

JUDGEMENT AND RATIONAL THEORY-CHOICE

by

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§1 Introduction

Philosophers of science have traditionally sought an account of scientific method which would shed light on the nature of scientific rationality. Such an account of method would provide criteria for the appraisal of scientific theories, on the basis of which theory-acceptance would be rationally justified. Philosophers engaged in this traditional project have tended to assume that there is a single, unchanging scientific method, which operates as an algorithm to mechanically determine choice between theories. However, recent trends in philosophy of science strongly suggest that the traditional search for the one true method is unlikely to meet with success. Many recent philosophers of science have rejected the idea of a single scientific method in favor of a variant set of methodological criteria which do not uniquely determine choice of theory. Such pluralism initially evoked objections of relativism and irrationalism¹. But many philosophers concerned with scientific rationality now seek to understand pluralism in the light of a new concept of rationality, rather than to dismiss it as relativism. Such philosophers increasingly suggest that the rationality displayed in scientific theory-choice is a non-algorithmic form of rationality, on which decisions between theories are not dictated by the rules of scientific method². However, in spite of such suggestions, precisely what is involved in a non-algorithmic concept of scientific rationality has yet to clearly emerge.

¹ Cf. the responses of early critics to Kuhn [10]; e.g., Lakatos [12], Scheffler [17] and Shapere [18]. Similar responses occur in critical reaction to later advocates of methodological variation. See, for example, Gower [9] on Chalmers [5], Siegel [19] on Doppelt [6] and Worrall [20] on Laudan [13].

² The suggestion that the form of rationality involved in scientific theory-choice is non-algorithmic may be found in such authors as Bernstein [1], Kuhn [11], Newton-Smith [14], Putnam [15] and Rorty [16].

This paper is meant as a partial remedy to this situation. I wish to establish a crucial point about the nature of non-algorithmic rationality: in the absence of an algorithm of theory-choice, a role must necessarily be played by deliberative judgement in the process of rationally choosing between rival theories. Thus I will argue that a notion of judgement is a necessary component of an adequate non-algorithmic account of rational scientific theory-choice. But before I present this thesis I want to pose the problem of rational theory-choice of which the notion of judgement is part of the solution.

§2 *Rational theory-choice*

The problem of rational theory-choice is that of how choice of theory may be rational in the absence of a fixed scientific method. The problem is best approached by way of a brief look at the recent history of the philosophy of science. Early in the century, philosophers of science believed in the existence of a single scientific method. They thought there was a uniform methodology, which scientists throughout the history of science have sought to employ in all branches of science. They did not, however, agree on what this method was. Some philosophers thought the method was an inductive one, while others favored the method of hypothesis. Some thought theories are confirmed by experience, while others rejected confirmation in favor of the ruthless testing and falsification of theories. But, despite disagreement on the nature of method, it was generally held that scientific method provided scientists with criteria for the rational acceptance of theories.

The assumption of a unified methodology began, however, to be undermined at the mid-century, when a number of methodological, semantic and perceptual variances were discovered by a new wave of historically-minded philosophers of science, of whom the best-known are Hanson, Toulmin, Polanyi, Kuhn and Feyerabend. Drawing on influences from Quine, Wittgenstein, gestalt psychology and the history of science, these philosophers argued that observation is theory-laden, that there is no independent observational language, and that science is a cultural form which follows developmental patterns not unlike other areas of human life. Most importantly for present purposes, the idea of a unique and unchanging scientific method came under heavy fire. In *The Structure of Scientific Revolutions*, Kuhn argued that the methodological standards employed by scientists to evaluate proposed puzzle-solutions vary with the dominant scientific paradigm

in any given historical time period (cf. [10, pp. 103-110, 148]). In his later book, *The Essential Tension*, he argued that, rather than a uniform and fixed set of methodological rules, there is in fact a partly shifting set of guiding values, which are operative throughout science but fail to uniquely determine choice of scientific theory [11, pp. 330-335].

Kuhn's attack on the idea of a fixed methodology was paralleled by Paul Feyerabend's criticism of traditional methodology in *Against Method*. Feyerabend claimed that all rules known to methodologists have been violated at some stage in the history of science [8, p. 23]. This was not merely a matter of scientific practice failing to live up to a philosophical ideal. Rather, in many of the cases in which rules were violated, Feyerabend argued, breaking the rules was a rational course of action. The outcome of Feyerabend's critique of method is similar to that of Kuhn's attack on fixed method. For, if Feyerabend is right, there can be no fixed set of methodological rules that is both applicable in all circumstances and universally binding.

