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Rethinking Fideism through the Lens of Wittgenstein's Engineering Outlook

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Rethinking Fideism through the Lens of Wittgenstein's Engineering Outlook

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In an otherwise superbly edited compilation of student notes from Wittgenstein's 1939 *Lectures on the Foundations of Mathematics*, Cora Diamond makes an false step that reveals to us our own tendencies to misread Wittgenstein. The student notes she collated attributed the following remark to a student named Watson: "The point is that these [data] tables do not by themselves determine that one builds the bridge in this way: only the tables together with certain scientific theory determine that."[1] But Diamond thinks this a mistake, presuming instead to change the manuscript and put these words into the mouth of Wittgenstein. But to make such a change shows a lamentable, even if commonplace, ignorance of engineering. Diamond apparently shares this ignorance with Watson, *and* presumably with most of us as well, *especially* those of us who are educated in math and science, because this education makes us think we understand engineering

[1] Ludwig Wittgenstein, *Wittgensein's Lectures on the Foundations of Mathematics: Cambridge, 1939: From the Notes of R. G. Bosanquet, Normal Malcolm, Rush Rhees, and Yorick Smythies*, ed. Cora Diamond (Chicago: The University of Chicago Press, 1975), 110.

by extension. But we do not. I intend to show why Wittgenstein the former engineer could *never* have made the remark Diamond wants to attribute to him. The reasons why not drastically undermine the myth of Wittgensteinian fideism and have bearing on the manner of our conversations about religious pluralism.

Part I. Wittgenstein's engineering outlook

Just prior to the famous conclusion the third Lecture on Religious Belief (1939)—"the whole weight may be in the picture" (72)—Wittgenstein is reported as having said something most opaque. The discussion is about pictures of God. Suddenly Wittgenstein says, "we could, under certain circumstances, have one projection of an ellipse drawn instead of another" (71). What in the world does an ellipse have to do with God? As readers, we are tempted to skip over this remark in an attempt to follow the "real" thread of the conversation—in this case, various picturings of "God." It is my contention that this remark, and others like it, ought *not* be skipped over. Together they constitute evidence of an enduring conceptual backdrop against which Wittgenstein's thinking makes sense, namely his training in turn-of-the-century German engineering. I shall argue this background is determinative for rightly reading certain passages. More specifically, I shall argue that Wittgenstein's biography drastically undercuts the so-called fideism he is said to exemplify.[2]

[2] Nielsen defines "fideism" this way: "There is no Archimedean point in terms of which a philosopher (or for that matter anyone else) can relevantly criticize whole modes of discourse or, what comes to the same thing, ways of life, for each mode of discourse has its own specific criteria of rationality/irrationality, intelligibility/ unintelligibility and reality/unreality." Kai Nielsen, "Wittgensteinian Fideism," *Philosophy* XLII, no. 161 (1967): 22. See also Kai Nielsen and D. Z. Phillips, *Wittgensteinian Fideism?* (London: SCM, 2005).

The strategy I will *not* take is that of putting on thick spectacles in order to more precisely exegete passages of the *Investigations* and so lay bare what Wittgenstein *really* meant.[3] Rather, my strategy will be to consider Wittgenstein through the lens of biography.[4] My focus will be that singular aspect of Wittgenstein's life that everyone seems happiest to skip over: his education in engineering.[5]

[3] For recent books on "plain sense" approach, see Robert J. Fogelin, *Taking Wittgenstein at His Word: A Textual Study* (Princeton, NJ: Princeton University Press, 2009); Duncan Richter, *Wittgenstein at His Word* (New York: Continuum, 2004). Although I am generally in favor of such a strategy for clarifying *natural* readings, people far smarter than I have launched several "New Wittgenstein" schools that seem to have rich and fascinating research programs regardless of whether they uncover Wittgenstein's *real* meaning. If meaning is in the use, and Wittgenstein's own words are susceptible to multiple uses, then the exegetical approach seems unpromising for settling things between rival possible means. See Alice Crary and Rupert Read, eds., *The New Wittgenstein* (New York, NY: Routledge,2000); Timothy McCarthy and Sean C. Stidd, eds., *Wittgenstein in America* (Oxford: Clarendon Press,2001).

[4] The publication of Monk's powerful biography reminded us that whatever role Frege's *ideas* play in the *Tractatus*, it was the concrete conversations with Frank Ramsey and the rude gesture by Piero Sraffa ("What is the logical form of *that*?!" pp. 260-261) that constituted the pivots for his later philosophy. Anyone who has carefully read the biographies of McGuinness or Monk or the conversations and correspondence with Drury or Engelmann can attest to the illumination these bring to otherwise opaque themes. Ray Monk, *Ludwig Wittgenstein: The Duty of Genius* (New York: Viking Penguin, 1990). In addition to Monk's biography see, James C. Klagge, ed. *Wittgenstein: Biography & Philosophy* (Cambridge, UK: Cambridge University Press,2001); Béla Szabados, *Ludwig Wittgenstein on Race, Gender and Cultural Identity* (Edwin Mellen, 2010). See also M. O'C. Drury, "Some Notes on Conversations with Wittgenstein" and "Conversations with Wittgenstein," in *Recollections of Wittgenstein*, ed. Rush Rhees (Oxford, UK: Oxford University Press, 1984); Paul Engelmann, *Letters from Ludwig Wittgenstein, with a Memoir;* (Oxford, UK: Blackwell, 1967); Brian McGuinness, ed. *Wittgenstein: A Life. Young Ludwig 1889-1921 (Volume 1)* (Berkeley, CA: University of California Press,1988).

[5] Important exceptions to this "skipping over" include Kelly Hamilton, "Wittgenstein and the Mind's Eye," in *Wittgenstein: Biography and Philosophy*, ed. James C. Klagge (Cambridge, UK: Cambridge University Press, 2001); Kelly Hamilton, "Some Philosophical Consequences of Wittgenstein's Aeronautical Research," *Perspectives on Science* 9, no. 1 (2001); Kelly Hamilton, "*Darstellungen* in the *Principles of Mechanics* and the *Tractatus*: The Representation of Objects in Relation in Hertz and Wittgenstein," *Perspectives on Science* 10, no. 1 (2002); Susan G. Sterrett, "Physical Pictures: Engineering Models Circa 1914 and in Wittgenstein's *Tractatus*," in *History of Philosophy of Science: New Trends and Perspectives*, ed. Michael Heidelberger and Friedrich Stadler (Dordrecht: Kluwer Academic Publishers, 2002); Susan G. Sterrett, *Wittgenstein Flies a Kite: A Story of Models of Wings and Models of the World* (New York: Pi Press, 2006); Mark Wilson, "Wittgenstein: *Physica Sunt, Non Leguntur*," *Philosophical Topics* 25, no. 2 (1997); Alfred Nordmann, "Another New Wittgenstein: The Scientific and Engineering Background of the *Tractatus*," *Perspectives on Science* 10, no. 3 (2002).

