DOWNLOAD PDF TOWARD AN EPISTEMOLOGY OF PHYSICS

Chapter 1 : Karen Barad - Wikipedia

genetic epistemology that explains how experience feeds into knowledge llke my son showed, which in turn, feeds later into learning school physics. A sense of mechanism is the knowledge that provides us with the capability to.

Intra-action, a neologism introduced by Barad, signals an important challenge to individualist metaphysics. Thus, apparatuses, which produce phenomena, are not assemblages of humans and nonhumans as in actor-network theory. What it means to matter is therefore always material-discursive. Barad takes her inspiration from physicist Niels Bohr , one of the founders of quantum physics. For this, Barad employs the term onto-epistemology. Because specific practices of mattering have ethical consequences, excluding other kinds of mattering, onto-epistemological practices are always in turn onto-ethico-epistemological. In addition to Bohr, her work draws a great deal on the works of Michel Foucault and Judith Butler , as demonstrated in her influential article in the feminist journal differences , "Getting Real: Technoscientific Practices and the Materialization of Reality. According to Barad, the deeply connected way that everything is entangled with everything else means that any act of observation makes a "cut" between what is included and excluded from what is being considered. Nothing is inherently separate from anything else, but separations are temporarily enacted so one can examine something long enough to gain knowledge about it. This view of knowledge provides a framework for thinking about how culture and habits of thought can make some things visible and other things easier to ignore or to never see. For this reason, according to Barad, agential realism is useful for any kind of feminist analysis, even if the connection to science is not apparent. She defines agency as a relationship and not as something that one "has. This differs from the view that political critiques of science seek to undermine the credibility of science; instead, Barad argues that this kind of critique actually makes for better, more credible science. She argues that politics and ethical issues are always part of scientific work, and only are made to seem separate by specific historical circumstances that encourage people to fail to see those connections. She uses the example of the ethics of developing nuclear weapons to argue this point, by claiming that the ethics and politics are part of how such weapons were developed and understood, and therefore part of science, and not merely of the "philosophy of science" or the "ethics of science. She also rejects the idea that science is "only" a language game or set of fictions produced only by human constructions and concepts. Although the scientist is part of the "intra-action" of the experiment, humans and their cultural constructs do not have complete control over everything that happens. Books[edit] German Barad, Karen English Barad, Karen Meeting the Universe Halfway: Quantum Physics and the Entanglement of Matter and Meaning. English Barad, Karen , "Meeting the universe halfway: Kluwer Academic Publishers, pp. Barad, Karen , "Agential realism: Rutgers University Press, pp. University of Washington Press, pp.

Chapter 2 : Towards an Epistemology of Missions | Randall Holm - calendrierdelascience.com

Why Minimal Guidance During Instruction Does Not Work: An Analysis of the Failure of Constructivist, Discovery, Problem-Based, Experiential, and Inquiry-Based Teaching.