Rejection of monomethodological orthodoxy has become something of a commonplace in contemporary philosophy of science. For example, Alan Chalmers argues in *Science and its Fabrication* that 'the search for a substantive universal, ahistorical methodology is futile' because scientific standards are subject to change in the light of practice' [4, p. 21]. Chalmers insists, though, that science may still be rational in the absence of such a substantive methodology because 'changes in substantive methods [and] standards ... can be appraised from the point of view of the extent to which they further the aim of the production of improved and more extensive knowledge' [4, p. 39]. In arguing that variation of methodology is justifiable by appeal to epistemic aims, Chalmers adopts an approach similar to that of other recent critics of orthodoxy, such as Larry Laudan and W.H. Newton-Smith¹.

The problem raised by the attack on a fixed method, and confronted by authors such as those I have just mentioned, is the problem of rational theory-choice. The appeal by the latter authors to the aims of science in order to justify methods is an attempt to show how one might rationally choose between alternative theories by

¹ Both Laudan [13] and Newton-Smith [14] analyze the rationality of science in terms of the justificability of methodology relative to the aims of science. However, they differ in that Laudan holds that both the aims and methods of science are subject to variation, whereas Newton-Smith, who groups a variety of methodological criteria under the heading of 'scientific method', holds that science has one overriding aim, namely truth.

means of methodological standards which are themselves subject to change. More specifically, the problem raised by the denial of a fixed method is that of how a choice based on standards that are not universal can be rational in any objective sense. For if scientists who accept rival theories are free to appeal to different sets of standards to support their choice of theory, then the problem clearly arises of how the choice between such theories is one which is capable of resolution by appeal to objective standards.

There is much to be said in favor of an aim-theoretic analysis of the rationality of science⁴. However, I mention this approach only to indicate the extent to which the rejection of fixed methodology is now prevalent in the philosophy of scientific theory-change, and to indicate the existence of an approach to the rationality of scientific theory-choice which does not presuppose fixity of scientific method. My concern in this paper is to establish a point about the nature of rationality that is given little prominence by defenders of the rationality of methodological variation. Many contemporary philosophers of science would agree with Kuhn's claim that 'there is no neutral algorithm for theory-choice' [10, p. 200] — for it is now common to deny that there is a set of mechanical rules which uniquely determines choice of theory. What is usually left unstated, however, is that if rationality is non-algorithmic, then rational theory-choice not dictated by rules must ultimately involve an act of deliberative judgement⁵. My aim in this paper is to show that judgement has a necessary role to play in rational decisions between theories, and to start to explore the nature of such judgement.

§3 *Judgement*

Before it can be argued that judgement is required by theory-choice, some indication is needed of what judgement is. As a preliminary to the arguments which I will present in the next two sections, in this section I will give a rough sketch of the notion of judgement. In a later section, I will provide further analysis of

⁴ In particular, aim-theoretic accounts of scientific rationality have the potential to account for rational theory-choice on the basis of natural assumptions about rationality which do not require a fixed method. Thus both Laudan and Newton-Smith rely on the standard 'instrumental' conception of rationality according to which rational action is action that is appropriate in light of the agent's aims and beliefs. It is this which enables them to argue that considerations about cognitive aims render theory-choice rational.

⁵ A notable exception is Newton-Smith, who explicitly incorporates a role for judgement into his model of scientific rationality [14, pp. 232-235, 270].

judgement when I discuss an account of judgement due to Harold Brown. I begin with some remarks about ordinary usage. We sometimes say, of a person who appraises a situation wisely and decides upon a suitable course of action, that his decision shows 'good judgement'. There are occasions in which someone with specialized knowledge and training in an area forms an opinion on a particular subject, basing his opinion on familiarity with the relevant facts and expertise in the general area. In such cases, we may say that he exercises 'professional judgement'. There are also cases in which an immediate decision is called for, with no time for proper evaluation of the situation at hand, in which one must make a 'snap judgement'. Sometimes, for example when a situation requires appraisal in the absence of relevant information, we may have to make a 'judgement call'.

