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The Augustinian methodological family of psychology

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ABSTRACT

In his *Investigations*, Wittgenstein employed a quotation from Augustine to capture certain of the essential features of an incoherent conception of language that he believed was at root of many of the dominant theories of meaning of his day. It is argued in the current paper that this very same Augustinian conception of language (ACL) is the foundation of some of the most influential methodological orientations of present-day psychological science, and, as a result, these orientations suffer from a range of ACL-induced incoherences. This thesis is illustrated by way of a case study drawn from the construct validation literature.

Wittgenstein begins his *Investigations* with a quotation from Augustine's autobiography, in which Augustine describes how he believes that he has learned his mother tongue. In the first volume of their analytical commentary on *Investigations*, Baker and Hacker (2005) elucidate and flesh out Wittgenstein's skeletal references to this proto-theory of meaning, calling it the *Augustinian conception of language* (hereafter, the ACL). They do this because the ACL "…exhibits the roots from which numerous philosophical conceptions of meaning grow" (Baker & Hacker, 2005, p. 1), and it was Wittgenstein's belief that the ACL infected these conceptions with a host of incoherences. In order to properly describe the precise nature of ACL-induced incoherences inherent to philosophical conceptions of meaning, it is necessary to make transparent the full reach of the ACL.

While there has, in recent years, been a steady trickle of published opinions to the effect that Wittgenstein's philosophy is the product of a simpler era, and has little if any relevance to the activities engaged in by the modern psychologist, such opinions are the predictable offspring of a naïve conception of science characterized by a failure to appreciate the astonishing diversity of the components that can

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enter into scientific investigations. It is true that a chief aim of the scientific enterprise is to describe the objects, entities, forces, and phenomena that populate natural reality, construct theories to explain that which is described, search for new truths about constituents of natural reality, and discover heretofore unknown features of natural reality. However, as even a cursory reading of any introductory textbook on physics will reveal, science is not a purely empirical undertaking, for it involves mathematics, a multitude of systems of logic, and both technical and non-technical language. More particularly, the truth of a scientific proposition is adjudicable with respect to empirical evidence only if it is coherent, and the adjudication of coherence is not an empirical, but, rather, a logical undertaking. The coherence of the claims that constitute the ACL is a logical issue, and, as such, the scientist's expertise in tackling empirical issues turns out to be of questionable relevance. If it could be shown that psychological research is, indeed, informed by the ACL, then the analyses of the coherence of the ACL carried out by Wittgenstein, a masterful logician, would seem to be of central relevance.

The structure of the current paper is as follows. First, it is argued that, far from being a relic from the historical backwaters of philosophy, the ACL is the foundation of many of the most influential methodological perspectives indigenous to the present-day science of psychology. These perspectives will be said, herein, to form the *Augustinian Methodological Family* (AMF), and include the construct validation theory approach to test analysis, the meta-interpretational bedrock of latent variable modelling, the view that psychological concepts are either natural or artificial categories, and, most fundamentally, the pervasive view that the meanings of psychological concepts are constituents of natural reality that the psychologist can come to know through empirical investigations (a perspective that will be labeled, the *Generalized Construct Validity Perspective* (GCVP)). Second, it is suggested that the path from the Wittgenstein-era ACL to the members of the AMF runs through the empirical realist philosophy of Feigl, Hempel, Sellars, and Rozeboom that came to prominence as a philosophy of science in the 1950s, and played a formative role in the thinking of many of psychology's most important methodologists. Third, it is argued that the logical dependency of each of the members of the AMF on the ACL visits upon these methodological orientations precisely the same ACL-induced incoherences that Wittgenstein identified nearly 100 years ago. We illustrate just how profound these incoherences can, in fact, be in an example drawn from the construct validation literature.

1. The Augustinian conception of language (ACL)

Baker and Hacker (2005, p. 1) suggest that, in Augustine's description of how he learned language, Wittgenstein detected "a picture or conception of the essence of human language: namely, that (i) words name objects, and (ii) sentences are combinations of words." Baker and Hacker extend and elaborate upon this primal conception to produce what they call the ACL. According to them, the ACL makes particular claims about word-meaning, sentence-meaning, and the role of ostensive explanation in language, and is naturally associated with a number of metaphysical commitments. Because the ACL is the "seedbed from which numerous philosophies and theories of language grow" (2005, p. 4), Baker and Hacker devote the first chapter of their book to a comprehensive accounting of the claims made by the ACL, and an analysis of the interdependencies of these claims. The following is a listing of the claims Baker and Hacker consider as essential to the ACL (cf. Baker & Hacker, 2005):

i Every significant word names (or signifies) something;
ii For a word to have a meaning, it must name an entity. To name an entity is to stand for or represent this entity;
iii The entity a word stands for is what the word means;
iv Words are either definable or indefinable. Definables are explained by means of other words. Their meanings are given by specifying necessary and sufficient conditions for their application;
v Indefinables are the points at which language touches up against reality, for they are connected to the simple entities that are their meanings. "Simple entities" may, depending on one's perspective, be conceived of as simple ideas in the mind, or as simple natures, or as simple objects out of which the world is made;

vi Ostention is the instrument by which language is connected to reality. Hence, ostensive explanations must be a part of any language, for it is through them that content is injected into the web of words.