What are the necessary and sufficient conditions for S to know that p? We may distinguish, broadly, between a traditional and a non-traditional approach to answering this question. False propositions cannot be known. Therefore, knowledge requires truth. Therefore, knowledge requires belief. Thus we arrive at a tripartite analysis of knowledge as JTB: S knows that p if and only if p is true and S is justified in believing that p. According to this analysis, the three conditions â€" truth, belief, and justification â€" are individually necessary and jointly sufficient for knowledge. They diverge, however, as soon as we proceed to be more specific about exactly how justification is to fulfill this role. According to evidentialism, what makes a belief justified in this sense is the possession of evidence. NTK, on the other hand, conceives of the role of justification differently. One prominent idea is that this is accomplished if, and only if, a belief originates in reliable cognitive processes or faculties. This view is known as reliabilism. There are cases of JTB that do not qualify as cases of knowledge. JTB, therefore, is not sufficient for knowledge. Cases like that â€" known as Gettier-cases[5] â€" arise because neither the possession of evidence nor origination in reliable faculties is sufficient for ensuring that a belief is not true merely because of luck. Consider the well-known case of barn-facades: Henry drives through a rural area in which what appear to be barns are, with the exception of just one, mere barn facades. From the road Henry is driving on, these facades look exactly like real barns. This is known as the Gettier problem. According to TK, solving the problem requires a fourth condition. According to some NTK theorists, it calls for refining the concept of reliability. They would say that, if we conceive of knowledge as reliably produced true belief, there is no need for justification. Reliabilism, then, comes in two forms: As the former, it views justification to be an important ingredient of knowledge but, unlike TK, grounds justification solely in reliability. As a theory of knowledge, reliabilism asserts that justification is not necessary for knowledge; rather, reliably produced true belief provided the notion of reliability is suitably refined to rule out Gettier cases is sufficient for it. When we discuss the nature of justification, we must distinguish between two different issues: Second, what makes beliefs justified? It is important to keep these issues apart because a disagreement on how to answer the second question will be a mere verbal dispute, if the disagreeing parties have different concepts of justification in mind. Here is an example: Tom asked Martha a question, and Martha responded with a lie. Was she justified in lying? What might Jane mean when she thinks that Martha was justified in responding with a lie? A natural answer is this: She means that Martha was under no obligation to refrain from lying. This understanding of justification, commonly labeled deontological, may be defined as follows: S is justified in doing x if and only if S is not obliged to refrain from doing x. Deontological Justification DJ S is justified in believing that p if and only if S believes that p while it is not the case that S is obliged to refrain from believing that p. Whereas when we evaluate an action, we are interested in assessing the action from either a moral or a prudential point of view, when it comes to beliefs, what matters is the pursuit of truth. The relevant kinds of obligations, then, are those that arise when we aim at having true beliefs. Exactly what, though, must we do in the pursuit of this aim? According to one answer, the one favored by evidentialists, we ought to believe in accord with our evidence. For this answer to be helpful, we need an account of what our evidence consists of. According to another answer, we ought to follow the correct epistemic norms. If this answer is going to help us figure out what obligations the truth-aim imposes on us, we need to be given an account of what the correct epistemic norms are. Today, however, the dominant view is that the deontological understanding of justification is unsuitable for the purposes of epistemology. Two chief objections have been raised against conceiving of justification deontologically. First, it has been argued that DJ presupposes that we can have a sufficiently high degree of control over our beliefs. But beliefs are akin not to actions but rather things such as digestive processes, sneezes, or involuntary blinkings of the eye. The idea is that beliefs simply arise in or happen to us. Therefore, beliefs are not suitable for deontological evaluation. This claim is typically supported by describing cases involving either a benighted, culturally isolated society or subjects who are cognitively deficient. Such cases involve beliefs that are claimed to be epistemically defective even though it would not seem that the subjects in these cases are under any obligation to refrain from believing as they do. What makes the beliefs in question epistemically defective is that they are formed using unreliable and intellectually faulty methods. The reason why the subjects, from their own point of view, are not obliged to believe otherwise is that they are either cognitively deficient or live in a benighted and isolated community. DJ says that such beliefs are justified. If they meet the remaining necessary conditions, DJ-theorists would have to count them as knowledge. According to the objection, however, the beliefs in question, even if true, could not possibly qualify as knowledge, due to the epistemically defective way they were formed. Consequently, DJ must be rejected. The technical sense is meant to make the term suitable for the needs of epistemology. What does it mean for a belief to be justified in a non-deontological sense? Let us say that this is accomplished when a true belief instantiates the property of proper probabilification. We may, then, define non-deontological justification as follows: If we wish to pin down exactly what probabilification amounts to, we will have to deal with a variety of tricky issues. Those who prefer NDJ to DJ would say that probabilification and deontological justification can diverge: This is just what cases involving benighted cultures or cognitively deficient subjects are supposed to show. Reliability What makes justified beliefs justified? According to evidentialists, it is the possession of evidence. What is it, though, to possess evidence for believing that p? Some evidentialists would say it is to be in a mental state that represents p as being true. For example, if the coffee in your cup tastes sweet to you, then you have evidence for believing that the coffee is sweet. If you feel a throbbing pain in your head, you have evidence for believing that you have a headache. If you have a memory of having had cereal for breakfast, then you have evidence for a belief about the past: And when you clearly "see" or "intuit" that the proposition "If Jack had more than four cups of coffee, then Jack had more than three cups of coffee" is true, then you have evidence for believing that proposition. In this view, evidence consists of perceptual, introspective, memorial, and intuitional experiences, and to possess evidence is to have an experience of that kind. So according to this evidentialism, what makes you justified in believing that p is your having an experience that represents p as being true. Many reliabilists, too, would say that the experiences mentioned in the previous paragraph matter. However, they would deny that justification is solely a matter of having suitable experiences. Rather, they hold that a belief is justified if, and only if, it results from cognitive origin that is reliable: Reliabilists, then, would agree that the beliefs mentioned in the previous paragraph are justified. But according to a standard form of reliabilism, what makes them justified is not the possession of evidence, but the fact that the types of processes in which they originate â€” perception, introspection, memory, and rational intuition â€" are reliable. External In contemporary epistemology, there has been an extensive debate on whether justification is internal or external. Internalists claim that it is internal; externalists deny it. How are we to understand these claims? To understand what the internal-external distinction amounts to, we need to bear in mind that, when a belief is justified, there is something that makes it justified. Likewise, if a belief is unjustified, there is something that makes it unjustified. The dispute over whether justification is internal or external is a dispute about what the J-factors are. Among those who think that justification is internal, there is no unanimity on how to understand the concept of internality. We can distinguish between two approaches. According to the first, justification is internal because we enjoy a special kind of access to J-factors: Externalists deny that J-factors meet either one of these conditions. Evidentialism is typically associated with internalism, and reliabilism with externalism. Evidentialism says, at a minimum, two things: By virtue of E2, evidentialism is obviously an instance of mentalist internalism. Whether evidentialism is also an instance of accessibility internalism is a more complicated issue. The conjunction of E1 and E2 by itself implies nothing about the recognizability of justification. Recall, however, that in Section 1. TK advocates, among which evidentialism enjoys widespread sympathy, tend to endorse the following two claims: Relying on introspection, one can always recognize on reflection what mental states one is in.