Such idioms as these illustrate two features of judgement, as we ordinarily speak of it. First, it is typical of cases in which judgement is called for that there is some sort of decision to be made. Second, the exercise of judgement in making the decision involves an appraisal of the situation with respect to which the decision is to be made. Both these aspects of judgement are apparent in cases where we are faced with a choice relative to which there is a variety of potentially conflicting factors to be taken into account.

Practical decision-making frequently provides examples of this. We are often confronted with a range of possible courses of action, no one of which is uniquely determined by relevant considerations. In such cases, we weigh up the alternatives and attempt to gauge which one is, on balance, the preferable course of action. Judgement may enter into this process at various points. We may rely on judgement in reflecting on what our aims are, as well as on which action best serves our aims. We may use judgement when we decide which of a range of relevant considerations is to be given more weight than the others. Judgement may even be employed in determining which, of all the possibly relevant factors, are to be counted as relevant considerations.

It is characteristic of circumstances which call for judgement that the considerations on the basis of which the decision is made fail to determine the outcome of the decision. This contrasts with cases in which the decision may be subsumed under an algorithmic decision-procedure. In such cases, there is no role for judgement in determining the outcome. For it is precisely the function of an algorithm to remove the need for judgement. Conversely, it is characteristic of judgement that it is non-algorithmic.

But judgement is not merely the capacity to make decisions without an algorithm. It also involves the capacity to evaluate the situation in which the decision is to be made. This may include consideration of a range of information, as well as determination of the relevance and significance of various items of information. This aspect of judgement is emphasized by a number of authors. For example, Jon Elster defines 'judgement'

as the capacity to synthesize vast and diffuse information that more or less clearly bears on the problem at hand, in such a way that no element or set of elements is given undue importance. [7, p. 16].

Here Elster suggests that judgement involves two processes, the assembly of a mass of relevant data, and the judicious appraisal of the relative significance of different pieces of data.

But it is not clear that judgement need be restricted, in the way Elster suggests, to cases involving synthesis of a broad range of data. To be sure, in cases where there is a wealth of data, use of judgement may involve evaluation of a large range of data. But there are cases in which only a small amount of data is needed, or in which relevant data is unavailable, or in which there is insufficient time to take all the relevant data into account. In such cases, judgement may still be employed, even though no great synthesis of data is required. Thus, judgement should not strictly speaking be thought of as the synthesis of a large quantity of data. Rather, judgement involves the evaluation of such data as seems appropriate in relation to the decision at hand, regardless of the quantity of data available. To sum up what has just been said, the ability to form judgements is the ability to arrive at decisions on the basis of an evaluation of the situation with respect to which the decision is to be made. This may involve both an assessment of relevant considerations, and a determination of which considerations are relevant. To the extent that decisions based on such evaluations cannot be made by means of an algorithm, such decisions are based on judgement.

§4 *Judgement and the regress of justificatory criteria*

In the next section I will argue that judgement is required in rational theory-choice due to the existence within science of multiple methodological criteria. However, in this section I will argue that any appeal to criteria for rational support must rest on judgement, or lead to infinite regress. If this is right, even if the existence of multiple criteria did not require a role for judgement, appeal to

methodological criteria in rational theory-choice would still require the use of judgement.

The argument I will now present is that rational acceptance of theory on the basis of methodological criteria involves judgement on pain of infinite regress. Consider the decision made by a scientist to accept a theory. Suppose that the scientist makes this choice on the basis of appeal to a single methodological criterion C. Let us ask whether acceptance of the theory on the basis of C is rational. To answer this question, we need to ask whether appeal to C is able to provide the scientist with rational justification. In order to show that such appeal does provide rational justification, one might appeal to a meta-criterion, C*, on the basis of which appeal to criterion C may be shown to provide rational justification. But if appeal is made to a meta-criterion C* to justify C, the question immediately arises of what justifies C*. If appeal is made to some meta-meta-criterion, C**, then we embark on an infinite regress⁶.

But it is absurd to appeal to an infinite series of meta-criteria to establish rational acceptance of a theory. Therefore, rational theory-acceptance cannot be based on appeal to infinite meta-criteria. Appeal to criteria must come to a halt somewhere. In particular, a judgement must be made at some stage in the justificatory process that this or that criterion is an appropriate criterion on which to base one's choice of theory. In other words, appeal to a given criterion in defence of theory-choice must ultimately rest on a judgement that it is rational to appeal to this criterion. This suggests that, to the extent that a role is played by criteria in rational theory-acceptance, a role must also be played by an act of judgement which does not itself rest on appeal to further criteria⁷.

