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Just-if-ication

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A Discussion of Scientific Reasoning

“If knowledge is my God, doubt would be my religion.” – Kedar Joshi

“Everything should be made as simple as possible but no simpler.” – Einstein

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Scene: Kedar’s flat in Pune, India.

Players: Ram, an older philosopher, and Kedar, a younger philosopher (for other philosophical adventures of this duo, go to slumdogphilosopher.blogspot.com and courtofsanity.blogspot.com and definingknowledge.blogspot.com).

Ram: So when we left off the other day, you wanted to talk about justification?

Kedar: Yeah, I was intrigued by your comment that justification being more technical is a more promising concept to investigate philosophically than knowledge.

Ram: That’s right. But before plunging into the epistemological sense of justification, I think we should consider one other sense of it as it may shed light on the sense we want to investigate.

Kedar: What other sense did you have in mind?

Ram: We give justifications for our beliefs but we also give justifications for our actions. Justification has an ethical sense as well as an epistemological one.

Kedar: Interesting. It must be because decisions are made in both cases, a verdict handed down whether it’s to believe a proposition or perform an action. And decisions, verdicts are the hallmarks of justice, hence just-ification.

Ram: I would even say just-if-ication, since it consists of giving just ifs or reasons in support of our beliefs or actions.

Kedar: Now I think you’re taking etymology too far.

Ram: Yeah, I guess I was being punny rather than funny. Philosophers are disposed to make bad puns.
Kedar: And sweeping generalizations.

Ram: Anyway, you’re right. Justice is probably the etymological root of justification in epistemology as it is more obviously in ethics, though there’s an important difference: ignoring three-valued logic, beliefs are either true or false. Actions on the other hand are three-valued, being good, bad, or as indifferent as scratching an itch. That’s why we don’t demand justifications for every action as we do for beliefs.

Kedar: This is interesting but you suggested the parallel with ethics could shed light on the epistemological sense of justification?

Ram: I did. Justice is a virtue of reasonableness, whether in the way people are treated or decisions are made. So we should be reasonable in the demands we make of justification. If we don’t demand justifications for every action, perhaps we should be less demanding in assessing epistemic justifications.

Kedar: I disagree. If the only alternative to good actions were bad actions, we would demand justifications for every action to avoid bad ones just the way we demand justifications to avoid false beliefs. Because beliefs are two-valued, we have the right to demand the highest standards in the justifications people offer. I for one don’t think we’re ever fully justified about anything because we never know the true underlying reasons that make our beliefs true. This is certainly the case in our inductively justified beliefs, but even in the case of deductive reasoning we are not justified because we can never know either the premises that go into our deductions or know that our deductive capacities are working properly.

Ram: Of course, you can be as demanding as you want about justification. I can even concede that we’re never ‘fully justified’ in any of our beliefs, whatever that means. But I would point out that if we’re never fully justified, we are often what you might call partially justified and that is a philosophically interesting phenomenon. What characterizes what you’d call partial justification.

Kedar: Could you give an example of what I’d call partial justification? I use scare-quotes because I don’t think there is any such thing as partial justification. Only God has full justification which we can’t even approach.

Ram: Well, the ideal, God’s eye justification for believing it’s 5:00pm may be that the sun is exactly at a certain position in the sky given where you are on earth and what date it is. Now looking at your watch may not be justification enough, but we can approach the ideal, reasoning on the basis of physics/cosmology that it’s about 5:00pm because the sun is in roughly the right position in the sky. The
philosophically interesting issue is what makes the rough reasoning in some sense more scientific than simply looking at your watch which might be wrong, and for that matter what difference in degree makes the rough reasoning less than it could be.

**Kedar:** OK, if you can concede we’re never fully justified, I can concede we’re sometimes partially justified. And I have to admit investigating why some forms of justification rank higher than others is philosophically interesting. Perhaps we can rank different types of justifications by considering the hierarchy of the sciences, investigating why we think there’s a hierarchy. For example, physics is more basic than chemistry, which is more basic than biology, which is more basic than psychology. The phenomena of the more basic and more justified sciences constitute the phenomena of the less basic.

