemplation of the matter will modify his views.

The following doctrines are in the *Kritik* :—

1. At the basis of the natural order is a transcendental object.

"Das *transcendentale Object*, welches den äusseren Erscheinungen, ingleichen das, was der inneren Anschauung zum Grunde liegt, ist weder Materie, noch ein denkendes Wesen an sich selbst, sondern ein uns unbekannter Grund der Erscheinungen, die den empirischen Begriff von der ersten sowohl als zweiten art an die Hand geben." (IVth Paralogism, of Ideality ; *First Edition.*)

2. The transcendental object is *unreasonable*, or evades the processes of human thought.

(*a*) Of the sensibility :—

"Die nichtsinnliche . . . Ursache dieser Vorstellungen ist uns gänzlich unbekannt, und diese können wir daher nicht als Object anschauen." . . . (VIth section of Antithetic.)

(*b*) Of the understanding :—

"Unser Verstand . . Dinge an sich selbst (nicht als Erscheinungen betrachtet) *Noumena* nennt. Aber er setzt sich auch sofort selbst Grenzen, sie durch keine Kategorien zu erkennen, mithin sie nur unter dem Namen eines unbekannten Etwas zu denken." (Ground of distinction between Phenomena and Noumena.)

3. The doctrine of the contradictions is one means by which we know this.

"Mann kann aber auch umgekehrt aus dieser Antinomie . . . die transcendentale Idealität der Erscheinungen . . . indirect . . . beweisen," &c. (VIIth section of Antithetic.)

The Kantian theory had two legs to stand upon ; one the alleged necessity of mathematical axioms, the other these alleged necessary contradictions in our ideas of the natural order. How completely the first has been amputated I hope to have shortly an opportunity of showing in a course of lectures at the Royal Institution. The doctrine, that we may infer the existence of an unknowable from supposed contradictions in the knowable, "has been developed and extended by the great successors of Kant ;" and when in "a later form" these contradictions were set forth from an ultimately empirical standpoint (*not* that of Hamilton, but of Spencer, as stated in my note) the doctrine became fit for notice in a scientific lecture. Only the contradictions themselves, however, could be criticised, and not the step from them to the existence of the unknowable, or the unknowability of the existent. And Kant's name could only be mentioned as the historical starting-point of the doctrine ; whose importance for the empiricist is mainly due to the modifications it has undergone since his time.

If Dr. Ingleby will kindly look at my lecture (*Macmillan's Magazine*, October 1872) again, he will see that I have attributed to Kant no more than the above-quoted doctrines ; that I never pretended to expound Kant's form of them, or their relation to the rest of his system ; and that I never said nor accused anybody of saying either that the antithetic was unreasonable, or that any natural order of thought or things was unreasonable. In regard to the other misrepresentations he speaks of, I shall be very glad indeed to be told of them, and to be set right, provided only they exist in my words, and not in the exuberant imagination of my critic.

London, Feb. 9 W. K. CLIFFORD

P.S.—There is an important error in p. 508 of the lecture in question. The surface-tension of camphor and water is *less* than that of water, not *greater*, as there stated. The general argument depends only on there being a difference.

Prof. Clifford on Curved Space

THE friend, who (as I stated in my letter in NATURE, Feb. 6) called my attention to Prof. Clifford's address in *Macmillan's Magazine* for October last, asked me certain questions respecting curved space, which I was quite unable to answer : and another friend, occupying the foremost place among English philosophers, has since communicated to me the great discomfort which Prof. Clifford's views had occasioned him, and suggested that I should comment upon them in NATURE. I am not sure that what I have to say will prove to be helpful either to my discomforted friend, or to truth : yet the doctrine of curved space is so extraordinary in itself, and so momentous in its consequences, if it be true, that it is a fair subject for sceptical scrutiny. Moreover, I do not conceive that in commenting upon it I am going *ultra crepidam* ; for the nature of space is not a subject on which the mathematician can claim a monopoly. *In limine* allow me to express my regret that Prof. Clifford should have selected such a topic for the entertainment of a popular audience. It is quite incredible that any of his hearers could have apprehended his meaning. There was assuredly no need for the lecturer to have cast a glamour on their mental eye by the invocation of those awful names, Lobatchewsky and Gauss, Riemann and Helmholtz.

The principle, in exemplification of which Prof. Clifford expounded the doctrine in question, was this : that a law can be only provisionally universal (*i.e.* as "we find that it pays us to assume it"), but that it is theoretically universal, or true of all cases whatever, "is what we do not know of any law at all" p. 504. I fancy he would not include numerical formulæ under the term "law :" else arithmetic and algebra would afford an infinity of examples of such a law. Be that as it may, he does not select an example from either of those sciences, but from Euclidian geometry. He takes the proposition established by Euclid, that in any plane triangle the three angles added together are equal to two right angles. This he asserts we do not know as a universal truth. I now quote his own words : "Now suppose that three points are taken in space, distant from one another as far as the sun is from α Centauri, and that the shortest distances between these points are drawn so as to form a triangle : and suppose the angles of this triangle to be very accurately measured and added together ; this can at present be done so accurately that the error shall certainly be less than one minute. . . . Then I do not know that this sum [? apart from the question of error] would differ at all from two right angles ; but also I do not know that the difference would be less than 10°." If, then, after a sufficient number of observations it were found that the deviation were greater than the assigned limit of error (less than one minute), it would follow that the Euclidian law is not universal, and that for triangles of such dimensions it is not true. The conclusion would be, then, that our Tridimensional space is not a homaloid. We need not run our heads against the ghost of a fourth dimension ; for the refinements of the geometer enable him to investigate a curved tridimensional space, just as he investigates a homaloidal tridimensional space. But all the same, it is absurd to attempt the interpretation of the results without supposing that fourth dimension as the *conditio sine quâ non.*

Now we will suppose that the triangle in question has been surveyed, and that the sum of its three angles have been found to deviate from π far beyond the assigned limit of error : what have we really got thereby ? The triangle, says Prof. Clifford, is formed by drawing "lines of shortest distance" between the three points in space. Is observation through a telescope drawing such a line ? Be it so, for the sake of argument. Then, if the conclusion to be drawn is that space is curved, I ask does it or does it not follow that the sides of the triangle are themselves curved ? Observe that if those seeming (to us) straight lines are really curves of an exceedingly small curvature, the Euclidian law is not touched. Of course, then, Prof. Clifford did not mean to assert that in a case in which the sides of a triangle are