It might be objected, however, that it does not follow from the infinite regress of higher-order criteria that an act of judgement is necessary in order to avoid the regress. Strictly speaking, all that follows is that appeal to criteria must come to

⁶ While the argument in the text is evidently formally analogous to the one which leads to the Pyrrhonian problem of the criterion, it is important to note that it is not here put to sceptical use. Contrary to scepticism, I assume that we are capable of both knowledge and rational belief. Rather than raise sceptical doubts, the regress of criteria is here used to establish a feature of essentially justified rational belief, viz., that it requires judgement. I do not, therefore, appeal to judgement as a solution to the problem of the criterion.

⁷ A formally analogous argument shows that application of criterion C' to theory T rests on judgement. For how is it determined that T satisfies C'? Appeal may be made to a meta-criterion C** which shows that T satisfies C. But the question arises whether C satisfies C*. Infinite regress ensues if appeal is made to a C** to justify application of C* to C.

an end somewhere if the regress is to be avoided. But nothing in particular follows from this about how to end the regress. The decision to halt the regress might, for example, be based on dogmatic commitment, non-rational leap of faith, or arbitrary convention. Thus, it is consistent with the need to halt the regress of criteria that the decision to accept a theory on the basis of a criterion may rest on any number of things other than judgement. The trouble with this objection is that, while it is indeed true that judgement is not the only way to end the regress, none of the apparent alternatives to judgement are rational. It may readily be conceded that there are numerous non-rational ways to halt the regress of justifications, such as dogmatic commitment or leap of faith. But the point of the above argument is not that the attempt to rationally support a theory must fail because it ultimately rests on non-rational commitment. Rather, the point is that the *rational* justification of theory on the basis of criteria must ultimately rest on a judgement of the rational acceptability of some criterion. And, while not itself justifiable by criteria, the process of judgement may nevertheless be a rational process, and acceptance of theory by appeal to criteria accepted on the basis of judgement may also be rational.

No doubt, the claim that judgement not supported by criteria rationally supports theory-acceptance conflicts with engrained philosophical preconceptions. For one might be inclined to think that rationality necessarily involves criterial justification, so that judgement unsupported by criteria is necessarily non-rational. But it is by no means clear that the process of judgement can be so hastily dismissed as non-rational.

Quite the contrary, the process described in Section 3, of forming a judgement on the basis of relevant information in the absence of an algorithm, bears the hallmarks of a rational process. For the process of judgement characteristically involves the evaluation of relevant information, and results in a decision that is made on the basis of that information. While there may be no conclusive grounds for choice if judgement is required, judgement may nevertheless yield plausible reasons for making the decision one way rather than another. Thus, far from being beyond the pale of rationality, such a process of deliberative judgement involves the use of reason in a manner that is paradigmatic of rational decision-making.

§.5 *Judgement and multiple criteria of theory-choice*

In this section I will argue that judgement is necessary in rational theory-choice due to the existence of multiple methodological criteria. In particular, because of the potential for conflict between criteria, it may be necessary to choose which criteria to weight more heavily in deciding between rival theories. Such a choice between conflicting criteria is one which requires scientists to exercise judgement.

Among philosophers who deny the existence of a fixed, universal scientific method, it is now widely assumed that there is instead a multiplicity of methodological criteria, which scientists at various times and in various contexts employ in the appraisal of theories. Standard examples of such methodological criteria include empirical adequacy, testability, explanatory power, simplicity, coherence and fertility. Not all such criteria need be employed throughout all periods of the history of science, for there has been considerable variation in operative methodological criteria. Nor need all the criteria operative at a given time be satisfied by any acceptable scientific theory, since there may be circumstances in which failure to satisfy certain criteria is justified*. Thus, while there is no single scientific method, there is nevertheless a partially shifting array of individually feasible methodological criteria, which broadly constitutes the methodology of science.