**Ram:** That’s certainly how it’s commonly conceived, but in philosophy we should get at the root of the issue. It’s not constitution that makes some laws more justified. It’s which laws are more truth-preserving. Constitutive phenomena generally permit more truth-preserving inferences but that needn’t always be the case. Consider Mendel’s genetics. Its subject matter is constituted by chemistry but as far as justification is concerned, Mendel’s laws concerning the distribution of dominant and recessive traits in the propagation of pea plants permit inferences as truth-preserving as chemistry’s law about the distribution of $^{12}C$ and $^{14}C$ atoms in a carbon compound. That’s why they’re as reliable in justifications.

**Kedar:** Yes, the more truth-preserving the law the more reliable the justification that uses it. That’s why I think only the laws of logic approach full justification. I say approach because even there we may be flawed in our deductive capacities.

**Ram:** Hold on. I think admitting the possibility that our reasoning faculties may be flawed is good philosophical humility. But that’s all it is. Nothing interesting can be said further on the subject. So in exploring different kinds of justification we might as well put the limitations of our faculties aside.

Now let’s turn to logic. I think we shouldn’t lose sight of the fact that laws of logic—like modus ponens—are justification schemas or rules of inference not actual justifications or inferences themselves. Nobody believes $q$ on the basis of $p$ and $p$ implies $q$. We believe genuine propositions not proposition variables. That’s why I think it’s somewhat confused to say that only the laws of logic are fully justified.

Still, all forms of reasoning can be put into a deductive format by putting in implicit premises. That’s why axiomatic systems have provided theorists since
Aristotle a good model to study justification. Being guided by their example, we can say there are really only three things that can be justified: the theorems, the axioms and the rules of inference. Within the deductive system, the theorems are justified by the axioms using the rules of inference. The axioms and rules of inference are justified by their capacity to generate the truths that we want to come out as theorems. But we don’t construct deductive systems in a vacuum: they’re constructed so that some statements we independently want to count as theorems come out as theorems. The independent justification we have for them is inductive, reasoning from the particular to the general. These inductive truths may become so compelling that we are willing to preserve them even at the cost of abandoning cherished axioms and rules of inference when they come into conflict.

**Kedar:** I guess a good example of our reconsidering cherished axioms and rules of inference is the development of three-valued logic in response to indeterminacy in quantum mechanics.

**Ram:** That’s right. Another may be the greater legitimacy non-Euclidean geometry enjoyed after the discovery that space is curved. In both cases, alternative deductive systems were given greater legitimacy by emerging inductive discoveries.

To sum up, there are three kinds of justification: deductive justification of theorems, justifications of axioms and rules of inference by considerations of strength and simplicity and inductive justification.

**Kedar:** Whew that’s quite a summation but I’ll be damned if I can think of any exceptions. Now how do you propose to rank these three forms of justification?

**Ram:** Well, each has something to recommend it. The theorems are the result of truth-preserving inferences, the axioms have to be believed because they’re the basis of everything else and the inductive truths are the raison-d’etre of the whole deductive system in the first place. Given your preference for deductive reasoning, you’d probably prefer conditional statements like if the axioms are true the theorems have to be true. I on the other hand think some inductive truths are the most certain. To make them come out as theorems is the reason we formulate deductive systems in the first place.

But we don’t have to rank them. Our next course should be to investigate any problems that are associated with each.

**Kedar:** I’ve studied enough philosophy to know the chief problems are with induction, the method inductive truths are first justified.
Ram: You’re right again. But before we examine the old and new riddles of induction, we should consider what form inductively justified truths take. It may give us insight into the type of justifications that are appropriate for them.

Kedar: Don’t inductively justified truths take the form of generalizations like, ‘All men are mortal’?

Ram: To consider that, let’s examine a simpler, more basic inductive truth. Suppose you’re taking coins out of an urn. You’ve withdrawn 5 coins and they’ve all been dimes. As you keep drawing dimes, at some point it’ll become reasonable to assume that if you were to draw another coin from the urn, it would be a dime. The belief that it would be a dime would be justified because the set-up is just sufficiently law-like to support that counterfactual—though not all counterfactuals would be supported…for example it’s not true that if I were to drop a penny into the urn it would become a dime. The question is what happens when you first entertain the proposition that all the coins in the urn are dimes.

Kedar: I don’t know if this is what you have in mind but what would happen for me would be that I’d entertain some story about how only dimes came to be in that urn, like maybe someone is sorting the change in his pocket…maybe the laws of nature are God sorting the change in his pockets.