Chapter 3 : Andrea diSessa, Toward an Epistemology of Physics - PhilPapers

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This should not be surprising given that experiment was emerging as a central scientific tool at the time. The aim of these reflections was to uncover why nature reveals its hidden aspects to us when we force experimental methods upon it. Some natural philosophers believed that scientific knowledge was little more than the proper application of observational and experimental techniques on natural phenomena. Francis Bacon went so far as to claim that it was possible to perform what he called a crucial experiment experimentum crucis , an ideal experiment of sorts that can determine alone which of two rival hypotheses is correct. And even some of the giants of modern science such as Newton subscribed to the view that scientific theories are directly induced from experimental results and observations without the help of untested hypotheses. It is little wonder, then, that many natural philosophers thought that experimental techniques and their proper application should be a primary object of philosophical study of science. Yet not everybody agreed. Hobbes, for instance pointed out that human reason preceded experimental techniques and their application. If so, we should focus on the philosophical study of reason and theoretical scientific reasoning rather than on the study of experimental techniques and their applications. This vigorous early debate in many ways anticipated the main points of disagreement in debates to come. Yet the philosophical interest in experimentation almost completely lost its steam at the end of the 19th century and did not recover until fairly late in the 20th century. During that period philosophers turned much of their attention to the study of the logical structure of scientific theories and its connection to evidence. The tenets of logical positivism influenced this area of investigation â€” as well as philosophy more generally â€” at the time. One of these tenets stated that observational and theoretical propositions in science are separable. My readings of the gradation on the scale of a mercury thermometer can be separated from rather complicated theoretical statements concerning heat transfer and the theoretical concept of temperature. In fact, not only can one separate theory and observation, but the former is considered justified only in light of its correspondence with the latter. The theory of heat transfer is confirmed by propositions originating in the kind of readings I perform on my mercury thermometer. Thus, observational propositions are simply a result of an experiment or a set of observations a scientist performs in order to confirm or refute a theory. Thomas Kuhn and Paul Feyerabend vigorously criticized this view. They argued that observations and experimental results are already part of a theoretical framework and thus cannot confirm a theory independently. Nor there is a theory-neutral language for capturing observations. Even a simple reading of a mercury thermometer inevitably depends on a theoretically-charged concept of temperature. In short, the evidence is always theory-laden. Yet neither the proponents of logical positivism nor their critics ever attempted to explain the nature of experimentation that produces all-important observational statements. And the reason for this was very simple: Their views on the relationship between theory and evidence were diametrically opposed, but they all found only the final product of experimentation, namely observational statements, philosophically interesting. As a result, the experimental process itself was set aside in their philosophical study of science. How do we distinguish between a valid result[2] and an artifact created by that apparatus? If experiment is to play all of the important roles in science mentioned above and to provide the evidential basis for scientific knowledge, then we must have good reasons to believe in those results. Hacking provided an extended answer in the second half of Representing and Intervening He pointed out that even though an experimental apparatus is laden with, at the very least, the theory of the apparatus, observations remain robust despite changes in the theory of the apparatus or in the theory of the phenomenon. His illustration was the sustained belief in microscope images despite the major change in the theory of the microscope when Abbe pointed out the importance of diffraction in its operation. One reason Hacking gave for this is that in making such observations the experimenters intervenedâ€”they manipulated the object under observation. Thus, in looking at a cell through a microscope, one might inject fluid into the cell or stain the specimen. One expects the cell to change shape or color when this is done. Observing the predicted effect strengthens our belief in both the proper operation of the microscope and in the observation. This is true in general. Observing the predicted effect of an intervention strengthens our belief in both the proper operation of the experimental apparatus and in the observations made with it. After all, it is our theory of light and of the microscope that allows us to consider these microscopes as different from each other. Nevertheless, the argument holds. Hacking correctly argues that it would be a preposterous coincidence if the same pattern of dots were produced in two totally different kinds of physical systems. Different apparatuses have different backgrounds and systematic errors, making the coincidence, if it is an artifact, most unlikely. If it is a correct result, and the instruments are working properly, the coincidence of results is understandable. It is, however, incomplete. What happens when one can perform the experiment with only one type of apparatus, such as an electron microscope or a radio telescope, or when intervention is either impossible or extremely difficult? Other strategies are needed to validate the observation. Experimental checks and calibration, in which the experimental apparatus reproduces known phenomena. For example, if we wish to argue that the spectrum of a substance obtained with a new type of spectrometer is correct, we might check that this new spectrometer could reproduce the known Balmer series in hydrogen. If we correctly observe the Balmer Series then we strengthen our belief that the spectrometer is working properly. This also strengthens our belief in the results obtained with that spectrometer. If the check fails then we have good reason to question the results obtained with that apparatus. Reproducing artifacts that are known in advance to be present. An example