In accordance with this view of the methodology of science, let us suppose that a scientist faced with a choice between theories has an array of methodological criteria to draw upon in deciding which theory to accept. In appraising such rival theories, the scientist considers whether each theory satisfies the various criteria. In certain conditions, the decision to adopt one theory over another may be unproblematic. For example, one theory might satisfy all or most of the criteria while its rival satisfies none or very few of them. Problems arise if rival theories satisfy different criteria. For the various methodological criteria may fail to be mutually consistent in application. One theory might be simpler than another, while the other is more empirically adequate. Or, of two empirically adequate theories, one might be more fertile than the other.

* E.g., it may be rational to accept (or, at least, to pursue) a recently introduced theory which has yet to be established empirically, or which has only been established in a narrow domain, provided that it promises to satisfy other criteria or to become empirically adequate.

to be characteristic of the kind of decision in which judgement is called for. However, to conclude from this that judgement is necessary in the decision between criteria would be to overlook a possibility which remains for a defender of algorithmic accounts of theory-choice. For it might be objected that judgement is unnecessary in case of conflicting criteria, since it is always possible to formulate an algorithm for choosing between conflicting criteria. Thus, while the choice between rival theories may require a decision on which of conflicting criteria to accord priority, there might be a higher-order rule which decides between the conflicting criteria.

One might, for example, propose the following rule: if two theories are equally empirically adequate, choose the simpler; otherwise, choose the one with greater empirical adequacy. It might even be possible to formulate a complex higher-order rule, which defines an ordering over criteria in such a way that any potential conflict decided by relations of dominance between criteria. Where such a higher order algorithm is available, the choice of which criterion to grant priority is fully determined by the rule. It appears, therefore, that judgement is unnecessary in the choice between conflicting criteria, for the choice may be dictated by means of a higher-order algorithm.

In reply to this objection, it suffices to note that, while it may very well be possible to formulate a higher-order algorithm able to decide between conflicting criteria, the decision to adopt such an algorithm cannot itself ultimately be determined by an algorithm. For even where a higher-order algorithm is available, there is a genuine question whether the algorithm should be adopted, since the mere availability of such an algorithm does not itself constitute a positive justification for using it. Thus, use of such an algorithm must rest at some level on a prior appraisal of the relative significance of the various methodological criteria. But such an appraisal cannot ultimately be based on an algorithm, for it can always be asked why use of any particular algorithm is justified. It remains only to conclude, from the need for prior appraisal of criteria, that the adoption of any higher-order algorithm requires judgement. More specifically, since the decision to adopt a higher-order algorithm rests on a non-algorithmic appraisal of methodological criteria, such a decision therefore involves a judgement, not determined by rules, of the relative significance of the criteria. Thus, even if it is possible to formulate a higher-order algorithm able to decide between conflicting criteria, it still does not follow that judgement is unnecessary in such a case.

while the other has greater coherence". In such a situation, methodological criteria fail to uniquely determine choice of theory.

Where different criteria favor different theories, a scientist choosing between alternative theories is faced with a choice between conflicting methodological criteria. For in order to choose between the theories on the basis of methodological criteria, the scientist must also decide which criteria to base the choice of theory on. In such a situation, the scientist must determine which of the conflicting criteria is to be weighted more heavily than the other. But such a decision between methodological criteria is not itself one that is able to be made on the basis of appeal to methodological criteria.

To see that this is so, consider how an attempt to decide between criteria by appeal to criteria might proceed. In the first place, the decision to accord greater weight to one criterion than another cannot be made on the basis of appeal to the very criterion to which greater weight is given, since that would simply beg the question in favor of that criterion. In the second place, the decision to favor a given criterion cannot be based on appeal to other criteria. For the criteria in question are not meta-criteria which apply to criteria, but object-level criteria which apply to theories. In the third place, even if a given criterion did support some criterion over another, the problem of deciding between conflicting criteria would not be removed. For suppose that coherence favors a theory which is simple over one which is empirically adequate. To choose the simpler one on that basis would require coherence to be accorded greater weight than empirical adequacy. But that in turn requires that a decision be made to favor one criterion over another, which was the original problem.

Since the decision between criteria cannot be made by appeal to criteria themselves, it is tempting to conclude that such a decision can only be made on the basis of judgement. For, unable to decide on the basis of criteria, it may seem that a scientist's only recourse is to reflect, in a manner not governed by criteria, on which criteria are of greater significance in the circumstances. Such deliberations can only be made on a case-by-case basis, they demand thorough competence in the relevant scientific discipline, and the decisions arrived at may vary from scientist to scientist. Thus, the decision between conflicting criteria would appear

* Kuhn provides an example of a similar case [II, pp. 323-4]: prior to Kepler, he says, Copernican astronomy was no more empirically accurate than the Ptolemaic system; and while the Ptolemaic scored better on the criterion of consistency, the Copernican rated higher with respect to the criterion of simplicity.