At the 1876 World's Fair, German engineering was unilaterally deemed "cheap and bad," even by the Germans themselves.[6] Courageously, in the quarter century that followed, the German engineering society (*Verein Deutsche Ingenieure*, or VDI) reinvented the German school system, inserting between the vo-tech school system (*Fachschulen*) and the university-prep system (*Gymnasium*) a new kind of prep school system, *technische Hochschulen.*

The educational revolution hinged on four correctives.[7] First, from 1884 onward, a year of shop training was required as a *prerequisite* for admission to a *technische Hochschule.* Second, there followed a "de-emphasis of calculus in favor of less precise but more pragmatic graphic methods." (This was to develop into a full blown "anti-mathematics" movement among engineering educators.) Third, laboratories were reintroduced as the means for both empirical research and hands-on training.[8] Finally, there was a tremendous expansion of instruction over the topics of design (*rather* than theory) and graphical drawing techniques (*rather* than numerical analysis or mathematical proofs).[9] So complete was the shift from scholasticism to hands-on training that some complained the reform movement had gone too far.

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[6] Franz Reuleaux, of "kinematics alphabet" fame, served as the director of Berlin's Industrial Institute and was perhaps Germany's leading 19th-century authority on technological development, attended the World's Fair in Philadelphia and reported back to Germany in the form of ten letters that were published in the *National Times* (*Nationalzeitung*) the summer of 1876. He traced German technology's "momentous defeat" in Philadelphia to the fact that German industry is governed by a basic principle: "Cheap and bad." Kees Gispen, *New Profession, Old Order; Engineers and German Society, 1815-1914* (Cambridge, UK: Cambridge University Press, 1989), 116.

[7] Ibid., 153.

[8] Think of all the times Wittgenstein complained that his *hands* were too course to mend the spider web.

[9] "Students were made to spend long hours in the drafting rooms of the *technische Hochschulen* , learning how to become practical designers and do the work of ordinary draftsmen, in order to develop

> In Berlin, laboratory and drafting hours went from roughly 35 percent of the total time devoted to instruction in 1881-2 to 45 percent in 1886-7, 48 percent in 1888-9 and 1885-6, and *over 70 percent* in 1898-9.[10]

Wittgenstein attended *technische Hochschule* from 1906-1908. In 1908, the Wright Brothers toured Europe with their flying contraption. The next thing we know is that Wittgenstein had enrolled in a doctoral program in aeronautical engineering at Manchester. These facts may chafe against the image we have of Wittgenstein the eccentric logician. But consider the fact that as a precocious child, this same Wittgenstein built (from wood!) a working sewing machine at age 12, designed a variable volume combustion chamber and patented a jet-fuelled propeller at age 22, repaired machinery at a local factory (using only synchronized vibration!) when he lived in Norway in his early thirties, meticulously designed and oversaw the construction of a *Bauhaus* home for his sister at age 35, and at age 54 built a an apparatus for recording blood pressure for a war-time hospital.[11] It is in light of his engineer's "eye" that passages in the *Nachlaß* must be read. In what follows, I will offer three components of his engineering outlook that help us see why fideism was very unlikely to have been his perspective on religious pluralism: *methods of projection*, *dynamical similarity*, and *satisfactoriness*.

1. Methods of projection

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their powers of spatial conceptualization and shed erroneous notions about the easy road to success…." Gispen, 156.

[10] Ibid., 102. Emphasis added.

[11] {McGuinness, 1988 #2623@45, 68-69} {Monk, 1990 #2630@197} {Leitner, 1995 #4944} {Henderson, 1973 #7424@190}

In PI §115, Wittgenstein confesses "A picture held us captive."[12] As one familiar with engineering training, Wittgenstein is rightly worried about being captivated by a picture. Ordinarily, when we encounter the word 'picture' we think "first and foremost of something drawn or painted and, say, hung on a wall."[13] But pictures played a special role in the training of engineers. By the time Wittgenstein attended *technische Hochschule* in 1906, nearly three-quarters of the educational instruction was devoted to hands-on work. Chief among these was graphical drawing techniques (a much more complex form of "drafting" than we normally think of). Students spent hundreds of hours drawing mechanisms, for example mechanisms moving by increments through various "possible" positions. Of course, "possible" with respect to a drawing and "possibility" in real practice are two different things. What captivates the students at the early stage is the idea that the "possibility" of a mechanism's motion was like an occult force that overshadowed the mechanism, guaranteeing the manner of its motion. But this is all rubbish from the vantage of an actual practitioner: "We talk as if these parts could only move in this way, as if they could not do anything else. How is this—do we forget the possibility of their binding, breaking off, melting, and so on?"[14] For this reason, students must be broken of their unwitting allegiance to a faulty, though ideal, picture. On the one hand, there is the picture that is *drawn*, and on the other hand a *different* picture governing the use of drawings. It was this second picture, the one governing use, that Wittgenstein worried

[12] " And we could not get outside it, for it lay in our language and language seemed to repeat it to us inexorably."

[13] Ludwig Wittgenstein, *Wittgenstein's Lectures on the Foundations of Mathematics. Cambridge, 1939: From the Notes of R. G. Bosanquet, Norman Malcolm, Rush Rhees, and Yorick Smythies*, ed. Cora Diamond, Chicago (University of Chicago Press1975), 240.

[14] Ludwig Wittgenstein, *Philosophical Investigations*, ed. G. E. M. Anscombe and Rush Rhees, trans. G. E. M. Anscombe (New York: Macmillan, 1953), §193.

about. If captivity to the ideal-use picture is not broken, the student will never succeed as an engineer. Nevertheless, the time students spend drawing mechanisms are valuable, because by them they cultivate mastery in language of two dimensional representation and therefore, of being able to respond appropriately to those drawings rendered by others. At first, the student must "interpret" another's drawing, and do so haltingly. But the highly skilled are said to *read* technical drawing as effortlessly as you read this sentence.[15]

The idea that there are *various kinds* of pictures indicates that there are correlative kinds of skills needed to use them.