Thus, at root, the ACL characterizes words as gaining their meanings through acquaintance with constituents of natural reality. Ostention is the means by which this acquaintance is established.

2. Empirical realism

The ACL is a conception of language, and, hence, a conception of concept meaning. Many methodological perspectives indigenous to modern psychological research must say something, either implicitly or explicitly, about concept meaning, and, as we will demonstrate, the account of concept meaning to which these perspectives answer is the ACL. As is made clear from even a cursory reading of the work of the psychometricians who set psychology's methodological table, notably Cronbach and Meehl (1955), Lazarsfeld (1950), and Lord and Novick (1968), the route from the Wittgenstein-era ACL to these perspectives runs through the mid-century empirical realist philosophy of science of Feigl, Hempel, Sellars, Tuomela, and Rozeboom.[1]

The core tenets of empirical realist philosophy (see, e.g., Tuomela, 1973) can be outlined as follows:

i Natural reality is comprised of observable phenomena and the unobservable causes of these phenomena;
ii These phenomena and causes exist independently of whether they are perceived by humans;
iii Scientific concepts can be categorized as either theoretical or observational terms. Observational terms are semantically unproblematic, as they designate observable phenomena. They are defined in data-language terms (i.e., in terms of observables). On the other hand, theoretical terms, e.g., electron, phlogiston, neutrino, are introduced by scientific theories and designate unobservable causes of observable phenomena. Accordingly, theoretical terms cannot be defined on the basis of observational terms. Thus, theoretical terms are both essential to what scientific theories claim about natural reality and semantically problematic[2];
iv A theoretical term is an *open concept*: it is not explicitly definable in terms of observables. Instead, it is implicitly, and incompletely, defined by the system of laws and core presumptive hypotheses which comprise the theory in which it is embedded;
v While a given theoretical term is implicitly defined by its embedding theory, if the theory turns out to be correct, the theoretical term does, in fact, name the causal entity it denotes.

Thus, in the words of Rozeboom (1984, pp. 211–212),

> Logical positivism courageously sought to face down this doubt in the only way that classical epistemology could envision, namely, by proposing that theoretical sentences which seem to make claims about unobserved entities do not really do so … The thesis that theoretical expressions are always equivalent to data-language constructions if meaningful at all was largely a promissory note whose lack of cash backing eventuated in positivism's bankruptcy during the 1950s … logical positivism gave way in the 1950s to the empirical realism long championed by Feigl (cf. 1950, 1956) under the title 'logical empiricism.' This is the thesis that although theoretical terms get their meanings from the data-language contexts in which they are used, what

[1] While the philosophers who have been identified as empirical realists are, in fact, a philosophically heterogeneous group, they yet subscribe to a core of tenets that can justifiably be called empirical realist. Slaney (2001a) provides a detailed account of the similarities and differences between the empirical realisms of many of these philosophers. Maraun (2007) includes a detailed analysis of the linkages between psychology's most influential methodologists and empirical realist philosophers.

[2] To the logical positivist, a theoretical term is, at best, a "useful fiction" which may be used to structure the theory (Slaney, 2001b; Worrall, 1982). If it has any meaning, a statement of its meaning is reducible to statements made in terms of observables.

they semantically designate are causal features of natural reality generally concealed from perception but knowable through their data consequences.

Empirical realism's tenets (iii) and (iv) speak directly to the issue of concept meaning. Both are drawn from the ACL. Tenet (iii) is empirical realism's reiteration of the ACL's distinction between definables and indefinables, and tenets (iv) and (v) echo the ACL's insistence that the meaning of a term is settled by constituents of natural reality. Whatever be the virtues and defects of the empirical realist account of theoretical terms, the statistical methodologists of the social and behavioural sciences took the extraordinary step of interpreting empirical realism as the correct description of the place in science of the *ordinary language* psychological concepts that are the conceptual foundation of psychological research (see Lazarsfeld, 1950, for a striking example). Thus, they projected the empirical realist account into psychology as follows: (Pi) it is extremely difficult to come to grips with psychological concepts; (Pii) the source of this difficulty is the fact that the meanings of psychological concepts are the unobservables to which these concepts refer[3]; (Piii) because of this unobservability problem, the psychologist cannot be "directly acquainted" with the meanings of ordinary language psychological concepts. He or she must, instead, build empirical cases that yield inferences about these meanings.

3. The Augustinian methodological family (AMF) of psychology

Through their belief that empirical realist philosophy was the correct description of the place in science of ordinary language psychological concepts, the methodological table-setters of psychology tethered many of the most important methodological orientations of psychology to the ACL. Thus was born the AMF, which includes the construct validation theory approach to the adjudication of tests, the interpretational meta-theory of latent variable modelling, the Paul Meehl-inspired insistence on the necessity of distinguishing between natural and artificial kinds (backed up by a comprehensive methodology, taxometrics, that, he claimed, should be employed in the search for natural kinds) that is gaining in popularity within psychology,[4] and, most fundamentally, the pervasive belief that the meanings of psychological concepts must be discovered through the carrying out of empirical investigations. In this section, each of these orientations is briefly reviewed.