of this comes from experiments to measure the infrared spectra of organic molecules Randall et al. It was not always possible to prepare a pure sample of such material. Sometimes the experimenters had to place the substance in an oil paste or in solution. In such cases, one expects to observe the spectrum of the oil or the solvent, superimposed on that of the substance. One can then compare the composite spectrum with the known spectrum of the oil or the solvent. Observation then of this artifact gives confidence in other measurements made with the spectrometer. Elimination of plausible sources of error and alternative explanations of the result the Sherlock Holmes strategy. The only remaining explanation of their result was that it was due to electric discharges in the ringsâ€"there was no other plausible explanation of the observation. In addition, the same result was observed by both Voyager 1 and Voyager 2. This provided independent confirmation. Often, several epistemological strategies are used in the same experiment. Using the results themselves to argue for their validity. Although one might very well believe that his primitive, early telescope might have produced spurious spots of light, it is extremely implausible that the telescope would create images that they would appear to be a eclipses and other phenomena consistent with the motions of a small planetary system. A similar argument was used by Robert Millikan to support his observation of the quantization of electric charge and his measurement of the charge of the electron. In both of these cases one is arguing that there was no plausible malfunction of the apparatus, or background, that would explain the observations. Using an independently well-corroborated theory of the phenomena to explain the results. Although these experiments used very complex apparatuses and used other epistemological strategies for details see Franklin , pp. I believe that the agreement of the observations with the theoretical predictions of the particle properties helped to validate the experimental results. In this case the particle candidates were observed in events that contained an electron with high transverse momentum and in which there were no particle jets, just as predicted by the theory. It was very improbable that any background effect, which might mimic the presence of the particle, would be in agreement with theory. Using an apparatus based on a well-corroborated theory. In this case the support for the theory inspires confidence in the apparatus based on that theory. This is the case with the electron microscope and the radio telescope, whose operations are based on a well-supported theories, although other strategies are also used to validate the observations made with these instruments. An interesting example of this arose in the s when the search for new particles and resonances occupied a substantial fraction of the time and effort of those physicists working in experimental high-energy physics. The usual technique was to plot the number of events observed as a function of the invariant mass of the final-state particles and to look for bumps above a smooth background. The usual informal criterion for the presence of a new particle was that it resulted in a three standard-deviation effect above the background, a result that had a probability of 0. This criterion was later changed to four standard deviations, which had a probability of 0. They provide us with good reasons for belief in experimental results, They do not, however, guarantee that the results are correct. There are many experiments in which these strategies are applied, but whose results are later shown to be incorrect examples will be presented below. Neither are these strategies exclusive or exhaustive. No single one of them, or fixed combination of them, guarantees the validity of an experimental result. Physicists use as many of the strategies as they can conveniently apply in any given experiment. In his histories of the measurements of the gyromagnetic ratio of the electron, the discovery of the muon, and the discovery of weak neutral currents, he considered a series of experiments measuring a single quantity, a set of different experiments culminating in a discovery, and two high- energy physics experiments performed by large groups with complex experimental apparatus. Galison emphasizes that, within a large experimental group, different members of the group may find different pieces of evidence most convincing. Thus, in the Gargamelle weak neutral current experiment, several group members found the single photograph of a neutrino-electron scattering event particularly important, whereas for others the difference in spatial distribution between the observed neutral current candidates and the neutron background was decisive. Galison attributes this, in large part, to differences in experimental traditions, in which scientists develop skill in using certain types of instruments or apparatus. In particle physics, for example, there is the tradition of visual detectors, such as the cloud chamber or the bubble chamber, in contrast to the electronic tradition of Geiger and scintillation counters and spark chambers. For further discussion of this issue see Galison Galison points out that major changes in theory and in experimental practice and instruments do not necessarily occur at the same time. This persistence of experimental results provides continuity across these conceptual changes. Robert Ackermann has offered a similar view in his discussion of scientific instruments. The advantages of a scientific instrument are that it cannot change theories. Instruments create an invariant relationship between their operations and the world, at least when we abstract from the expertise involved in their correct use. When our theories change, we may conceive of the significance of the instrument and the world with which it is interacting differently, and the datum of an instrument may change in significance, but the datum can nonetheless stay the same, and will typically be expected to do so. An instrument reads 2 when exposed to some phenomenon. After a change in theory,[5] it will continue to show the same reading, even though we may take the reading to be no longer important, or to tell us something other than what we thought originally Ackermann , p. Galison also discusses other aspects of the interaction between experiment and theory.

Chapter 4 : Experiment in Physics (Stanford Encyclopedia of Philosophy)

On the Empirical Law of Epistemology: Physics as an Artifact of Mathematics. Nikos A. Tambakis - - In M. Ferrero & A. van der Merwe (eds.), Fundamental Problems in Quantum Physics. pp.