§ 6 *Brown's theory of judgement*

The arguments I have given in the preceding two sections show that judgement must be employed in the use of methodological criteria, and therefore plays a necessary role in rational choice between theories. In this section I will further develop the idea of judgement by discussing the account of judgement proposed by Harold Brown in his book *Rationality*.

Brown sets the notion of judgement within the context of an agent-centered model of rationality, on which the notion of rational agency rather than that of rational belief is taken as fundamental. What is crucial to rationality, for Brown, is not 'the logical relations between [] evidence and [] belief', but 'the way in which an agent deals with evidence in arriving at a belief' [2, p. 185]. Rationality is not something which attaches to belief in virtue of objective features of what is believed; rather, rationality attaches to agents in virtue of the capacities which they exercise in forming their beliefs.

On Brown's model of rationality, the most fundamental capacity of a rational agent is the capacity to exercise judgement. Rationality cannot be fully analyzed as conformity with rules, since one can be rational in the absence of rules. Indeed, it is precisely where rules are lacking that rationality is most needed, and under such circumstances the rational agent must exercise judgement [2, p. 185]. But rationality not fully governed by rules does not reduce to unconstrained individual judgement. Rationality has an essentially social nature, as a result of which, rather than being constrained by rules, judgement is constrained by interaction with other rational agents. In order for a belief based on judgement to be rational, it must be subjected to evaluation, though not necessarily approval, at the hands of those who have the relevant expertise. Thus, Brown somewhat paradoxically concludes, 'Robinson Crusoe alone on his island could exercise judgement, but he would not be able to achieve rationality' [2, p. 187].¹⁰

Brown characterizes judgement as 'the ability to evaluate a situation, assess evidence and come to a reasonable decision without following rules' [2, p. 137]. Brown does not, of course, deny that much human thought and behavior is governed by rules [2, p. 139, 186]. Nor does he deny that it may be rational to

¹⁰ Brown has recently modified his position to avoid this consequence: where he formerly held social evaluation to be necessary for rationality, he now allows that logic and observation also constrain individual judgement, and may yield rational beliefs without social interaction (see Brown [3]).

follow appropriate rules when such rules are available [2, p. 184]. His point, rather, is that:

we do have an ability to think and reason beyond the range that is captured in our ability to follow rules. We exercise this ability when we are creating rules, when we modify existing rules, and when we recognize that we have an unusual case at hand, and decide how to deal with it. [2, p. 156]

Thus, in Brown's view, while we are capable of reasoning in a rule-governed manner, situations may arise in which our reasoning cannot proceed in accordance with rules. In such cases, we make use of our capacity for judgement.

While judgement is not rule-governed, however, it is subject to an important constraint. Judgement requires expertise. In order to exercise judgement in some matter, one must have expertise in the area and be well-informed about the specific details of the situation in question [2, p. 146]. Given the need for expertise, the ability to make judgements in an area is a learned ability that requires training [2, p. 146], and having the ability to exercise judgement is having a certain kind of skill [2, p. 165]. However, since even the most skillful and well-informed expert can arrive at erroneous conclusions, the capacity to make judgements must be viewed as a fallible capacity [2, p. 144].

In sum, according to Brown, judgement is a fallible, acquired capacity to make decisions, on the basis of expert knowledge, without following explicit rules. Such a capacity is well-suited for the role played by judgement in rational theory-choice for which I have argued in the preceding two sections. For the capacity to form a judgement, in a manner that is not determined by rules, is itself a capacity to make decisions which are potentially rational. Thus, the decision, based on judgement, to choose a theory on the basis of appeal to a given methodological criterion, or set of such criteria, is capable of being a rational decision. Given this, the necessity for judgement in theory-choice need not detract in the least from the rationality of such choice.