4. Construct validation theory

Construct validation theory is a methodological orientation that prescribes how a researcher should go about passing judgment on a test designed to measure a particular construct. Within the social sciences, construct validation theory is the dominant approach to the adjudication of the performances of tests. It was popularized in a series of papers by Cronbach and Meehl (the most influential of which was their 1955 *Psychological Bulletin* article), was refined and extended by various individuals, notably Messick (1981), and was, finally, enshrined as received account in the Standards for Educational and Psychological Testing (1999) of the American Psychological Association. While it contains positivistic elements (see Norris, 1983), it is undeniably empirical realist in character,[5] most quintessentially in its commitment to empirical realism's tenets (iii) and (iv), which, as will be recalled, jointly echo the account of concept meaning that is the ACL. The logic underlying construct validation theory may be characterized as follows: let test T be composed of a set of items, $\{i_1,\ldots, i_k\}$, designed to measure a construct ω. According to construct validation theory: (i) The behaviour of the test-taker when he or she is tested with test T (i.e., his or her "test-behaviour") is caused by a set, $\{c_1, c_2, \ldots\}$, of unobservable constructs whose identities will always remain unknown; (ii) Test T is construct valid, and the $\{i_1,\ldots, i_k\}$ are indicators of ω, if ω is the dominant cause of test behaviour on T; (iii) Because the members of $\{c_1, c_2, \ldots\}$

[3] Charles Spearman (1927), the father of latent variable modelling, was perhaps the first to suggest the claim in (Pii).

[4] Of the 120 articles listed in the EBSCO research database which contain "taxometric" as a keyword, 77 were published in the last five years.

[5] This comes as no surprise given that Meehl has made his philosophical commitment to empirical realism clear in many of his papers (e.g., 1992).

are unobservable, the test analyst must infer both the identities of the members of $\{c_1, c_2, \ldots\}$ and their relative causal impacts on test behaviour on T; (iv) Test behaviour, $\{c_1, c_2, \ldots\}$, and other unobservables and observables are embedded in theories (nomological networks); (v) In passing judgment on the performance of test T as a measure of ω, the researcher must deduce, from T's nomological network, and under the supposition that the dominant cause of test behaviour on T is ω, observable requirements, $\{r_1, r_2, \ldots\}$, for the joint distribution of a sample of responses to the items of T; and (vi) if the joint distribution of item responses satisfies $\{r_1, r_2, \ldots\}$, then there is provisional support for the claim that T measures ω.

The dependency of construct validation theory on the ACL can then be summarized as follows:

i Every construct stands for or represents an unobservable cause;
ii The meaning of a given construct is the unobservable cause for which it stands;
iii From (ii), it follows that constructs are indefinables and, hence, cannot be defined by necessary and sufficient conditions;
iv When the joint distribution of a set of test items designed to measure a construct ω satisfies $\{r_1, r_2, \ldots\}$, a "methodological ostensive definition" is established, which, in the limit (as the nomological network nears completion), "points to" and identifies the unobservable cause, and, inter alia, the meaning of the construct;
v Because the nomological network is never complete, the methodological ostensive definition never fully settles the meaning of the construct.

Strauss (1999, p. 19) provides a stock summary of the construct validation perspective:

> One major concern in psychology is to define and describe psychological constructs such as a person's anxiety, extraversion, intelligence, or goal orientation. However, such psychological constructs cannot be observed directly. Measurements, tests, and item responses are used as indicators for the respective constructs. A psychological construct is empirically substantiated when it is confirmed by (valid) indicators like observations or tests.

5. The generalized construct validation perspective

Construct validation theory proper is the technical sibling of a perspective that is so entrenched in the thinking of psychological researchers that many would be surprised to hear it described as a methodological perspective. This perspective, the Generalized Construct Validation Perspective, portrays a psychological concept as a label for a roughly circumscribed cluster of phenomena. The link between phenomena and concept-label, often the product of mere language, is viewed as being tentative and inexact. The true meaning of the concept-label is a pure essence that lies somewhere "behind" the phenomena. Because it is taken to be a constituent of natural reality, the true meaning of the concept is seen, at least potentially, as partially discoverable through the doing of empirical research. The tools of science must be employed to penetrate the "noise" of the observable world and reveal shreds of evidence about the concept's true meaning. It is accepted that one may be dead wrong in one's hypothesis that the meaning of a particular concept is such-and-so. Only through a program of rigorous research can the researcher hope to come to possess a reasonable conjecture about what is *really* meant by concepts such as *self-esteem*, *anxiety*, and *intelligence*.

The essence of GCVT is nicely revealed in Cronbach and Meehl's (1955) assertions that "Scientifically speaking, to 'make clear what something is' means to set forth laws in which it occurs"(p. 290) and that:

> We will be able to say 'what anxiety is' when we know all the laws involving it; meanwhile, since we are in the process of discovering these laws, we do not yet know precisely what anxiety is (1955, p. 294).