Randall Holm JAM 4: It is a classic in that every church, in some measure has drawn strength and direction from what happened to a band of disciples in Jerusalem on a particular day of Pentecost some two thousand years ago. Pentecost or the Festival of Weeks, coming fifty days after the Passover, is one of three great Jewish holidays. Annually, many Jews and proselytes from the Diaspora would make the pilgrimage to Jerusalem to at the end of the grain harvest to offer thanks to God by presenting the first-fruits of their labor. Others in the crowd mockingly dismissed the novelty as evidence of a bit too much wine. Yet no matter what one thinks of the events described by Luke in Acts 2, the day marks the birth of the church. Today in remembrance of that occasion, a typical liturgical reading for Pentecost Sunday starts with both Acts 1: As part of the oldest theological tradition of the Old Testament, Genesis 11 narrates as aetiology, the dispersion of people throughout the known world. Traditionally, it has been suggested that Acts 2 is the reversal of Genesis Namely speech that became confused resulting in dispersion has now been united by the advent of the Holy Spirit. Part three will attempt to synthesize these two passages. The story is equally divided in two parts. Part one begins with the actions of humankind v. Verse five serves as a linchpin between the two parts as God leaves his domain and performs a divine inspection on earth. In the first four verses people migrated to the land of Shinar and with the use of bricks and mortar built a city both in an effort to make a name for themselves and to prevent their dispersal to the ends of the earth. In the center of the city a tower was constructed with the aim to reach the 2 Walter Brueggemann, Genesis, Interpretation: John Knox, , p. Narrative Commentaries Valley Forge: Trinity, , pp. Basil Blackwell, , pp. Fortress, , p. Verses narrate the response of God to this so-called intrusion. Reminiscent of the later situation at Sodom and Gomorrah, God is pictured in anthropomorphic terms as coming to investigate what people were building. Subsequently, God reacted by confounding the speech of the people, which abruptly halted construction and scattered everyone over the face of the earth. As a piece of literature in and of itself, the passage cannot help but tickle the imagination of the reader. The passage is a grand example of alliteration. Michael Fishbane describes the story as an acoustical sound track. The alliteration has the effect of underlining the ultimate importance accorded speech throughout this pericope. It is language that binds and then scatters humankind over the face of the earth. It visualizes the power of speech to build and the power of speech to tear down. While God and humans are the actors of this story, it is speech that provides the generative energy. It is, therefore, not surprising that exegetes of Acts 2 invariably look to Genesis 11 as an interpretive reference point. Could Luke have had this ancient tradition in mind when he described the activities of Acts 2? And if he did, in what way does Luke reach back into the memories of his own consciousness and activate the regnant symbols of Genesis 11? The majority consensus among contemporary scholars is that the confusion of speech created by God in Genesis 11 was in reaction to human hubris. Schocken, , p. Word, , pp. Westminster, , pp. Van Gorcum, , p. Reading diachronically the story is about vertical striving in the same spirit as Genesis 3 the fall and Genesis the Noahic flood. It was a Promethean attempt to storm the heavens and be like God. But God retaliated by confounding the speech of the people thus putting an abrupt halt to their efforts. In such a perspective, the subsequent scattering is understood in punitive terms. Midrash adds some illustrative material. In Genesis Rabbah we read, Said R. So come, let us make a tower for ourselves and put an idol on top of it, and put a sword in its hand, so that it will appear as if it carries on warfare with him. Such a view however is not without 7 Fokkleman, Narrative Art in Genesis, p. See also Wenham, Genesis 1- 15, p. Scholars Press, , p. One is left to wonder about the omnipotence of a God who is described as feeling threatened by aspiring architects. One may also speculate why the tower, if indeed it is central to the understanding of this story, is left out in the conclusion? Instead of the tower being destroyed the people are scattered over the face of the