> What we call 'descriptions' [*Beschreibungen*] are instruments for particular uses. Think of a machine-drawing, a cross-section, an elevation with measurements, which an engineer has before him. Thinking of a description as a word-picture of the facts has something misleading about it: one tends to think only of such pictures as hang on our walls: which seem simply to portray how a thing looks, what it is like.[16]

No picture comes prepackaged with automatic applicator. (If it did it would be a "super-picture."[17]) Rather, the skill set required to render or read a picture is called a "method of projection." This also is an engineering term, though in concept it is quite simple, even if the skill set is difficult to master. The simplest skill set to master

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[15] In the *Philosophical Grammar*, Wittgenstein reproduces the sketch by which someone (likely, his father) thought to propose a perpetual motion machine. The illusion comes from the poorly drawn sketch. If standard kinematics diagramming is applied, the "machine" quickly reveals itself as either rigid or unhinged (depending on decisions that diagramming forces one to make explicit). The bewitchment comes from the way the mind supplies the revolute joint here while assuming the slider to be fixed and the then supplies the slider while assuming the revolute to be fixed.... See Ludwig Wittgenstein, *Philosophical Grammar*, ed. Rush Rhees, trans. Anthony Kenny (Berkeley and Los Angeles: University of California Press, 1974), 194.

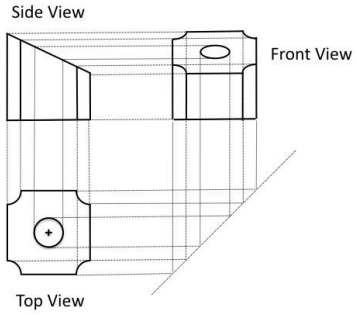
[16] Wittgenstein, *Philosophical Investigations*, 291.

[17] Wittgenstein works very hard to disabuse his students of the myth of "super-pictures." Ludwig Wittgenstein, *Lectures & Conversations on Aesthetics, Psychology, and Religious Belief*, ed. C. Barrett (Oxford: Oxford University Press, 1966), 67.

Wittgenstein calls a "technique." (Wittgenstein does not disparage "technique," for novices must begin somewhere. But, as we shall see momentarily, there are some skill sets of picture-usage that are extremely complex, difficult to master and in fact cannot be mastered without the assistance of others.[18]

> For there may be *many different* techniques of comparison and many different kinds of resemblance. For instance, one thing may be said to resemble another if it is a projection of it; but there are *many different modes of projection*—of representing an object.[19]

In the simplest instance, an engineering students would have understood "method of projection" as an orthogonal projection as famously set out by Albrecht Dürer.[20]

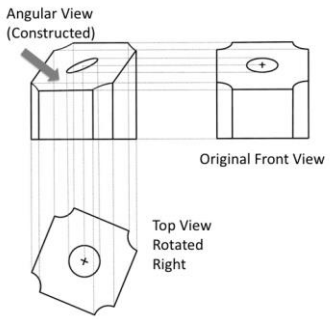


This technique, easy enough even for the novice to begin to get the hang of, enabled a student to construct alternate views as if the object were incrementally rotated in space by, say, 24 degrees:

[18] In the field of medicine, physicians must *learn* to read x-rays. See Michael Polanyi, *Personal Knowledge: Towards a Post-Critical Philosophy* (Chicago, IL: University of Chicago Press, 1974), 106.

[19] Wittgenstein, *Wittgenstein's Lectures on the Foundations of Mathematics. Cambridge, 1939: From the Notes of R. G. Bosanquet, Norman Malcolm, Rush Rhees, and Yorick Smythies*, 69. Emphasis added.

[20] Dürer's drawings can be seen in Peter Jeffrey Booker, *A History of Engineering Drawing* (London: Chatto and Windus, 1963).



Students also became familiar with non-orthogonal projection, as when a circle viewed from various angles takes an elliptical appearance. So, ellipses can be projected onto a circle and vice versa. With a little thought students might devise a way to project a *square* onto a circle, until finally *anything can be projected onto anything*.[21]

But now consider the puzzle of the following table:

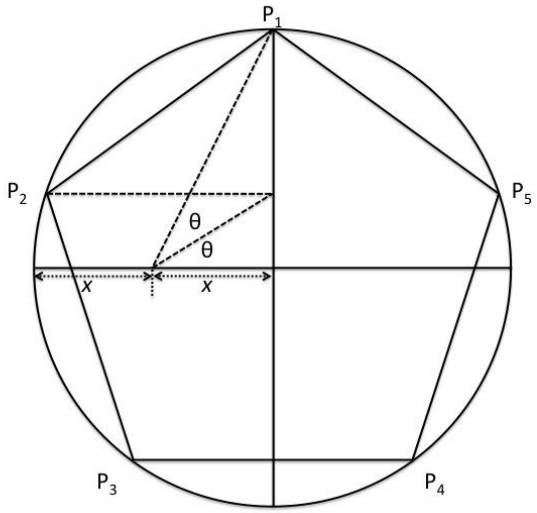
X	*Y*
3	2.99
3	0.01
3	1.00
3	.77
3	1.75

[21] "Suppose we were set the task of projecting figures of various shapes on a given plane I into a plane II. We could then fix a method of projection (say orthogonal projection) and carry out the mapping in accordance with it. We could also easily make inferences from the representations on plane II about figures on plane I. But we could also adopt another procedure: we might decide that the representations in the second plane should all be circles, no matter what the copied figures in the first plane might be. (Perhaps this is the most convenient form of representation for us.) That is, different forms on I are mapped onto II by different methods of projection. In order in this case to construe the circles in II as representations of the figures in I, I shall have to give the method of projection for each circle; the mere fact that a figure in I is represented by a circle in II by itself tells us nothing about the shape of the figure copied. That an image in II is a circle is just the established norm of our mapping. –Well, the same thing happens when we depict reality in our language in accordance with the subject-predicate form. The subject-predicate form serves as a projection of countless different logical forms." Wittgenstein, *Philosophical Grammar*, 204-05.

What conceivable method of projection maps *X* onto *Y*? Since the relationship is not 1-1 onto, we immediately suspect there is no such method of projection. In fact, this table represents the conversion of distances on a globe (*x*) and their respective distances on a Mercator projection map (*y*), where distances at the margins collapse sinusoidally.

In the case of the Mercator projection, of course, if one knows the technique and the location relative to the center longitude, one can follow what is going on. In *Lectures on the Foundations of Mathematics*, Wittgenstein gives two additional examples. But in each example there is simply no "trick" as there is for Dürer or Mercator. The first example involves the geometrical construction of a heptacaidecagon. The second example will begin the next section of this paper.