Ram: Interesting analogy, especially if in the case of God devising the laws of nature, you mean ‘change’ in both senses. Hmm maybe I’m being punny again… Anyway, a story is essential because it explains why all the coins in the urn are dimes. Without the story there is at most the generalization—that all the coins in the urn are dimes—which may be only accidentally true. Without the story, there is no reason to think future draws from the urn will yield dimes and we have no explanation why the draws to date have all yielded dimes.

Kedar: But different stories could be given which make the generalization not accidentally true. So any given story is not essential.

Ram: You’re right. But some story or theory might be thought essential because it establishes a connection between properties, the property of being one of the coins in that urn and the property of being a dime. So inductively justified truths could be said to take the form of connections between properties, as philosophers like Dretske and Armstrong have argued, connections that vary in strength depending on how compelling is the story doing the connecting. Inductively justified truths are not generalizations of individuals, on this reading; they are not about individuals but about properties. All men are mortal not simply
because each individual human is mortal but because being human is connected with being mortal.

**Kedar**: Just to play devils advocate, maybe they could be generalizations—they just are non-accidental because they play a part in a larger story, one that contains only other generalizations…like ‘all men are mortal’ being subsumed under ‘all organisms are mortal’.

**Ram**: That’s another theory about laws of nature or LON’s. Lewis for example has argued that LON’s are elements of systems that optimize the opposing desiderata of strength and simplicity. As we alluded to before, the LON’s, which serve as premises in our justifications, should be strong enough to explain the wide variety of phenomena but simple enough in the sense that they don’t assume more than is necessary. LON’s on this view are generalizations that appear in our best, most optimal true theories.

**Kedar**: Doesn’t optimizing between strength and simplicity make LON’s too dependent on our subjective preferences? Couldn’t LON’s be what we would rightly or wrongly consider suboptimal?

**Ram**: That’s indeed one of the chief objections to views like Lewis’ which are collectively called the systems view of LON’s, the other being the universals or properties view. The criticism is evident in our dimes example.

**Kedar**: How’s that?

**Ram**: The story in our dimes example is like the theoretical system. It gives us a reason to think the generalization that all the coins in the urn are dimes is non-accidentally true. But before we think of the story, it’s a fact that there is a law-like connection between drawing dimes and drawing coins from that urn. The fact may be better explained by a different story—for example, there could be other coins in the urn but because someone’s vigorously shaken the urn, the heavier coins are at the bottom. Still whatever the explanation, there is a connection between our drawing dimes and the setup of that urn; it’s a connection between properties not mere individuals. The story makes the generalization non-accidentally true by establishing a connection between the relevant properties, but the connection exists before the story.

**Kedar**: Your modified dime example where there are other coins in the urn is illuminating. It suggests that the connection between properties in a LON may be only a probable connection not always a necessary one.
Ram: In fact, that reminds me of the standard problem with the properties view: how do we characterize the connective connecting the properties? Whatever it is, it’s capable of connecting individuals with individuals, individuals with properties and properties with properties. It also can be a necessary connection or a probabilistic one. Material implication as used in generalizations, being not so diffused, is on a sounder footing.

Kedar: Well as usual you’ve summarized both views and the problems with each. Are you going to indicate which one you prefer?

Ram: As usual you’re going to be disappointed because as usual I’m going to straddle both positions.

Laws of Nature, like the concept of God, has several satisfaction conditions. We might be willing to consider a being as God if it possessed the three omni’s, or failing that some of the three omni’s or failing that was perfect or failing that had created the world, etc. The point is it’s not like searching for the ‘God’ particle where physicists have clear ideas of the particle’s properties before they discover it. LON’s and other pretheoretic concepts like God, could have one of several ‘essential’ characteristics. One characteristic may be that they make connections between universal properties another may be that they are a part of our most optimum theories about the world.

Kedar: What I’m interested in is when these intuitions come into conflict, which one wins out?

Ram: Since interest in that kind of conflict is commendable philosophically, I’ll try to oblige. But first let’s draw a sharper distinction between the two camps. Allied with the systems view of what LON’s are is the Regularists’ view of what LON’s do. If laws are generalizations then they serve to describe the world.

Kedar: That seems fairly uncontroversial. What’s the view of the other camp?