earth. Increasingly, in part because of these questions, scholars have been led to a different conclusion concerning the Babel pericope. Proponents of this view note that typically humans are more underachievers than they were prideful overachievers. It is speculated that perhaps the people gathered together in one city in fear of being subjected to another flood? Were they in a quest for securityâ€" for fear of being lost? Whatever the reasons, by clinging to each other in a homogenous community, they were avoiding that for which they were created. In the end the people would be forced to create heterogeneous cultures for the benefit of all. Gunther Plaut, The Torah: A Modern Commentary New York: Union of American Hebrew Congregations, , pp. Jewish Publication Society, , pp. Mesorah Publishing, , p. In between Luke15 chronicles the footsteps of Jesus and subsequent disciples as they fan the flame of the gospel to the ends of the earth. But the disciples were not going to be alone; Jesus is quoted as telling the disciples that the Holy Spirit will accompany them in power. In Acts 2, that which was promised occurs. Not knowing what to expect, the Holy Spirit in the form of a mighty wind greeted the disciples. Witnesses reported tongues of fire resting on each disciple. To do so, however, is to impose a criterion for truth on the biblical writer that was not practiced 14 Brueggemann, Genesis, p. For the sake of convenience I will refer to the author as Luke. Our interest cannot be so much what happened but in what was claimed to have happened. And it quickly becomes evident that Luke is drawing on many traditions in underscoring the importance of this event. Tongues of fire appear possibly as a referent to the tongues of fire that appeared on Mount Sinai during the giving of the Law. But perhaps the most unusual occurrence on that day was the inspired speech of the disciples in foreign languages that they did not recognize. Precisely it will be the only occasion, where tongues glossolalia imply known languages. Moving geographically from the east to the west the list of those present represents a swath of Jews, proselytes and devout gentiles who had come to participate in the Festival of Pentecost. In addition it is noted in the text that those listening detected their own languages Acts 2: This stands in contrast to latter usages of the world glossolalia Synthesis Traditional hermeneutics has favored interpreting Acts 2 as a reversal of Genesis The reading starts with the presupposition that the actions of God in Genesis 11 are punitive in response to human hubris. There are, however, difficulties with such an interpretation. First, if the Holy Spirit in Acts 2 is said to reunite language, then it does not follow that there were so many languages present. Acts 2 does not eliminate language diversity, rather it celebrates the same said diversity. The disciples do not leave speaking one language, instead they reflect the languages that are present. Second, in Acts 2 the accent is on proclamation, not human pride. In light of this we propose a different reading of Acts 2 that remains open to the pulses of meaning found in Genesis As we have already noted Luke is interested in chronicling both the development and spread of the gospel message both politically and geographically. Politically the message begins with the Jewish population and geographically it is centered in Jerusalem. However, while Luke starts with Jews, he clearly anticipates the mission to the gentiles. Accordingly John the Baptist is the voice calling in the desert: Prepare the way of the Lord, make his paths straight. Every valley shall be filled, and every mountain and hill shall be made low; and the crooked shall be straight, and the rough ways made smooth; and all flesh shall see the salvation of God. In Acts 2, although the list is not meant to be exhaustive, Jews from every nation under heaven assemble together for the Feast of Pentecost. In effect, the text says to those assembled as they spoke in known foreign languages that were unknown to them: The commission is now to go to these nations with the kerygma the gospel message. In this way the physical happenings of Acts 2 reinforce the verbal admonition of Acts 1: All of which stands in opposition to the human temptation to stay and build. The missionary mandate is to go and scatter. With this understanding it is not hard to imagine Luke drawing on Genesis 11 if he interprets the Babel narrative as a redemptive act of God.