After sketching the geometrical construction of a pentagon,



Wittgenstein poses the following order: "Here is the construction for five [-sided polygon], now do the same, the analogous thing, for 17."[22] Here the novice is left in the

[22] Wittgenstein, *Wittgenstein's Lectures on the Foundations of Mathematics. Cambridge, 1939: From the Notes of R. G. Bosanquet, Norman Malcolm, Rush Rhees, and Yorick Smythies*, 84.

dust. There is no straightforward projection of the *process*-of-constructing-a-pentagon to the *process*-of-constructing-a-heptacaidecagon.[23] The two processes do not look anything like each other (I had trouble even following the second one[24]). Yet we must say that the man who invented the construction did, in fact, "do the analogous thing." The repartee with Alan Turing is worth quoting at length:

> Wittgenstein: [Re: the man who invented the construction of a heptacaidecagon (17-sided polygon)]: "Wasn't he introducing a new mode of projection? He invented a new mode of projection, which there is reason to call so-and-so. He discovered a new kind of analogy."
>
> Turing: "It certainly isn't a question of inventing what the word 'analogous' means; for we all know what 'analogous' means."
>
> Wittgenstein: Yes, certainly, it's not a question merely of inventing what it [the word 'analogous'] is to mean. For if that were the problem, we could settle it much easier by making 'analogous' mean 'cushion'.
>
> The point is indeed to give a new meaning to the word 'analogous'. But it is not merely that; *for one is responsible to certain things*. The new meaning must be such that we who have had a certain training will find it useful in certain ways.[25]

The phrase just quoted, "we who had a certain training will find it useful in certain ways," makes into a live question whether Wittgenstein meant to include or exclude Turing in the "we!" A few lectures later he makes it quite clear that there is an enormous difference between mathematical and non-mathematical tasks. "If it is a mathematical task, you can go away and do it elsewhere."[26] But nearly all everyday tasks are non-mathematical in nature, because they are *context-bound*: If I lost my keys in the

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[23] Ibid., 65. "What is analogous…is a *method* of construction." Emphasis added.

[24] For a diagram see http://www.jimloy.com/geometry/17-gon.htm.

[25] Wittgenstein, *Wittgenstein's Lectures on the Foundations of Mathematics. Cambridge, 1939: From the Notes of R. G. Bosanquet, Norman Malcolm, Rush Rhees, and Yorick Smythies*, 66. Emphasis added.

[26] Ibid., 84.

basement, I don't search for them on the front lawn even if the light is much better. Engineering is just such a context-bound enterprise. It is sensitivity to the possibility that context matters for philosophical tasks that separates Wittgenstein from Turing.

2. Dynamical similarity

The difference in training—Wittgenstein in engineering, Turing in mathematics—leads us to the second complex example of a method of projection. This second example will yield the second engineering concept that frames Wittgenstein's outlook.

The notion of "dynamical similarity" is present from the very beginning of Wittgenstein's corpus. It lies the passage in the *Tractatus* 4.40141 where Wittgenstein speaks of the kind of projection involved in moving from a musical performance to the printed score and back, as well as from performance to gramophone recording. We would agree that the performance, score and gramophone were "similar"—i.e., it is the "same" music in each case. If the similarity involved were of the run of the mill sort (called *dimensionless*[27]), the estimation of sameness would be a mathematical task, one which could be assessed from anywhere.[28] But in fact, the similarity is *dynamical* in nature. In short, the estimation of sameness is inextricably bound up with the skills of this human (e.g., the musician) in this place. Consider, how many of us while faced with a large stack of printed but untitled scores, could select the "same" unfamiliar music as the one being

[27] If Jane is twice the height of her child, it does not matter whether height is measured in feet or millimeters. "Dimensionless" similarity is the kind in which units of dimensions drop out when the ratio is calculated.

[28] Wittgenstein-the-engineer insisted in inserting dimensions into the thermodynamic text he used. P. D. M. Spelt and Brian McGuinness, "Marginalia in Wittgenstein's Copy of Lamb's *Hydrodynamics*," in *From the Tractatus to the Tractatus and Other Essays*, ed. Gianluigi Oliveri (Frankfurt am Main: Peter Lang, 2001), 131-48.

performed? Now imagine *you* are the very instrument of transcription: "Here is a pen and blank score; project the performed music onto the score." The method of projection involved can only be said to pass *through* your skills as the musical transcriber.[29] Similarly, we feel the inextricability of human skills from the method of projection if, while attending the symphony in pre-Edison days, we are charged with capturing the sound mechanically by *inventing* a machine to do so (a gramophone).

If we succeed in transcribing the music; if we succeed in capturing the symphony onto wax or vinyl, we will clearly be qualified to *judge* the performance, the score and the LP record as all of the "same" symphony. But we will be using the word "same" in a privileged way, one unavailable to those who lack skills. Estimation of sameness under these conditions cannot be done, "from sideways on" as it might when we compare a portrait painting to its original. In light of the full range of examples, we see that words like "same," "similar," and "analogous" are, from the engineering outlook, *not univocal terms*.

> For instance, if I say the word 'picture', you would think first and foremost of something drawn or painted and, say, hung up on a wall. You would not think of Mercator's projection of a globe; still less of the sense in which a man's handwriting is a picture of his character. A word has one or more nuclei of uses which come into everybody's mind first; so that if one says so-and-so is also a picture—a map, or Darstellung in mathematics—in this lies a comparison: as it were, "Look at this as a continuation of that.[30]

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[29] I am indebted to Susan Sterrett for this discussion. Following her lead, I have also written about the parallel problem facing engineering circa 1906, namely that of how to scale up the Pénaud Flyer, a toy whirligig that actually flew, into a manned helicopter. See Sterrett, *Wittgenstein Flies a Kite: A Story of Models of Wings and Models of the World*. And then see Brad J. Kallenberg, "Dynamical Similarity and the Problem of Evil," in *God, Grace and Creation: The Annual Publication of the College Theology Society 2009, Vol. 55*, ed. Philip J. Rossi (University of Notre Dame: 2010), 163-83.

[30] Wittgenstein, *Wittgenstein's Lectures on the Foundations of Mathematics. Cambridge, 1939: From the Notes of R. G. Bosanquet, Norman Malcolm, Rush Rhees, and Yorick Smythies*, 240.

3. Satisfactoriness

In PI §43, we find Wittgenstein's famous definition of meaning : "the meaning of a word is its use." At least that is how it us usually quoted. I've intentionally skipped over the crucial bit, so let me read it more carefully: "For a *large* class of cases—though not for all—in which we employ the word 'meaning' it can be defined thus: the meaning of a word is its use in the language." Crucial for my argument is this phrase: "though not for all." The fact that both we and his commentators tend to misremember the quotation is evidence of tendencies shared by both sides of the debate. Those who are Wittgenstein fans long for a totalizing theory from him that covers all the cases and puts everything to right; those who are his enemies hope to catch him at falsely purporting a totalizing theory. But Wittgenstein-the-engineer is not interested in totalizing claims any more than he is in building a bridge privately in his mind. Wittgenstein is speaking like an engineer when he writes

> If I tell someone "Stand roughly here"—may not this explanation work perfectly? And can every other one fail too?
>
> But isn't this an inexact explanation?—Yes; why shouldn't we call it "inexact"? Only let us understand what "inexact" means. For it does not mean "unusable."[31]

In engineering, the relevant metric of correctness is always a function of the nature of the given case. For example, when can a cylinder be said to "fit" a hole? Only when it is stuck tightly? Well, yes, if you are making a wooden boat and the dowel must hold out water; but no if you are boring an engine's cylinder to receive a piston, it must slide freely

[31] Wittgenstein, *Philosophical Investigations*, §88.