It is also manifest in discussions of the diagnosis of psychopathology, when it is suggested that the Diagnostic and Statistical Manual (i.e., "DSM") criteria are "hunches" about, or approximations to, the true meanings of psychopathological concepts, and, hence, may well be "wrong." What is truly meant

by schizophrenia, it is confidently asserted, is yet to be discovered, and will be progressively better approximated through the interplay of empirical investigation, theory, and concept revision. Thus, in discussing the diagnostic criteria of schizophrenia, Hare (1987, p. 515) states that "while such [specific] criteria may improve the reliability of diagnosis among those who use them, there is no assurance they improve validity." With respect the meaning of the concept *psychopathy*, Hare (1996, p. 27) states that "no-one knows exactly what it is. It might be a disease or a mental disorder. Its symptoms, as far as we know, are … [the 20 Psychopathy Checklist-Revised (PCL-R) disgnostic criteria (Hare, Harpur, Hakstian, Forth, & Hart, 1990)]." To paraphrase, each of the DSM diagnostic criteria for schizophrenia, and the PCL-R criteria for psychopathy, are approximations to the true meaning of the concepts *schizophrenia* and *psychopathy*, and, in fact, might well be incorrect.

When Lubinski (2000) makes the claim that a high Spearman–Brown coefficient (an index of reliability) indicates that "a reliable source of individual differences has been established … attention naturally turns to its psychological nature" (p. 11), he is invoking a related feature of the GCVP: psychological entities are "out there in nature"; the researcher has cast his "net" (his psychometric research tool) into the "sea" of psychological entities; a high Spearman–Brown coefficient indicates that he has come up with something; because of the unobservability of his "haul", the identity of this something must still be inferred. The dependency of the GCVP on the ACL is self-evident:

i The meaning of a psychological concept is a pure essence residing in nature;
ii Because this essence lies "behind" the phenomena for which the concept stands, scientists must come to know it through the accumulation of facts about these phenomena;
iii As the body of evidence accumulated about the phenomena for which a concept stands moves towards completeness, it comes to form a methodological ostensive definition that points to the pure essence that is the meaning of the concept.

6. Latent variable modelling

Latent variable models are statistical models in which are featured two types of random variates: the *manifest variate*, which is said to be observable, and a set of which constitutes the "input" into a latent variable analysis; and the *latent variate*, which is said to be, among other things, unobservable and unmeasurable. To date, there have been invented many latent variable models, prominent examples being the linear factor models (and their siblings, the classical true-score models), the latent class and profile models, an assortment of non-linear factor models, including the classical item response models, and the structural equation models. McDonald (1977, p. 165) claims that the "common factor model is probably the most widely employed device for the statistical analysis of multivariate data." In discussing the history of structural equation modeling, Bentler (1986, p. 35) notes that "Unlike many other developments in theoretical psychometrics, this methodology spread from the methodology laboratory into the research laboratory with unusual rapidity."

Consider the practice of applying the (unidimensional) linear factor (ULF) model to a set of p indicators, within a population P_T under study. The investigator: (i) draws a "random sample" consisting of N of the individuals contained in P_T; (ii) computes an estimate, S, of the population covariance matrix, Σ; (iii) using S, estimates the p factor loadings and p residual variances that are the parameters of the ULF model; (iv) using S and the parameter estimates, estimates how well Σ is described by the ULF model; (v) if it is decided that the ULF model describes Σ sufficiently well, continues on to "interpret the common factor" through an examination of the estimated factor loadings.

Consider step (v) of this procedure, commonly called factor or latent variable interpretation. Essentially, the latent variable model is being portrayed as a detector of the conceptual essences that are presumed to "underlie" the chaotic buzz of phenomena. This way of thinking is present in Lazarsfeld's claim that "Empirical observations locate our objects in a manifest property space. But this is not what we are really interested in. We want to know the location of objects in a latent property space. Our

problem is to infer this latent space from the manifest data" (1959, p. 490). Lord and Novick, on the other hand, express the same notion in the following way:

> the abilities or traits that psychologists wish to study are usually not directly measurable; rather they must be studied indirectly, through measurements of other quantities. We cannot directly measure a person's mathematical ability; we can only measure his performance on a number of mathematical test items (Lord & Novick, 1968, p. 13).

When a given latent variable model adequately describes a set of indicators, a conceptual essence – of which the indicators are imperfect reflections – has been detected. The latent variable represents or marks this conceptual essence. In Bollen's (1989, p. 11) words, "Latent random variables represent unidimensional concepts in their purest form." The question that remains, however, is, "what is the identity of the detected conceptual essence?" It is accepted that an inference must be made about the identity of that which has been detected, and, because this inference must be made on the basis of limited information (i.e., the estimated factor loadings), the researcher may well be incorrect in concluding that, e.g., his indicators are indicators of self-esteem (they might, instead, be indicators of leadership). McDonald and Mulaik (1979, p. 298) capture the essence of this member of the AMF as follows:

> "Factor analysis has commonly been treated as a theory-generating device; that is, it has been treated as a device for the *post facto discovery of the psychological concepts* [italics added] that explain the correlations of the variables one has chosen to measure.

The dependency of latent variable modeling on the ACL can be summarized as follows:

i Latent variates are "pure", unobservable concepts located in a "latent realm";
ii The event of a unidimensional latent variable model describing adequately well a set of indicators constitutes a methodological ostensive definition that points, as it were, from these indicators to the pure unobservable essence (concept meaning) that underlies them;
iii Because the meanings of psychological concepts are unobservable, they must be detected (through the use of latent variable models) and identified (through the practice of latent variate interpretation).