Chapter 5 : Epistemology and Modern Physics

Interested in more than just the learning of physics, diSessa offers a broad theory of cognitive change and learning -- a theory of the nature of cognitive representations and the organizations of knowledge.

The Emergence of Logical Empiricism publ. The whole of Schlick selection for series is reproduced here. There is no longer any doubt nowadays, that theoretical philosophy has standing only in close connection with the sciences, whether it seeks in them a basis on which it attempts to build further, or whether they form for it merely the subject-matter of its own analyses, whereby it then makes individual inquiry into the first principles of knowledge. This is very much the case if, as I believe, philosophy can be nothing else whatever but the activity whereby we clarify all our concepts. And it is also beyond doubt that, of all the sciences, physics here stands at the forefront. Physics, that is, occupies an exceptional position, because in it two elements are united, which are only found separately in the other sciences: Even a person who did not follow Kant, in permitting only absolutely certain, exact knowledge to count as knowledge at all, would yet be convinced that at any rate it represents the high point of knowledge, so that a philosophy which could do complete justice to exact knowledge would thereby at the same time have solved the entire problem of knowledge. But this it can do, however, only if it deals not merely with strict knowledge, but at the same time with knowledge of the real, since merely imagined or contrived objects are of little interest to the philosopher; it is the world of reality which yields him the major problems. Hence the physical sciences are assured of having a unique significance for philosophy, though this has not always been apparent in equal measure to philosophers of different periods. After the making, in our own day, of some attempts that were already methodically defective, to couple the historical with the exact sciences from a philosophical standpoint, the modern development of physics, which has taken on a highly philosophical character, has brought out the peculiar position of this science a great deal more clearly than ever before. So clearly, indeed, that, given the present state of research, some altogether crucial questions about the mutual relationship of physics and epistemology can perhaps be brought to a decision. The most important of these questions seems to me this: Given a proposition of physics, we know how its truth can in principle be established: But the question of how we actually recognise the truth of a philosophical system is so far from having found a generally satisfying answer, that it has often been put forward only for the purpose of deriding philosophy. Today, however, after the insight gained into the thorough interpenetration of philosophy and the sciences, we can and must say of epistemology, at least, that the correct theory is that which prevails in course of the advance of physical research. But this formulation of the criterion of truth is initially so indeterminate and general, that we still need very accurate elucidations in order to understand its meaning aright. And here it is contemporary physics alone which provides us with the instances of cognition that are needed to specify and explain matters in full. Before examining individual cases, we shall ask in what sense we can really expect beforehand to find epistemological statements confirmed in physics. Can philosophy predict any experimental finding of the empirical sciences? We certainly have no right to assume this, for if so, philosophy would be dabbling in the trade of physics, and nobody believes any more nowadays that physical results can be obtained by purely philosophical methods. The task of epistemology is not to predict what will be observed in nature. It merely tells us beforehand how science will react, if this or that is observed. What it prophesies, therefore, is not the results of experiments, but the impact of experimental results on the system of physics. By far the most important limiting case of such statements occurs when it lays down specific principles with the claim that science will always adhere to them, whatever sort of observations may be made. In short, epistemology makes statements about the dependence of physics on, and in limiting cases its independence of possible observations. The statements are correct when, on the occurrence of these observations, physical science actually takes the form predicted. Here now is the weightiest example from modern physics. The epistemology pursued by the great mathematicians of the 19th century Gauss, Riemann, Helmholtz had maintained that a specific course of processes in nature a specific mode of behaviour on the part of light-rays and measuring rods was conceivable, on observation of which physics would turn over to employing non-Euclidean geometries. This prediction, as we know, has been most brilliantly confirmed by the general theory of relativity, and the premises on whose basis this prophecy was made, have thereby demonstrated their truth-value. But what role did these premises play in the epistemology of the said mathematicians? Do they form the inmost heart of their philosophy, determining the character of the whole edifice of thought, or are they of a less essential kind, so that they might perhaps equally find a place in an altogether different theory of knowledge? This question has to be answered in order to know in what degree and what aspect modern physics is actually to be seen as confirmation of that particular epistemology, which was notoriously that of empiricism. An important step towards deciding the matter is taken if we establish whether, or in what degree, the opposite theory to empiricism, that of Kantian apriorism, would be equally capable of validating the principles of modern physics. This apriorism teaches, of course, that natural science will always adhere to certain general principles, whatever any given experimenter may happen to observe. These principles are said to be synthetic, that is, not to express mere tautologies, and they are also said to be a priori. The latter has a double significance in the Kantian system. First, that is, that they represent logical presuppositions of science, so that without them we could erect no structure of connected truths about nature at all; but secondly, too, that these principles are self-evident for us, so that we simply cannot imagine their invalidity, and hence that our ideational consciousness is inexorably linked to them. Of these two aspects the so-called logical interpretation of Kant the Marburg school emphasises the first, while the psychological view stresses the second. The conflict between the two attitudes is strange, since both interpretations are quite indubitably combined together in Kant: Now which, according to the doctrine of apriorism, are the basic synthetic judgements of all science? For Kant, they include the axioms of Euclidean geometry, of which, as we have just seen, modern physics demonstrates that they are not a priori in the first sense, after it had already been made clear before this that they are not so in the second psychological sense. For in that sense apriorism with regard to Euclidean geometry has already been refuted by psychological considerations, which many philosophers still seem to overlook. In this one connection, concerning some and hence not yet all geometrical axioms, modern physics therefore opts decisively in favour of empiricism. It would be quite generally refuted only if it turned out that science contains no synthetic a priori propositions whatsoever. Anyone who maintains their existence must of course be able to produce them. An apriorism that cannot really enumerate a single synthetic a priori principle, has thereby pronounced its own death-sentence. And to this question modern scientific research appears to give an answer of the same kind as that given in the case of Euclidean geometry; for it shows that physical science refuses to regard any one of the principles which might come into question here as the sole possible basis. In order to convince ourselves of this, let us go through the particular proposals which have been made for keeping