(though not loosely). And somewhere between these two notions of "fit" will be needed if you are building a child's toy in which a dowel must be sticky enough to need a toy hammer to pound it flush, and then flipped over to be pounded flush from the other side, and so on endlessly to the child's delight.[32] The relevant notion of "fit" is relative to the given project. Such is always the case in engineering design.

Wittgenstein was no stranger to engineering design. (Recall the propeller patent devised just after WWI and the useful medical gadget devised during WWII.) By means of the complex activity of "design," engineers respond to a particular context-bound problem. More often than not, the problem will be "wicked." In the context of engineering design, "wicked " is a technical term. A wicked problem is one whose solution, if it exists at all, is compelled by no finite set of conditions nor optimizable across the board.[33] It is *this* concept of design-as-response-to-a-wicked-problem that *escapes* the polar opposites of the one and the many. On the one hand, it is *not* the case that a design problem has one and only one correct solution. Quite to the contrary, any given design problem, being the highly contextual critter it is, has *multiple* acceptable responses possible, each response competing against others in a chaotic field where no single metric governs all contenders.[34] Consequently, every design is an inevitable compromise between this sort of usefulness and that sort of usefulness. Admittedly our brains chafe against this hurly-burly and we tend to conclude, "Then, anything goes?!"

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[32] Ibid., §182.

[33] The 10 or so marks of "wicked" design problems are detailed by Horst W. J. Rittel and Melvin M. Webber, "Planning Problems Are Wicked Problems," in *Developments in Design Methodology*, ed. Nigel Cross (Chichester & New York: John Wiley & Sons, 1984), 135-44.

[34] I owe this insight to Koen's careful study. Billy Vaughn Koen, *Discussion of the Method; Conducting the Engineer's Approach to Problem Solving* (New York & Oxford: Oxford University Press, 2003).

No. For on the other hand, some responses are clearly *wrong* (obviously the ones that don't work, but also for the ones that don't work "well"). Thus the engineering outlook: Within the middle range of roughly acceptable designs, each proposed design is assessed against others for its *relative satisfactoriness*.[35]

By way of summarizing what I'm calling here Wittgenstein's "engineering outlook," listen again to Wittgenstein's reply to Turing. Recall that the order here is, given the construction of a pentagon, "do the analogous thing" for a heptacaidegon. Turing-the-mathematician has just said "…for we all know what 'analogous' means."

> The point is indeed to give a new meaning to the word 'analogous'. But it is not merely that; *for one is responsible to certain things. The new meaning must be such that we who have had a certain training will find it useful in certain ways.*[36]

Wittgenstein's reply displays his engineering outlook: for one is responsible to certain things." What things? Engineering design is obviously beholden to the material conditions of a given problem. Which is to say, engineering problems are not mathematical tasks, they cannot be taken elsewhere for solving. But of course, material conditions fall far short of *compelling* this or that solution. *Many* working responses are possible. Granted, a seasoned design team instinctively pays scant attention to the majority of proposals and zeroes in on a handful of possibilities. Yet their thinning of the field is not random, because those who do the thinning have had "a certain training." Those who are adequately trained have an "eye" that can be trusted. Justification for a

[35] The term is co-opted from Anthony Kenny. Anthony Kenny, "Practical Reasoning and Rational Appetite," in *Will, Freedom and Power* (New York: Barnes and Noble, 1976), 70-96.

[36] Wittgenstein, *Wittgenstein's Lectures on the Foundations of Mathematics. Cambridge, 1939: From the Notes of R. G. Bosanquet, Norman Malcolm, Rush Rhees, and Yorick Smythies*, 66. Emphasis added.

given exercise of embodied skill may in some cases be given. But such a justification would only be fully understood by someone of equally advanced training, the very one who may recognize the move for what it is and therefore, *not ask* for further justification. In other words, there are *masters* as well as novices. This kind of mastery [*Beherrschung*], namely the ascendancy to the rank of expert practitioner (e.g., musicians, surgeons, and athletes as well as engineers) is what Wittgenstein alludes to with the oft-repeated phrase " 'mastery' ['*beherrschen*'] of a technique."[37] He's not talking about something like learning to master the bicycle, something virtually everybody has done or can learn—but the mastery of things that only timeful intense participation in a social practice can deliver.[38]

Part II. Wittgenstein and Religious Pluralism

I have argued thus far that three concepts employed by Wittgenstein are really engineering concepts and that Wittgenstein likely employed them in the way an engineer would.[39] In this present section I will show how an engineer's view of these same three

[37] Wittgenstein, *Philosophical Investigations*, 150.

[38] See the literature that has exploded around the MacIntyrean concept of a socially-embodied "practice." Alasdair MacIntyre, *After Virtue: A Study in Moral Theory*, 2d ed. (Notre Dame, IN: University of Notre Dame Press, 1984), 187.

[39] Apparently Rush Rhees complained that Wittgenstein never recovered from his engineering training, a fact that in Rhees's mind prevented Wittgenstein from addressing certain philosophical problems. For example, Rhees notes that Wittgenstein thought a language could be learned by *Abrichtung*, by training, like engineering is learned. But Rhees thinks this notion may have prevented Wittgenstein from noticing differences between kinds of application, application within language on the one hand and application of propositions in engineering, on the other. See Rush Rhees, *Wittgenstein and the Possibility of Discourse*, ed. D. Z. Phillips (Cambridge, UK: Cambridge University Press, 1998), 76, and cp. 195, 228. I am arguing that Rhees himself may not understand engineering fully and thus has neglected von Wright's strong advice: "that the two most important facts to remember about Wittgenstein were, firstly, that he was Viennese, and, secondly, that he was an engineer…." Cited in Allan Janik and Stephen Toulmin, *Wittgenstein's Vienna* (New York: Simon & Schuster, 1973), 28-29.

terms may shed light on what can and what cannot be said about Wittgenstein's putative "fideism." I will not argue directly that the charge of fideism is faulty, a task that Stephen Mulhall has set for himself in a recent paper.[40] Rather, I will argue that Wittgenstein's engineering outlook meant that he did not see the world in a way that allows the charge of fideism even to make sense.