7. The search for natural kinds: taxometrics

Since Plato endeavoured to "carve nature at its joints", a number of somewhat distinct perspectives on the existence of natural kinds have been put forth (see Hacking, 1991 for an historical perspective on the tradition of natural kinds). In essence, the doctrine of natural kinds states that there are objectively existing categories, each category defined by the essential, intrinsic properties shared by its members (Lakoff, 1987; Wilkerson, 1995, pp. 30–33). Importantly, it is believed that what separates natural kinds from non-natural kinds (i.e., "artificial kinds", "dependent kinds", "superficial kinds") is that the former are classifications that are "given to us by nature" and, hence, are not dependent upon human linguistic structures, whereas the latter are classifications that are "somehow up to us" (Wilkerson, 1995, p. 36). Thus, certain concepts are considered to be essences in nature, while others are merely created by humans.

For the majority of his career, noted theorist Paul Everett Meehl was concerned with questions having to do with the possible existence of natural kinds (latent taxa). In particular, Meehl believed that the question of whether there existed "real", or "non-arbitrary", classes (taxa) within a particular domain of phenomena, was an empirical question that had to be addressed through the collection of evidence. He therefore invented and developed a suite of multivariate statistical procedures which he called "taxometrics", and which included MAXCOV, MAMBAC, and MAXEIG, among others (cf. Waller & Meehl, 1998). Meehl believed that these procedures could be employed to detect the presence of latent taxa, when, in fact, they were operational within a domain of phenomena.

The link between the ACL and this methodological orientation can be summarized as follows:

i In analogy with the ACL distinction between definables and indefinables, categories are either artificial (constructed) or natural (real, occurring in nature);

ii Natural kinds are unobservable. They are latent, existing not in the conceptual schemes of humans, but as taxa, "in the perfect conceptual system of Omniscient Jones" (Meehl, 1992, p. 122);

iii Special methodological procedures are required to detect natural kinds. When a taxometric analysis indicates the presence of a taxon, this constitutes a methodological ostensive definition that "points" to the discovered natural kind. Because it is unobservable, its identity (essence) must be inferred.

8. Wittgensteinian lessons for the practicing psychologist

What we have thus far described are several members of a family of methodological orientations, the AMF, each of which is sculpted from the clay provided by the empirical realist philosophy of science that became influential at mid-century. Empirical realism's account of concept meaning is, it will be remembered, simply that of the ACL. At root, the ACL obliterates the distinction between conceptual and empirical issues by portraying concept meanings to be constituents of natural reality, and Wittgenstein analyzed the incoherences that arose when this misstep was taken. Let us briefly summarize the key Wittgensteinian lessons (more detailed treatments are available in Bennett & Hacker, 2003 and Baker & Hacker, 2005).

A concept is not a constituent of natural reality, but, rather, a token in a linguistic practice. Linguistic practices are human creations. Within the domain of linguistic behaviour, the employments of concepts can be either correct or incorrect, and what is meant by correct (and, hence, incorrect) concept employment is fixed by the rules of language. The rules that fix the correct employments of concept "θ" are taught, learned, and made reference to in arguments over the meaning of concept "θ". When someone is learning a language of which "θ" is a part, those who have already mastered the correct employments of "θ" can, and do, set him or her straight: "That is not how 'θ' is used. This is what you say." To employ concept "θ" correctly is to employ it in accord with the linguistic rules that fix its sense, and to recognize an incorrect employment of "θ" is to recognize a departure from this normative employment.

The physicist lays down definitions for his novel technical concepts.

The concept *alpha particle*, for example, is defined as follows:

Definition: *alpha particle*. A nuclear particle (positively charged) consisting of two protons bound to two neutrons.

In so doing, he or she fixes the meanings (correct employments) of his or her terms. Thus, the rule (necessary and sufficient condition, in this case) that governs application of the concept *alpha particle* specifies that the concept is applied to an x, if and only if x is a positively charged nuclear particle consisting of two protons bound to two neutrons. While the correct employments of the technical concepts of science are standardly fixed by necessary and sufficient conditions (i.e., by definitions), the rules that fix the correct employments of psychological concepts are notoriously varied and ramifying (see Bennett & Hacker, 2003). In particular, the correct employments of psychological concepts are not fixed by necessary and sufficient conditions (Baker & Hacker, 1982). Rather than the necessary and sufficient conditions that scientists have become used to through their familiarity with the technical concepts of the natural sciences, the meanings of psychological concepts are fixed by enormously complicated grammars, and this fact has been misinterpreted by many a psychologist as the ineffability or unobservability of the meanings of psychological concepts. As with any concept, the meaning of a psychological concept is fixed by linguistic rules, and, hence, to clarify this meaning is not to fabricate imaginary domains in which "unobservable meanings" reside, but, rather, to clarify the linguistic rules that fix the concept's correct employments.

Certain concepts, including many invented by natural scientists, denote elements of natural reality. The elements of natural reality that are denoted by a concept "π", say, π-things, are called its referents. The denotational relationship between concept "π" and π-things is fixed by the rules of language: to know that concept "π" denotes π-things is to grasp that it is correctly ascribed to π-things, and to grasp that it is correctly ascribed to π-things is to grasp a rule for its correct employment. Thus, to grasp the meaning of denotational concept "π" is, in part, to be able to identify its referents, π-things, in nature.