§ 7 *Judgement and subjectivity*

I will conclude this paper by considering an objection to the idea that judgement plays a role in rational theory-choice. The objection is that appeal to judgement brings an irreducibly subjective element into theory-choice, which undermines rationality. The objection arises from the fact that judgement is not grounded in criteria. For if, as I argued in Sections 4 and 5, judgement comes into rationality

because appeal to criteria cannot ultimately be based on higher-order criteria, then choice of theory would appear to rest ultimately on an act of judgement that is not supported by criteria. But, if this is so, theory-choice would appear to be based on a fundamentally subjective act, and is therefore unable to be rational. For if no objective criterion may be appealed to in support of the act of judgement, there can be no objective grounds for theory-choice.

This objection depends on two assumptions about objectivity and rationality. First, the objection assumes that if choice of theory rests on irreducibly subjective factors, then theory-choice cannot be rational. Second, the objection also assumes that removal of subjective factors requires that theory-choice be based on objective methodological criteria. Of these two assumptions, I will challenge the second, since appeal to criteria does not seem to be the only way to remove subjective factors, while irreducible subjectivity does seem to threaten rationality.

Before contesting this assumption, it is worth considering what lies behind it. The underlying thought is that appeal to methodological criteria avoids undue subjectivity in theory-choice, since methodological criteria provide objective grounds for such choice. Part of the explanation of the objectivity of criteria is that they are formulated in public language and, unlike private experiences, are open for public inspection. As a result, the question of whether a theory satisfies a criterion is not a matter to be decided on the basis of subjective intuition, but is open to public scrutiny. Another aspect of the objectivity of criteria has to do with their normative force. The reason scientists ought to seek theories which satisfy methodological criteria is not, at base, purely subjective. Rather, such criteria are normatively binding on scientists because theories fulfilling such criteria advance the epistemic aims of science, such as growth of knowledge or predictive reliability. Because methodological criteria are thus public and directed toward the aims of science, appeal to criteria in support of a theory insures that the theory is not adopted for irreducibly subjective reasons.

But while appeal to objective criteria is one way to avoid irreducible subjectivity, it is a mistake to assume that it is the only way. As Brown points out in his discussion of rational judgement, despite not being rule-governed, judgement may be subject to constraints. Two examples of such constraints are incorporated into his original model: first, it is a condition of being able to exercise judgement that one has expertise in the relevant area; second, for a judgement-based belief to be rational, it must be subjected to evaluation by others with the relevant

expertise. Of course, neither judgement based on expertise nor critical appraisal by a group of experts can guarantee that a belief is infallible or true. Such constraints can, however, serve to prevent the choice of one theory over another from being based on unduly subjective considerations. In light of this, I conclude that the objection from subjectivity is unfounded, since judgement not grounded on criteria need be neither irreducibly subjective nor a threat to rationality.

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MENTAL ILLNESS AND ENZYME ACTIVATION TREATMENT

by

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Introduction

Metabolism, the total of reactions in the cells when using air, food and drink, provides the energy and the biochemicals needed for the maintenance of life. The basis for all metabolism in the brain, the most complex organ of the body, depends on only two substances: oxygen and glucose. Glucose is a form of sugar which, combining with oxygen inhaled through our lungs, supports the body's activities.

As anyone who has taken a course in First Aid (particularly cardiopulmonary resuscitation or CPR) knows, when air cannot reach the lungs, oxygen is no longer available to the brain. Ordinarily, under these circumstances the victim will die in a few minutes. Likewise, when someone suffering from diabetes has had an overdose of insulin, the critically low glucose level in the blood that results must be recognized and restored or the person will die within hours.

Mental disturbances can result from problems in the metabolism of both oxygen and sugar. This is well known and taught in medical schools; however, in the daily practice of psychiatry it is not often considered. Yet, we believe that strengthening the metabolic ability of brain cells is important in the fight against many mental disorders.

Metabolism is governed by enzymes. Enzymes are biochemical substances that accelerate biochemical reactions and thereby direct the course of metabolic activities. When an enzyme, or a group of enzymes, is absent or becomes less active, disease often results. In our practice, we focus on the incomplete break-

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addition, proteins and fat are slowly digested and form excellent foods. Most of all, remember that the tried and proven staple foods providing complex sugars are Rice, Pasta and Rye bread. Try eating these most of the time, and if you want to "pig out" on ice cream, make sure that you also eat, for instance, some rye crackers with peanut butter or turkey breast before or after your icecream binge.

We have observed that proper diet, along with A+T ancillary medication, may lead to dramatic improvement in mental patients who are also hypoglycemic.

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