apriorism on its feet! In the first place, now that a portion of the Euclidean axioms has had to be dropped, the attempt has been made to extract a complex from the remaining axioms of geometry, and to proclaim it as the unshakeable foundation of all scientific accounts of space. But there are indications in modern physics that it has no wish to allow itself to be fettered for ever by such axioms. Hermann Weyl has already outlined a peculiar theory of matter according to which electrons, the ultimate constituents of matter, are as it were outside space. The latter would have such peculiar topological properties that it would be impossible, for example, to imagine a spherical volume of space containing electrons to contract by steady shrinkage into a point. Still bolder constructions are scientifically possible, and there is simply no predicting the assumptions to which we may be driven by the astonishing physical facts disclosed by modern research. Hence the appearance of contemporary physics gives us clear warning against the attempt to view the topological axioms, say, as a noli me tangere [touch me not]. In the second place, the language of the new physics pronounces more clearly still against the endeavour to cling, say, to the continuity of nature as a necessary and invariably satisfied condition, which now finds expression in certain synthetic a priori propositions. Here too, therefore, apriorism finds no resting-place. Third and lastly, let us examine the attitude of present-day physics to that principle which appears in Kant as the most important of synthetic a priori propositions, and is also not infrequently declared to be such even today: I mean, of course, the causal principle. If, appropriately enough, we mean by causality the existence of regularity in nature, it certainly represents a necessary presupposition of science; without causality, a knowledge of nature would be impossible, for such knowledge consists, in fact, of discovering laws. From this simple fact many have already sought to conclude that the causal law is to be regarded as an a priori principle in the fullest sense. But this is undoubtedly quite mistaken, or at least a misuse of terminology. For this does nothing to establish an epistemological apriorism. The latter only comes about if we add the claim that we should continue to uphold the validity of the causal principle for all natural processes, whatever science may disclose to us in. In other words, we should have to possess an unshakeable conviction of the factual validity of the causal principle. We see here how the logical a priori is inseparable from the psychological, if it is to characterise a particular epistemological position, namely the Kantian notion that our understanding prescribes laws to nature. So when Ernst Cassirer expresses the opinion that the idea of universal regularity in nature, as such, continues to hold good as a synthetic a priori principle, or when J. As against this, it can be read off from the present state of physics, that science does not recognise a priori constraints of this kind, and opposes to the view in question the healthy scepticism of the empiricist. The pursuit of processes within the atom by the methods of quantum theory has led many physicists to conclude that, within certain limits, processes that are strictly causeless occur there; to these, therefore, the causal law could find no applications. Even if - like the author - one fails to perceive in the facts available any sufficient basis for this conclusion, it could still become perfectly legitimate if further facts were to hand, and so this case has the following lesson to teach: Although physics is well aware that the causal principle, the reciprocal dependence of natural processes on each other, is a presupposition for its own existence, it still by no means assumes this presupposition to be satisfied a priori everywhere, â€” or even in a particular area; it ascertains for itself, rather, using its own methods and with the exactitude of these methods , whether and to what extent this is the case. It establishes for itself, that is, the boundaries of its own kingdom. That the methods of science are able to make such an examination, can be confirmed by a subsequent analysis of its procedure. All this in contradiction to apriorism, according to which the causal principle is supposed not to be an empirically testable proposition. The empiricist, of course, is well aware that it would always be possible in principle to sustain the causal law by suitable hypotheses -just as he knows that Euclidean geometry could be held valid without exception, if we really wanted this; but he denies that the human mind is unconditionally obliged to do this, and denies also that the application of scientific methods could always lead only to a confirmation of the causal principle. On the contrary, it is quite easy to imagine observations which would make it possible to sustain the causal law only by an infraction of these methods: Thus a survey of the state of modern physics indicates that it presents us in surprising sequence with a series of cases, in which the empiricist and apriorist views of natural knowledge may contend with one another; that without exception it pursues the course recommended by empiricism; and that not one of its principles is accorded those properties which a synthetic a priori judgement of the Kantian type would have to possess. We may say, therefore, that modern physics shows us, that even for epistemology there is a sort of confirmation by experience, an objective criterion of truth, and that this criterion decides in favour of the empiricist theory of knowledge. A remark needs to be added, to guard against erroneous conclusions from what we have said. The relation outlined between modern physics and philosophy could occasion regret that epistemology should cast the anchor of its criterion of truth into empirical science, and thereby partake of its uncertainty and mutability. But if the hope of grounding philosophy on a firmer soil than that of experience and logic must be abandoned and it has never been more than a hope anyway , this would have to be set off in the bargain against the advantage of having obtained any objective criterion at all. It is very notable that an actual exponent of apriorism, Elsbach in his book Kant und Einstein , expresses the view that epistemology can be expected only to vindicate the mutable state of science at any time, but not science as such. For the empiricist is unable to join in the lament of many onlookers, that physics is constantly changing, that its theories are short-lived and that hitherto supposedly correct laws are liable to be overthrown at any moment by new discoveries. He knows, rather, that no law till now, in the sense and with the exactitude whereby it has once been confirmed, has ever again had to be abandoned. The changeable elements in physics are not the relations of dependency, which once established, continue to find repeated confirmation, but rather the intuitive ideas which serve for interpretation and interpolation. The split between the purely conceptual and empirically confirmed content of a science, and the intuitive images which illustrate the content without themselves belonging thereto - this split is one of the most important achievements of modern epistemology. A philosophy that knows how to achieve it tidily everywhere may justifiably regard a confirmation by modern physics in the sense outlined above as a confirmation by science as such.

Chapter 6 : Physics of Blackness â€” University of Minnesota Press

TOWARD AN EPISTEMOLOGY OF PHYSICS there must be many such aspects of muscular control that are inarticulate. I am primarily interested in the pieces of our ability to control the world that can have.

Chapter 7 : Epistemology (Stanford Encyclopedia of Philosophy)

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This article provides one example of a method of analyzing qualitative data in an objective and quantifiable way. Although the application of the method is illustrated in the context of verbal data such as explanations, interviews, problem-solving protocols, and retrospective reports, in principle, the mechanics of the method can be adapted for coding other types of qualitative data such as.