Being constituents of natural reality, π-things have *empirical* natures: it is possible to come to know facts about π-things. However, the possibility of coming to know facts about π-things via empirical investigations presupposes the capacity to *identify* π-things in nature (and distinguish them from things that are not π-things), and possession of the latter capacity is to grasp part of the meaning of concept "π". Hence, to know what is the target of investigation in an investigation of π-things, i.e., precisely those elements of natural reality denoted by concept "π", is to grasp a rule of language, and, hence, is a conceptual matter. To study the natures of these targets, π-things, is an empirical matter.

The meaning of concept "π" (fixed as it is by the rules of language) is autonomous of facts about its referents:

i The meaning of concept "π" (which is not a constituent of natural reality, but, rather, a part of language) has no direct bearing on facts about π-things;
ii Facts about π-things (which are constituents of natural reality) have no direct bearing on the meaning (correct employments) of concept "π".[6]

Thus, to grasp the meaning of the concept *bachelor* is to grasp the rule that *bachelor* is ascribed to adult, unmarried males. This rule, however, has no direct bearing on facts about those individuals who can correctly be called bachelors. It is mute with respect the modal hair colour of the bachelor, his average income, and his median IQ. To make discoveries about the modal hair colour, average income, or median IQ of the bachelor, presupposes the capacity to identify bachelors in nature, a capacity that derives from knowing the linguistic rule that bachelors are adult, unmarried males. Conversely, to know that bachelors make, on average, $94,789 per year, has no bearing on the meaning of the concept bachelor. On the contrary, this proposition is a fact about bachelors only if it is a fact about those individuals to whom the concept *bachelor* can be correctly ascribed. And it is language that fixes those to whom the concept bachelor can be correctly ascribed: to wit, unmarried, adult males.

While the job of science is, indeed, to make discoveries about, and provide explanations of, constituents of natural reality, the scientist must concern himself with conceptual matters (the correct employments of concepts) because his scientific aims and products are expressed in language and, hence, in terms of concepts. Scientists employ concepts that denote, and denotational relationships are established by the rules of language. Hence, when the scientist hypothesizes that γ-things have such-and-such properties, offers a theory as to why γ-things do what they have been observed to do, or sets out to prove the existence, in the far north, of γ-things, his claims are, in fact, about γ-things only if they are informed by a correct employment of the concept "γ". And knowing how to correctly employ concept "γ" is equivalent to grasping the rules that fix "γ"'s correct employments. This is, of course, why innumerable scientific papers and texts in biology, chemistry, and physics, contain carefully stated definitions for key concepts. Given the correct employment of the concept "γ", it is a distinct, empirical issue whether the scientist's (coherent) empirical claims are in fact true.

That the linguistic rules that are constitutive for concept meaning are autonomous of facts about constituents of natural reality does not imply that the scientist need not pay attention to conceptual matters. Rather, it implies that he or she has two distinct tasks – the clarification of the concepts that denote the phenomena of scientific interest to him or her, on the one hand, and the empirical investigation of these phenomena, on the other. Research originates from a state of uncertainty over the nature of some feature of natural reality. If it were not so, there would be no need for research to be undertaken. Hence, when a researcher begins a study of η-things, he or she may know very little about the properties of these entities. However, a program of research whose aim is to reveal the properties of η-things cannot be fruitfully undertaken if there exists uncertainty in regard the correct employments of concept "η" that denotes η-things, for this would be equivalent to there being confusion over what, in natural reality, is the object of investigation. Research attempted under conditions of conceptual unclarity is destined to yield findings the meanings of which are unclear. This is because any empirical findings generated in the doing of research are findings about η-things only if they are about

[6] Facts about natural reality *can* have an indirect bearing on the linguistic rules that fix the meaning of concept "θ", by, for example, motivating humans to change these rules (Baker & Hacker, 1982).

phenomena denoted by concept "η". But to know which constituents of natural reality are, and are not, denoted by concept "η", is simply to grasp a rule that fixes a correct employment of concept "η".

In the event that the meaning of a particular concept is unclear, the remedy is neither further attempts to accumulate empirical evidence, nor the construction of theories about constituents of natural reality, but, rather, a clarification of the concept's rules of correct employment (Hacker, 1986). Einstein's enormous insight that the correct employment of the concept *simultaneous events* was unclear when the events in question were distantly occurring, and his retooling of this concept so that it was meaningfully applied to such events, is perhaps the most famous example of a conceptual clarification freeing science to do fruitful empirical work.

9. The incoherence of the AMF

The ACL takes the meaning of a concept to be something in nature for which the concept stands. This is a conflation of a conceptual issue (the concept's meaning) and an empirical issue (the empirical characteristics of its referents), and destroys the conceptual/empirical autonomies that must be respected in order to conduct fruitful empirical investigations. Each of the members of the AMF are founded on the incoherence of the ACL, and thus, not surprisingly, make no sense. It makes no sense to claim, as do certain experts in psychopathology, that the DSM criteria for schizophrenia may be wrong, for, as it currently stands, these criteria fix the grounds for ascribing the concept to an individual, and, hence, settle the meaning of the term. It may well be the case that psychopathologists come to decide, at a later date, to revise these criteria. If they do so, then they will have changed the meaning of the term schizophrenia. However, such an alteration would certainly not represent progress towards the discovery of the "true" meaning of the term, because the meanings of concepts are laid down by humans, and, hence, are known by humans. Meanings are not "out there" in nature. Humans decide upon what is meant by the concept *schizophrenia*. Nature decides upon empirical properties of the condition denoted by this concept.