Ram: Well if laws are necessary connections between properties they, according to the Necessitarians, govern real world phenomena; they are a necessary feature of the world. So the issue is whether LON’s merely describe the world or do they in some sense govern it as well.

Kedar: Well, being opposed to any sense of necessity other than logical necessity, I don’t much care for the necessitarians’ label. But I have to say, I think the view that LON’s govern phenomena seems more plausible. After all, even if there were no sentient beings to describe the world, the LON’s would still be there governing it.
Ram: I'm afraid it's not that simple. They could still be said to just describe the world even if there were no beings to do the actual describing. To say they govern the world has to mean something more, like the phenomena that come under their scope behave the way they do because the relevant LON’s are true.

Kedar: You know, now that you put it that way, I’m struck by something odd about the necessitarians’ view: statements are made true by things being a certain way; the necessitarians seem to invert that, committed as they are to things being a certain way because some statements are true. Is that odd enough to be damning?

Ram: Interesting. That cart-before-the-horse argument is indeed one of the criticisms of the necessitarians view. But I don’t find it all that compelling: necessitarians could always hold that LON’s, though they can be described as any other feature of the world, are states of affairs not statements. Saying that the law of gravity being true causes the proverbial apple to fall on Newton’s head may be no more odd than saying that the apple falling on Newton’s head being true makes Newton’s head hurt. In both cases you have states of affairs causing other states of affairs. It’s just that in case of the law of gravity causing the apple to fall you have a state of affairs connecting properties causing a physical event. Just because the properties state of affairs can be described by a proposition doesn’t mean that the proposition being true causes the event except in an elliptical sense.

Kedar: I think I follow that. But what then is the best case for highlighting the difference between the two positions?

Ram: Here’s one. Suppose that gravity doesn’t follow an inverse square law, that there is an inverse cube term as well. It just so happens that there is an inverse cube law of repulsion that in every case cancels out the inverse cube term in the gravity law. Would we say that there are two LON’s operating in that case or just one?

Kedar: Being an idealist I would say there are two, though you, being a pragmatist would probably say there is only one.

Ram: I don’t know if there is an ‘ism’ for straddling the fence but I find both views have their merits. I think we’d say there is just one law of gravity—the inverse square law—that describes the phenomena we observe but if there really are features of the world—albeit undiscoverable features—that make there be two opposing forces…I don’t know…I can be brought to say there are two laws operating in that case.
**Kedar:** Are you saying you’re confused?

**Ram:** I’m saying I’m confused beyond all hope. But seriously, I think the confusion is like admitting humility and boldness, as opposed as they are, are both virtues. Admitting some features of the world are undiscoverable is humility but we don’t stop with the admitting; we imagine scenarios of how some things could be undiscoverable and imagining them is like the beginning of the thought experiment that could lead to eventually discovering them. The admission is like humility, the imagining like boldness.

**Kedar:** That’s profound man. I’m myself almost tempted to straddle the fence as you say. But not to spoil your poetic moment, wouldn’t Hume have something to say about the view that there are necessary connections in nature?

**Ram:** He certainly would though even there the answer is not clear-cut. Hume’s point that we observe no necessary connections between events, that all we observe are constant conjunctions, certainly bears on the issue at hand…though recent exegesis of Hume tends to support the interpretation that he was making a purely epistemological point. He allowed there to be necessary connections between events. His point was simply that we can never have any evidence for them, that only habit leads us to suppose a billiard ball struck directly will move in the opposite direction to where it was struck from.

**Kedar:** Yeah I guess Hume being Scottish wouldn’t be sympathetic to there being any ‘English’ on the ball.

**Ram:** It’s tempting to make bad puns, huh?

**Kedar:** I guess it is. But seriously if we can’t ever know there are necessary connections why should we ever assert them?

**Ram:** The same reason that despite the fact that all we have are sense impressions, we nevertheless assert—our science asserts—there are physical objects. There may be no justification for our belief beyond the fact that we’re just constituted to believe so, but our constitution has served us well in the past and maybe that’s justification enough. (pause)

Or maybe not...you see, my straddling the fence is at least consistent. And I’m not just being cagey: beliefs like there are physical objects and that there is a necessary connection between causes and effects seem to play some role in how we understand the world but they don’t neatly fit into any of the tripartite division of justifications we made earlier: They are not deductively justified as are the theorems of our science, nor are they justified by considerations of
strength and simplicity as are the axioms, nor are they inductively justified as are the truths we independently want to come out as theorems.