a. Fideism and methods of projection

In the Third Lecture on religious belief, a student named Smythies misunderstands Wittgenstein's excursus on reference. Wittgenstein says what justifies my belief that my thought of "my brother in America"[41] is really about my brother in America involves a "method of projection." Because we think we already know what "method of projection" entails, we forget that Wittgenstein is speaking in engineering terms. Wittgenstein summarizes his point by saying "We associate a particular use with a picture." (71) Smythies, counters, "This isn't all he does—associate a use with a picture." To which Wittgenstein snaps, "Rubbish"! Smythies misunderstands Wittgenstein in at least two ways. In the first place, he thinks of a picture simply, univocally, as a portrait. Poor Smythies! Perhaps this is the only kind of picture he has ever encountered. If, as Smythies seems to imagine, religion employs *portraits* of God, then "what conclusions can be

[40] Stephen Mulhall, "Wittgenstein on Faith, Rationality and the Pasions," *Modern Theology* 27, no. 2 (2011): 313-24.

[41] Wittgenstein's brother, Paul Wittgenstein, was a concert pianist who had lost his right hand in WWI. A number of notable composers (e.g., Maurice Ravel) composed concert pieces for the left hand in honor of Paul. Nevertheless, he found himself no longer permitted to perform to audiences under the Nazi regime. Paul left for the U.S. in 1938 and was helped to settle there by Ludwig.

drawn?" Wittgenstein needles him: "Are eyebrows going to be talked of, in connection with the Eye of God?"[42]

Smythies second error is linked to the first. Because he can only think of portraits, he can only think of "use" as something added on and ultimately disconnected from (i.e., externally related to) the picture itself. Wittgenstein's response ("Rubbish!") to Smythies' remark ("this isn't all he does…."), indicates that Smythies seems to think that a *lot* of things are going, and one of these goings-on is the association of uses with pictures. But Smythies' presupposition undermines the point that Wittgenstein is making about the internal relation between pictures and use. For Smythies, a use is selected (from a range of possible uses) and the linked to the picture by the agent. For example, I can admire a painting, copy a painting, tell a story about a painting. But admiring, copying, and story-telling are not the kind of uses Wittgenstein has in mind. The alternative kind of "use" Wittgenstein-the-engineer has in mind means *nothing* apart from the picture; an engineering "picture" is intelligible as an engineering picture *only* in connection with a method of projection.[43] But Smythies is unaware of this sort of integral connection. He evidently thinks that using a portrait as a wall decoration (use #1) and using the same portrait to identify a person at the train station (use #2) are the kinds of uses Wittgenstein means. But Smythies' examples are one and the same use: picture-as-portrait. What Smythies cannot see is that his comment shows him already to be

[42] Wittgenstein, *Lectures & Conversations on Aesthetics, Psychology, and Religious Belief*, 71.

[43] By speaking of "verbal paradigms," say the Latin *laudo, laudas, laudat*, a given verbal paradigm means nothing apart from actual Latin verbs. We might say that the paradigm is *embodied* in actual uses of concrete Latin verbs. Similarly, it is in this sense of close linkage that Wittgenstein means by "associating" a paradigm of uses with the verb. Mastery of the Latin verb *laudo* simply *is* mastery of the paradigm; it is a package deal.

committed to a single use (or, a single method of projection) bound up with his all too familiar concept of picture-as-portrait.

In order for Smythies to uptake the complex notion of "use" Wittgenstein has in mind, he (and we) must first be freed from the grip of picture-as-portrait. To recall an earlier lecture, *non*-portraits can conceivably be used as portraits. Wittgenstein opened the *Lecture on The Foundation of Mathematics* with the thought experiment of using a smiley face for locating G.E. Moore at the train station![44] Conversely, the diagram depicting the construction of a pentagon can be used emblematically for the construction of the heptacaidegon. But in these instances, the pictures involved are decidedly not *portraits*.

"How is the connection made?—We imagine *first* a connection like strings."[45] Of course, this is where Smythies is stuck. (Lines of correspondence can be strung between G.E. Moore's eyes and the eyes of the smiley face. But what of Moore's nose?) But the lights go on for the student named Lewy, "The connection is a convention. The word designates." Well, convention yes—at least sort of. But "designate"? No, that is still bewitching. Affirming that he is on the right track, Wittgenstein replies to Lewy, "You must explain 'designates' by examples."[46] There are multiple ways to "designate" just as there are in engineering multiple methods of projection. But Lewy is on to something

[44] Wittgenstein, *Wittgenstein's Lectures on the Foundations of Mathematics. Cambridge, 1939: From the Notes of R. G. Bosanquet, Norman Malcolm, Rush Rhees, and Yorick Smythies*, 19.

[45] Wittgenstein, *Lectures & Conversations on Aesthetics, Psychology, and Religious Belief*, 67. Emphasis added.

[46] Learning by examples was absolutely central to the kind of hands-on pedagogy that marked engineering education in turn-of-the-century German and Austria.

with the notion of "convention," because conventions are both *social* (more than me) and *timeful* in the sense that the novice joins that which preceded him or her.[47]

For the next page and a half Wittgenstein mulls over the possibility that what enables the phrase "my brother in America" to work is a "connection by convention" (68). "There is a connection by convention—what do we mean? –This connection refers to events happening at various times. Most of all, it refers to a technique." (68)

Again the danger looms. When non-engineers, especially those of us who imagine themselves to be close to engineering but were trained instead in mathematics and hard sciences, hear the word "technique," we think in terms of works-every-time and one-size-fits-all. But for Wittgenstein whose engineering education was tied closely to the hands-on practices of mechanic, *bricoleur*, and craftsman, technique is never a one-size-fits-all. Rather, all "techniques" are heuristics, rules of thumb that require skilled judgment and on-the-spot revisions.[48] Any given "technique" had to be skillfully employed from within a field of competing, and sometimes contradictory, heuristics. This social nature of engineering *techne*—that skills are shared by practitioners and honed together over time and most perfectly embodied by masters—is captured by Wittgenstein's phrases repeated throughout the excursus: "the practice of using," "connection by convention," " method of projection," "a public instrument…functioning in a certain way," "the technique of a word," and "a whole technique of usage" (67-71). In short, what enable the phrase "my brother in America" to do work, is that the phrase is part of *our* game. And the important

[47] "What came before and after is not unimportant." Wittgenstein, *Lectures & Conversations on Aesthetics, Psychology, and Religious Belief*, 68.