Similarly, it makes no sense to attempt to determine, as does the researcher searching for natural kinds, which categories exist in nature, and which do not, for categories do not "exist in nature." Categories are elements of language and, hence, were created by humans. Certain categories are employed to categorize constituents of natural reality. The scientist studies constituents of natural reality. If the scientist wishes to study the constituents of natural reality contained in category Ω, then he or she must grasp the rules that specify admission into Ω, and this is to grasp part of the meaning of category-term "Ω". Finally, the meanings of concepts do not exist in nature, and, thus, it makes no sense to attempt to discover them, as does the latent variable modeller who employs parameter estimates to "interpret the latent variable." When an incoherent conception of concept meaning such as the ACL is made the foundation of a methodological perspective, further incoherence is the predictable result.

Wittgenstein distinguished carefully between the conceptual and empirical components of scientific investigation. The scientist's aim is to make empirical discoveries about natural reality. Because scientific aims, questions, and discoveries are expressed in language, if the scientist wishes to realize this fundamental aim of science, he or she must be clear about the meanings of the concepts that inform his or her work. This is why any introductory text in biology, chemistry, physics, kinesiology, or, for that matter, any other properly functioning, cumulative science is chock full of definitions. It is perhaps a pathology induced by the ACL that so many (see, e.g., Jost & Gustafson, 1998) believe that if the psychological researcher were to actually take Wittgenstein's advice and properly address the conceptual clarifications that are precursors to fruitful empirical investigations, he or she would, in effect, be prejudging what might be found through the carrying out of scientific investigations. It is as if the yield of the conceptual clarifications would "fill the epistemic space, thereby making the doing of science unnecessary." To specify that alpha particles are positively charged nuclear particles consisting of two protons bound to two neutrons does not foreclose on the possibility of making discoveries about the empirical natures of alpha particles; quite the contrary is the case. To specify that the targets of empirical investigation are those particular particles comprised of two protons bound to two neutrons makes it *possible* for scientists to focus the tools of science on *these* particles, and, in so doing, come to know their empirical natures.

To illustrate just how deeply the incoherence of the ACL can permeate the thinking of psychological researchers, we will next consider a case study drawn from the literature on construct validation theory, Professor David Lubinski's (2000) paper, "Intelligence: Success and Fitness."[7]

10. A case study

In his paper, "Intelligence: Success and Fitness", Professor Lubinski discusses research on general intelligence (*g*) from the perspective of construct validation theory and the GCVP. He explains the role of construct validation theory in science through a consideration of horsepower. However, many of the ideas expressed in the paper exemplify the damage that will be done to the scientist's thinking when it is founded on the ACL. In particular, the many distinct components of science will standardly be misidentified and confused, and, most fatally, science's most fundamental distinction, that between the conceptual and empirical issue, will be eradicated. The boundary between conceptual and empirical issues having been eradicated, the role of language in the scientific endeavour will be eternally mischaracterized. In particular, language will be wrongly portrayed as an "inexact", unscientific source of "hunches", that only obscures the scientist's vision of how natural reality is structured.

Lubinski begins his treatment of the concept of horsepower by explaining that "verbal definitions … are always problematic because they lack consensus …" (p. 19). Perhaps unbeknownst to him, those branches of science that resisted the pull of the ACL, actually undertook the difficult conceptual analyses that eliminated definitional problems and, eventually, achieved the conceptual consensus that is a precursor to the doing of fruitful, cumulative science. Let us consider what the physicist Bueche (1972, p. 83) has to say, in his Principles of Physics, about concepts such as *work*, *power* and *horsepower*:

> Does a baseball player work when he is playing baseball? Many people would say that since he is playing a game he is not working. But what if he were being paid to play baseball? Is the ground underneath a house doing work? It is holding the house. Is it, therefore, basically different in its function from a pillar holding the roof over the porch of the house? Yet some would insist that the pillar was doing work. Clearly, if we are to use the term work in physics, we need to define it in a precise way.

Thus, Bueche echoes the quintessentially Wittgensteinian view that the physicist cannot usefully proceed to his empirical investigations of work unless he grasps how the concept *work* is correctly employed. To define the term precisely is to settle what, in nature, will be investigated in investigations of work. Bueche also follows in Wittgenstein's footsteps by carrying out some elementary, but useful, conceptual clarifications. In particular, he suggests that the definition of work that he will provide is a technical homonym of ordinary language senses of the term work – the latter, but not the former, sense prohibiting us from coherently stating that, e.g., "the ground underneath the house is doing work". Under the ordinary language sense of work, such a claim is nonsensical; under physics' technical sense of work, however, such a claim is coherent and its truth can be adjudicated.

