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IF I WERE A DRY WELL-MADE MATCH

IT is commonly held that if a sentence of the form "all A's are B's" is a causal law then the subjunctive conditional "if a were an A then a would be a B" is true, whatever we substitute for "a". Goodman strongly suggests this in *Fact, Fiction, and Forecast* (Chapter I, section 3), and others have followed his suggestion[1]. I find it implausible; I think that a few examples show that a weaker condition must be substituted.

Consider the law "all offspring of Abraham and Sarah have blue coats" (relevant facts: Abraham and Sarah are blue long-haired cats, and blue long-haired cats breed true.) It certainly does seem to follow that if Jonathan, cream long-haired cat, were an offspring of Abraham and Sarah then he would have a blue coat. But it does *not* seem to follow that if I were an offspring of Abraham and Sarah then I would have long blue hair. For I could be an offspring of Abraham and Sarah as easily by virtue of their being human as by my being a cat.

The point is this. The counterfactual "If I were an offspring of Abraham and Sarah I would have a blue coat" is of doubtful intelligibility. If it is intelligible then surely it is false. For a counterfactual is true if all smallest possible variations in the conditions which actually obtain which make the antecedent true make the consequent true[2]. Thus the counterfactual in question is false for the reason that "If Bizet and Verdi had been compatriots, Verdi would have been French" is false: a change of no greater magnitude in the way things really are than that required to make antecedent and consequent true would make antecedent true and consequent false. (This is of course not to say "If I were an offspring of Abraham and Sarah I would not have a blue coat" is true, but that "It is not the case that if I were an offspring of Abraham and Sarah I would have a blue coat" is true.) If the counterfactual in question is not intelligible, it is not true. Either way the principle under discussion is refuted.

[1] See for example C. G. Hempel, *Aspects of Scientific Explanation* (New York : The Free Press, 1966) p. 339. Note that in section 6 of Chapter IV of *Fact, Fiction, and Forecast* Goodman describes some exceptions to his principle. But they are of a different sort to those that I shall discuss.

[2] This formulation is essentially due to R. C. Stalnaker, in 'A Theory of Conditionals', *Studies in Logical Theory* (A. P. Q. supplementary monograph series, 1968). A persuasive and rigorous sharpening of it will appear in David Lewis' forthcoming book *Counterfactuals* (Blackwell, probably 1973).

The presence of the proper names "Abraham" and "Sarah" in the preceding example is not essential, for consider the law "All tailless offspring of second generation tailless Manx cats are feeble kittens". It surely does not support the counterfactual "if this pebble were a tailless offspring of second generation tailless Manx cats it would be a feeble kitten." For it could as easily (that is to say, not at all easily) come about that this pebble was the offspring of second generation tailless Manx if the copulation of two second generation Manx resulted in a pebble as it could if this pebble were a cat.

We are drawn into these absurd deliberations when the antecedents of the conditionals in question are impossible. (Though many true conditionals have impossible antecedents, for example, "If I could lift three hundred tons then I could lift a horse".) We might therefore try weakening our condition to: if "All A's are B's" is a law then any object which could be an A would if it were an A also be a B. In symbols, using '$\supset$' and '$\rightarrow$' for the material and subjunctive conditionals, and '$\Diamond$' for causal possibility:

$$(x)\ (\Diamond Ax \supset (Ax \rightarrow Bx))$$

This is very weak. We can get a more interesting condition by reflecting on the reasons why one might suppose there to be a connection between laws and subjunctive conditionals.

Let us take it to be characteristic of law-like sentences that they are supported by their positive instances. That is, one does not have to verify that all of the instances hold in order to convince oneself of the truth of a law. And once one has convinced oneself of its truth one can use it to predict with regard to unexamined instances. As Goodman has argued, these are two aspects of a single characteristic. If one is using a law, "all A's are B's", to predict unexamined cases then one believes that when on examination an A turns up it will be a B. This does not commit one to believing that if those items which turned out not to be A's had been A's they would also have been B's, but rather that if one's examination had turned up A's in those circumstances then the A's that one had turned up would have been B's. One does not, for example, suppose that if whatever was in specimen case number eight (a cat, perhaps) had been a dry well-made match then it would have lit when struck, but rather that if there had been a dry well-made match in specimen case number eight instead of what was there, then it would have lit when struck.

These observations suggest a more interesting condition for being a law. If "all A's are B's" is a law then for any predicate C, such that

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if it is possible for there to be A's that are C's, if there were an A that were a C it would be a B. The best way to symbolise this is

$$\Diamond \exists x\,(Cx \,\&\, Ax) \supset (\exists x\,(Cx \,\&\, Ax) \rightarrow \exists x\,(Cx \,\&\, Bx))$$

where the C is schematic. C might be "is examined at 3:32 p.m." or "was in this chair at noon".

I believe this to be a sufficient as well as a necessary condition for the corresponding universal sentence to be a law. For if the condition holds then the universal sentence has predictive power. For the condition ensures that if an A is found in any circumstances in which an A could be found then it will be a B. It thus ensures that any A's which are found will be B's, for you don't find A's where they cannot be.

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