[48] See chapter 2 of Koen.

bit for my argument is this: If we happen to stand *outside* the "our" and hear another speak of "my brother in America"—or for that matter, "my Father in heaven"—Wittgenstein indicates that our only hope in making the connection is that "it must *become* a part of *our* game."[49] And that may take time.[50]

It is crucial to emphasize that this comparison: "anything projects onto anything" is categorically different that the statement "anything is analogous to anything." As Jeffrey Stout has argued, in the second statement the only thing it takes to make an analogy is a thin enough description of the things being compared![51] But notice that Stout's "rhetoric of thin description" presupposes that analogy is analogy is analogy: the activity of forming the analogy is always the same, while the descriptions vary in thickness. But for Wittgenstein-the-engineer, the method of projection is itself the thing that differs from case to case (recall: "analogy" is itself not a univocal term). Since one must attain a degree of mastery before one can understand a given method of projection (technique), and mastery takes time, there simply is *no way to pronounce in advance* whether two methods of projection (or two religious pictures) are on the one hand genuine rivals or on the other, insulated from criticism as fideism implies. On such a point Wittgenstein remained mute.

b. Fideism and Dynamical Similarity

[49] Ibid., 69. Emphasis added.

[50] In the words of Aristotle, "Those who have learned a subject for the first time connect together the propositions in an orderly way, but do not yet *know* them for the propositions need to become second nature to them, and that takes time." *Nic Eth* 7.3; 1147a21-22.

[51] Jeffrey Stout, *Democracy and Tradition* (Princeton, NJ: Princeton University Press, 2003), 171.

As with "method of projection," the notion of dynamical similarity also gestures to the sheer time needed for a novice to achieve the skills internal to a craft. But here I want to emphasize the skills required for judgment of sameness. Only those who are in the process of learning mastery of the appropriate method of projection are qualified to assess "sameness" and only then in proportion to how much progress they have made to date. For example, since we all have mastered well enough the techniques of Euclidian planar geometry, none of us have any trouble affirming "All squares are similar" and in special cases that two squares are "the same," or congruent. In such cases, a criterion of sameness can be explicitly spelled out (even if such criterion is really intelligible *only* to those who have already some mastery of the relevant method of projection). But if one *lacks* mastery of the relevant method of projection, is one thereby *justified* in affirming sameness? Oonly by *fides implicitas*.)

Suppose you are called in to arbitrate a case of musical plagiarism. A particularly prolific pianist has been churning out CD after CD and has now been called up on charges of having pirated another's recording of Rachmaninoff's Concerto No. 3 and is selling it as her own. *Obviously*, the two performances are similar—they are both of the Rach 3. They may even be *very* similar—down to issues of rhythm and volume. But are they the same? To your ears, and mine, the two recordings may sound identical. But as Wittgenstein alluded in the *Tractatus*, projecting music from score to performance involves finer distinctions that you and I as not-musicians are trained to make. When Schumann wrote the curious marginal direction to would-be performers, "Play as if from far away," his instructions meant more than simply "play softly"—or so I'm told by expert musicians; *for*

I don't know.[52] And that is my point.[53] (My wife, a musician by training, once observed that when music comes from far way prevents one from hearing what key it is in! This feature may make far away music quite different than from that which is simply played softly.)

Once again, we are brought up short when asking whether two religions are "the same" (i.e., occupy enough of the same conceptual space for comparison); whether two religious practices are "the same"; whether two religious utterances are "the same." J. L. Mackie says "God does not exist." Søren Kierkegaard says "God does not exist."[54] Are they saying the same thing? Wittgenstein-the-engineer warns that anyone lacking mastery in the respective techniques of projection also lacks warrant for thinking these two claims are the same. When Wittgenstein wrote famously that "*practice* gives the words their sense,"[55] he not only meant *their* practice. He meant *our* practice For the reliability of my conclusions about whether another's utterance means the same as when I say it is a function of my progress in the skills of the relevant method of projection.

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[52] "The direction: "*Wie aus weiter Ferne*" in Schumann. Must everyone understand such a direction? Everyone, for example, who would understand the direction "Not too quick?" Isn't the capacity that is supposed to be absent in the meaning-blind man one of this kind." Ludwig Wittgenstein, *Remarks on the Philosophy of Psychology. Two Volumes*, ed. G. H. von Wright and Heikki Nyman, trans. C. G Luckhardt and M. A. E. Aue (Chicago, IL: University of Chicago Press, 1980), I:§250.

[53] "Is there such a thing as "expert judgment" about the genuineness of expressions of feeling?—Even here, there are those whose judgment is "better" and those whose judgment is "worse." ¶ Correcter prognoses will generally issue from the judgments of those with better knowledge of mankind. ¶ Can we learn this knowledge? Yes; some can. Not, however, by taking a course in it, but through "*experience*."—Can someone else be a man's teacher in this? Certainly. From time to time he gives him the right *tip*.—This is what "learning" and "teaching" are like here.—What one acquires here is not a technique; one learns correct judgments. There are also rules, but they do not form a system, and only experienced people can apply them right. Unlike calculation rules." Wittgenstein, *Philosophical Investigations*, p.227e.

[54] "God does not exist; He is eternal."Søren Kierkegaard, *Concluding Unscientific Postscript*, trans. David F. Swenson (Princeton, NJ: Princeton University Press, 1968), 296.

[55] Ludwig Wittgenstein, *Culture and Value*, ed. G. H. von Wright and Heikki Nyman, trans. Peter Winch, English translation with the amended 2nd. ed. (Oxford, UK: Basil Blackwell, 1980), 85e.

c. Fideism and "satisfactoriness"

If Wittgenstein instinctively saw the world through the engineering eyes, then like any competent designer, he would have *both* denied that there is "at most one" solution and denied that "anything goes." I maintain that this holds true for his views on religion and ethics.

Now, there is plenty of evidence that show he eschews "at most one" view of religion and ethics.[56] So I won't belabor that point. At stake for my argument is whether there is any reason to suggest Wittgenstein stops short of outright fideism.

If Wittgenstein's engineering outlook endured throughout his entire life, it seems natural to expect Wittgenstein-the-engineer to eschew an "anything goes" position toward religion. Recall the words of PI §43, "for a *large* class of cases—though not for all…." In principle, there may be many satisfactory solutions to a design problem; *though not for all*. In practice there are many religions in the world, and in principle many other possible ones as well; *though not for all.* Perhaps the following example can clarify this last point.

Elizabeth Anscombe once asked Wittgenstein how he would respond to a Cambridge friend who went in for witch-doctoring, like you or I might go in for chemotherapy. Would he try to stop him? "He though about this for a little and said, 'Yes, but I don't know why'."[57] Three observations. First, Anscombe does not pose this as a

[56] For example, see *On Certainty* §§608-612 as well as Rush Rhees, "Some Developments in Wittgenstein's View of Ethics," in *Discussions of Wittgenstein* (New York: Schocken Books, 1970), 94-103.