**Kedar:** You were a bit quick. Why couldn’t we say they are justified as axioms based on considerations of strength and simplicity?

**Ram:** That’s the usual move but the skeptic can always say, ‘What additional theorems are you purchasing with these as axioms?’ For example, the supposition that there are necessary connections between causes and effects supports no scientific laws as far as I know. Same with the supposition that there are physical objects. So considerations of simplicity would seem to demand that we drop these from our set of axioms.

Though then again—fence straddling mode—, they do make a virtue of habit.

**Kedar:** OK, you’ve convinced me: maybe fence-straddling is the best position on this issue. Let’s see if we can make any progress on the New Riddle of Induction.

**Ram:** You won’t find me straddling the fence on that one. The new riddle has been around since the 1950’s so maybe, like grue, it too is past time t when it should be called something else—like maybe the ‘Solved Riddle of Induction.’ *(snicker, snicker)*

**Kedar:** I don’t get it. I confess I don’t know anything about the new riddle.

**Ram:** Oh I see. Before I give my solution to the new riddle, I have to explain it. As Goodman argued, Hume’s solution to the problem of induction leaves open the conditions under which regularities get habituated. Not all regularities get habituated: for example, while it’s true that the evidence to date has supported the claim that all emeralds are green, it’s also true that the same evidence is consistent with the claim that all emeralds are grue, where an emerald is grue if examined before some future time t and found to be green or otherwise is blue. The riddle is to give criteria under which the first regularity is supported by the evidence to date but the second regularity is not.

**Kedar:** Can’t we disqualify the second hypothesis on the grounds that it employs a disjunctive predicate and refers to a particular time instant? Proper scientific predicates shouldn’t have such characteristics.

**Ram:** Goodman has a nice response to such an objection. Analogous to grue, he defines another predicate, bleen such that an object is bleen if examined before t and found to be blue and green otherwise. If we adopt grue and bleen as our primitive predicates then green and blue turn out to have disjunctive definitions which refer to a time instant. The moral Goodman wants us to draw is that
preferring one set of predicates over the other is purely a matter of practice, practice conditioned by which predicates have been used successfully in past projections.

**Kedar:** Couldn’t we again appeal to our constitutions, saying we’re so constituted as to key-in on green things rather than grue things?

**Ram:** That’s another response to Goodman’s riddle, to point out that green things are a ‘natural kind’ for us, that the reason we favor green is not simply practice which could’ve just as easily favored grue. Our physical nature predisposes us to pick out green things rather than grue things.

But both practice, or entrenchment as Goodman calls it, and the constitution argument make it a little arbitrary that ‘all emeralds are green’ is better supported by the emeralds we’ve actually seen than ‘all emeralds are grue’. Science should be on a sounder footing.

**Kedar:** I presume your solution to Goodman’s riddle puts it on a sounder footing?

**Ram:** It does. My argument, which is detailed in a paper called ‘Resolution of Grue Using a Support Measure’ published in PhilSci Archive, is essentially as follows: denying ‘all emeralds are green’ lowers the likelihood of having found green emeralds more than denying ‘all emeralds are grue’ lowers the likelihood of having found grue emeralds. This is because when we deny all emeralds are grue we’re casting doubt on emeralds after t being blue, which is consistent with them being green like in our sample. Mathematically it can be shown that if some evidence is less likely given the denial of a hypothesis than given the denial of a second hypothesis, then the evidence supports the first hypothesis more than the second hypothesis. In other words, the evidence to date supports ‘all emeralds are green’ more than it supports ‘all emeralds are grue’.

**Kedar:** I’ll have to check out the PhilSci Archive paper, but it does sound intriguing. It is refreshing to see you not straddling the fence on an issue.

**Ram:** You could say I saved the best for last since I think we’ve covered about all the bases on the topic of justification.

**Kedar:** Say, now that we’re at the end, what would you make of our talk, not only this discussion but our philosophical discussions in general? Good, bad or indifferent as scratching an itch? I fear it’s the last, which may still be a little bad since there is so much other good things we could be doing.
Ram: Oh it’s not so bad. Philosophy is not just our itch to scratch. We’ll just have to see to it that other people’s inquisitive itches are scratched by our philosophizing as well.