

THE CASE OF THE BROBDINGNAGIAN LILLIPUTIAN:
A SWIFTLY PENNED REPLY TO SHRADER

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In a recent illuminating and intriguing discussion in *Auslegung*¹ of Reichenbach's theory of the interdependence of physical causality, geometry and measuring conventions,² Douglas Shrader invites us to consider the following passage:

The metric of a space becomes an empirical fact only after the postulate of the disappearance of universal forces is introduced. Similarly, the topology of space becomes an empirical fact only if we add the postulate of the principle of action by contact.³

This passage implies, Shrader contends, that in every physical situation Reichenbach claims that

- (R) We must set both the universal forces (F) and causal anomalies (A) equal to zero.⁴

In this note I would like to address the arguments Shrader presents in support of this assertion, urging that though instructive, none of them are cogent.

First of all, it is not clear that the above passage implies (R). In the above context, it may well be that all Reichenbach desired to express by the juxtaposition of the two sentences composing that passage was a sort of convoluted, perhaps even distant, analogy between the relation of the metric of a space and universal forces on the one hand, and the relation between the topology of space and action by contact on the other. The passage thus need not address the question of whether we must simultaneously posit that $F = 0$ and $A = 0$ for all physical situations, contrary to what Shrader insists. Since it is a maxim of philosophic methodology to extend that sympathy which extracts maximal cogency, I opt to give Reichenbach the benefit of the doubt.

Let us unsympathetically suppose, nevertheless, that the above passage is intended to be read as imply-

ing (R). Now (R), Shrader claims, is perversely problematic. For we may imagine, he suggests, a schizophrenic Gulliver adrift in a sea of concentric shells which collectively possess a very peculiar property. As Gulliver sails from shell 1 to shell 5 he finds them to be increasingly smaller, and, his log reports

Not only is there a duplication of everything that . . . (I) left in shell 1, but since shell 5 is smaller, everything else is correspondingly smaller; . . . (I) am a giant in a world identical to the one . . . (I) just left. Upon returning to shell 1, . . . (my) friends tell . . . (me) of a similar giant who visited in . . . (my) absence and finally left looking quite dumbfounded. Wandering off in the other direction, (I find) the shells get increasingly larger till, in the fifth shell, . . . (I am) a dwarf in a world exactly like the other two.⁵

In light of these experiences, Shrader claims, Gulliver has just two choices: either (a) he can posit that the geometry of space is Euclidean, and if so, he cannot also simultaneously posit normal causality and the absence of universal forces; or (b) he can hold that the geometry of space is non-Euclidean, say, toroidal, and if so, he cannot also hold simultaneously that there is normal causality and that there are no universal forces. In either case, Shrader concludes, (R) is just false. Since Gulliver's log is thus used to show that Reichenbach is not Swift in wit, the entry deserves our careful attention.

(a). In case (a) an important asymmetry between Gulliver's log and that of his Reichenbachian cousin,⁶ an explorer in a possibly toroidal world and a case whose analysis is previously accepted by Shrader, leaps from the page. Gulliver reports that sailing in direction $1 \rightarrow 5$ he becomes a Brobdingnagian in the same world he left; while sailing in direction $5 \rightarrow 1$ he dwindles to a Lilliputian in the same land. Gulliver's cousin, in contrast, notices no such changes in his relative size:

He finds that in 5 everything is familiar to him . . . This correspondence manifests itself in every detail⁷

The similarity in every detail is crucial, for in the context of the example, it is a necessary condition of the identity of worlds. If the similarity were not exact, that is to say, then Gulliver's cousin would have empirical evidence licensing him to purge causal anomalies from his interpretation of experience by denying the identity of 1 and 5 while still maintaining that there are no universal forces and that the geometry of space is Euclidean; in that case, however, the force of that essential example would be wholly destroyed.

Analogously, in case (a) changes in size relative to Gulliver (or his measuring rod) are sufficient to distinguish world 5 from world 1. The identity of worlds, furthermore, is a necessary condition for unambiguously positing causal anomalies in Reichenbach's terminology. For what Reichenbach means by 'causal anomaly' is that the interdependence of all events at corresponding points does not "require time for transference" or does not "spread as a continuous effect that must pass consecutively through the intermediate points" of a given space.⁸ Hence Gulliver's log fails to satisfy a necessary condition for unambiguously invoking the existence of 'causal anomalies'; the force of Shrader's counterexample is accordingly lost.

(b). Let us suppose, on the other hand, that Gulliver accepts the identity of 1 and 5 and assumes that there are no causal anomalies and that the geometry of the world is non-Euclidean, say, toroidal. Then, Shrader claims, Gulliver will have to accept the presence of universal forces which increase his size and the size of his measuring rod relative to their environ when he sails one direction and decreases them when he sails the other; in short, if Gulliver assumes toroidal geometry and the identity of worlds, he cannot also simultaneously assume both $A = 0$ and $F = 0$, and once again (R) is false.

Reichenbach's response to this analysis would be, in my judgment, quite direct. Every universal force, he would insist, affects "all materials in the same way."⁹ And by this, Reichenbach would mean that there is no physical property, in this case size, which is differentially affected. Hence the change in relative size Gulliver experiences cannot be the result of universal forces; he is still free, vis-a-vis Shrader's argument, to posit $F = 0$, though no doubt his physics would look rather strange to us.

If these considerations are sound, Gulliver's log does not meet Reichenbachian positing requirements: for

on the one hand, (a) the very conditions under which it is possible to posit unambiguously causal anomalies are denied by that log; and on the other hand, (b) Gulliver's use of the term "universal force" does not satisfy Reichenbachian grammar. Indeed, the course Shrader would have us believe Gulliver sailed from Brobdingnag to Lilliput and back again was set dead against the winds of wisdom.

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NOTES

¹Douglas W. Shrader, Jr., "Causal and geometric relations," Auslegung 4 (1977): 156-168.

²Hans Reichenbach, The Philosophy of Space and Time, translated by M. Reichenbach and J. Freund, Dover, 1958.

³Reichenbach, Philosophy . . . , p. 279.

⁴Shrader, "Causal . . . ," p. 161.

⁵Ibid.

⁶Ibid., pp. 158-59.

⁷Reichenbach, Philosophy . . . , p. 64.

⁸Ibid., p. 65.

⁹Ibid., p. 13.