[57] G. E. M. Anscombe, "The Question of Linguistic Idealism," *Acta Philosophica Fennica* 28, no. 1-3 (1976): 188-215. Citation from 03-04.

theoretical problem.[58] Anscombe knows better than to ask Wittgenstein to pronounce whether witch-doctoring per se is a bunch of hooey. But since Anscombe admits that the view of *On Certainty* seems to suggest that "there can be no such thing as 'rational grounds' for criticizing practices and beliefs that are so different than our own,"[59] she wants to know whether Wittgenstein's position precludes *any* opposition to the friend. So she poses a particular kind of defeater to a general prohibition against witch-doctoring: would Wittgenstein talk this friend out of it? Anscombe's question invites Wittgenstein to imagine a conversation that might ensue between him and the friend. It is important to see that Wittgenstein *can* indeed envision beginning such a conversation. As far as Wittgenstein was concerned, a conversation can *always* begin, even if, after a time, we might no longer "find our feet" with the other. In the place of a general theory about witch-doctoring, Wittgenstein trusts in the possibilities of conversation.[60] Of course, no conversation begins *tabula rasa*: each person brings skills and dispositions to the table. Wittgenstein knows he brings to the conversation an experience-formed disposition—in this instance, the disposition to dissuade the friend from visiting a witch-doctor. But importantly, his disposition is not to desist from conversation entirely.

Second, Anscombe's line of inquiry presumes that meddling in other's beliefs and actions is sometimes in order. By speaking with the friend, Wittgenstein would aim to

[58] The problem is a hypothetical one, as the friend is unnamed.

[59] Norman Malcolm, *Ludwig Wittgenstein: A Memoir* (London: Oxford University Press, 1958), 204.

[60] We must admit that Wittgenstein had better than average dialogical skills, engaging others where conversation seems impossible. Drury, a psychiatrist and close friend of Wittgenstein's, reports Wittgenstein's request to converse with some of his patients. "I was astonished to see how gently and helpfully Wittgenstein was able to discuss with him." Yet when Drury tried to join in, Wittgenstein promptly told him to "shut up." Wittgenstein explained later "When you are playing ping-pong, you mustn't use a tennis racquet." Maurice O'C Drury, *The Danger of Words and Writings on Wittgenstein*, Wittgenstein Studies (Bristol, UK: Thoemmes Press, 1996), 140.

change his friend's way of thinking. Now, when Kai Nielsen reads that Wittgenstein's ideal is one of "coolness"[61] that "leaves everything as it is,"[62] Nielsen seems to assume that Wittgenstein's method necessarily entails "hands off" and "to each his own." It is logically possible, of course, that Wittgenstein's admission to Anscombe is evidence of inconsistency. However, Wittgenstein's explicit intention is to perform therapies.[63] Wittgenstein once wrote to Norman Malcolm "What is the use of studying philosophy if all that it does for you is enable you to talk with some plausibility about some abstruse questions of logic, etc., & if it does not improve your thinking about the important questions of everyday life…?"[64] Sometimes intervention is called for.

Third, in good engineering form, Wittgenstein gives to Anscombe an answer that is clearly provisional. His current disposition is to oppose witch-doctoring. But in the same breath his admits "I don't know why." In admitting uncertain grounds for his disposition, Wittgenstein is gesturing toward the engineer instinct to reserve final action until one can "look and see." Depending upon what one sees, one may act in a way contrary to the initial disposition.[65] It has been the argument of this present paper that Wittgenstein's engineering outlook prevented him from settling anything in advance. If an engineer has

[61] "My ideal is a certain coolness. A temple providing a setting for the passions without meddling with them." Wittgenstein, *Culture and Value*, 2e.

[62] "Philosophy may in no way interfere with the actual use of language; it can in the end only describe it….It leaves everything as it is." Wittgenstein, *Philosophical Investigations*, §124.

[63] Ibid., §133.

[64] Malcolm, 39.

[65] An example of how one's mind might be changed by conversation is displayed by the now classic Peter Winch, "Understanding a Primitive Society," in *Religion and Understanding*, ed. D. Z. Phillips (New York, NY: Macmillan, 1967), 9-42. Where Sir Frazer would oppose primitive practices because they are *proto*-scientific, Winch emphasizes that "look and see" reveals that primitive practices (e.g., the rain dance) may not be proto-scientific at all, but something non-explanatory, perhaps like celebration. D.Z. Phillips writes of this in a variety of places, but see especially D. Z. Phillips, "Behavior, Explanation and Criticism," in *Introducing Philosophy: The Challenge of Scepticism* (Oxford, UK & Cambridge, MA: Blackwell Publishers, 1996), 166-82.

water seepage in the basement, he or she might undertake its repair. Then again, it might be more satisfactory to leave it alone. But there is no way to decide the best course of action *in advance* any more than it is possible to build a bridge without a site visit. One must first "look and see."[66] Wittgenstein's response to Anscombe is provisional precisely because more is needed. However, what is needed is not more data or more time to theorize, but more actual conversation with the friend.

In leveling a charge of fideism, Kai Nielsen seems to envision two mutually exclusive positions. Either one opposes witch-doctoring with hard-hitting reasoning that reveal it to be a mistake. Opposite this is fideism (or Nielsen's caricature of it) for which all things are permitted. If Wittgenstein is the fideist that Nielsen accuses him to be, there can be no good reason for bothering even to *begin* to converse; what could one possible hope to accomplish? Wittgenstein-the-engineer defies Nielsen's categories. Engineers are called upon to give a satisfactory response to an always poorly understood problem with too few resources at hand in a particular context armed only with whatever skilled reflexes one has cultivated to date. Which is to say, until particulars present themselves—Anscombe's question is, at this instant, hypothetical—Wittgenstein-the-engineer follows his nose.[67]

[66] Wittgenstein, *Philosophical Investigations*, §66, and §340. And from the 1913 notebooks, "Logic takes care of itself; all we have to do is look and see how it does it." Ludwig Wittgenstein, *Notebooks, 1914-1916*, ed. G.H. von Wright and G.E.M. Anscombe (Chicago: University of Chicago Press, 1961), 13 Oct 1913.

[67] Engineers around the globe have similar expressions. In English we say an engineer "has a good *eye*" in the way musicians are said to have "a good *ear*." In French the reference is to *le pif* (the nose), which English speakers also sometimes say. In Germany engineers refer to *Faustregel* (the fist) and in Russia the phrase is measuring "by the *fingers*." Koen, 34.