Before proceeding to an overview of the considerable body of facts about work that physics has thus far managed to accumulate, Bueche defines the term *work* followed by the term *power*. The definition of power is as follows: the amount of work done in a unit of time. There are available various units in terms of which measurements of power can legitimately be expressed, including the Watt (Joules/s), foot $\times$ pounds per second and horsepower (1 hp is equal to both 746 W and 550 ft $\times$ lb/s), this last unit being the concept on which Lubinski's analysis focuses. It is taken by the physicist as obvious that empirical findings cannot, for example, reveal 1 hp to be equal to 746 W. This equivalence is established by the rules that fix the correct employments of the concepts Watt and horsepower. It is not factually incorrect, but rather nonsensical to assert, e.g., that 1 hp is equal to 500 W. One either grasps that 746 W is equal to 1 hp, or fails to grasp a rule of correct employment of these unit-terms. Beginners to

[7] We do not wish to suggest that Professor Lubinski's discussion is uniquely incoherent. Quite the contrary: there exists an abundance of selections, any of which would have been equally suitable. It is because Professor Lubinski is an accomplished scientist and powerful expositor of the thinking inherent to construct validity that we have chosen to focus on his article.

the study of physics are expected to come to grasp an enormous number of such rules of concept employment.

Thus, horsepower is a unit for expressing the power generated by any constituent of natural reality that can, in fact, generate power (i.e., produce work in a particular unit of time). Empirical investigations into horsepower are, among other things, investigations into the horsepower produced, under particular conditions, by particular collections of work-producing entities (e.g., machines, people, structures, etc.). Such investigations might centre on the causes of an entity's capacity to generate high horsepower under particular conditions, or, alternatively, its inability to produce an expected level of horsepower. Empirical laws involving horsepower are generalized descriptions of the capacities of work-producing entities to generate horsepower. Such laws, of course, can have no direct bearing on the meaning of the term horsepower. On the contrary, fruitful empirical investigations centering on the horsepower generated by various constituents of natural reality, and, in particular, the coherent formulation of laws that arise from such investigations, presuppose clarity with respect the correct employment of the term horsepower. That is to say, a precondition to the carrying out of empirical scientific investigations whose focus is horsepower is the capacity to express measurements of power in terms of horsepower.

Having briefly considered what a physicist has to say about the concept horsepower, the means by which its meaning is settled, and its place in scientific work, let us now turn our attention to several of the commments Professor Lubinski (2000) offers on the topic:

> Construct validity seeks to validate measures of a postulated attribute. "Horsepower" is a postulated attribute, you can't 'see' horsepower, but you can construct indicators that co-vary with meaningful criteria that reflect our concept of horsepower and make it a conceptually powerful and useful concept. Just as horsepower is an abstract property of complex combustion systems, *g* is an abstract property of complex biological systems (p. 6).
>
> "The discipline of psychometrics has developed instruments for dealing with psychological phenomena remote from personal experience. Psychological constructs are 'removed' from experience because they co-occur with other phenomena. Multiple behavioural episodes are necessary to detect them" (p. 10).
>
> "To be clear, the *g* construct is not a 'thing'; it's an abstraction like horsepower. There are different components to horsepower, such as carburetors and cylinders, but still there is a general property. The overall functioning of this property can be increased by tinkering with the components individually, tinkering with the whole system or tinkering with fuel: there are a variety of different variables underlying horsepower as there undoubtedly are with *g*" (p. 28).

The ACL portrays the meanings of concepts as constituents of natural reality. It is not then surprising that construct validators vacillate unpredictably between two distinct senses of the term construct. At times, they talk as if constructs are constituents of natural reality (as when they speak of them as having indicators), and at other times as if constructs are terms that belong to the class of theoretical terms (technical terms that denote hypothesized unobservable constituents of natural reality).

Recall, for example, Strauss (1999, p. 19) claims that constructs must be "defined and described." It is a concept (but not a referent) that is a constituent part of language, and, hence, can rightly be said to be defined, or to lack a definition, or, if its rules of correct employment are not fixed by necessary and sufficient conditions, to have a meaning that is in need of clarification. Should it be the case that a particular concept denotes, then it is this concept's referents, being as they are constituents of natural reality, that can rightly be said to be in need of description. Consider Jost and Gustafson's (1998) assertion that "A goal of empirical investigation is to determine how each theoretical term interacts with others (their roles in nomological nets, in the ideal case), with external conditions, with whatever other variables can be studied in relation to what we initially and more-or-less pre-theoretically take as our target of investigation" (Jost & Gustafson, 1998, p. 474). Not being constituents of natural reality, theoretical terms can neither be said to "interact with others", nor "with external conditions", nor, certainly, with "other variables", and they certainly do not occupy positions in nomological nets (networks representing nomological laws describing constituents of natural reality). Lubinski, on the one hand, considers a "construct" such as horsepower to both be a "conceptually powerful and useful concept" and to "co-occur with other phenomena." However, it is a concept (not a referent) that can

potentially be a "useful concept" and a referent (not a concept) that can "co-occur with other phenomena."

Under the sway of the ACL, the construct validator takes the meanings of concepts to be constituents of natural reality, and, in so doing, eradicates the distinction between conceptual and empirical issues. This, in turn, enables growth of an incoherent explanation as to why the meanings of concepts in general, and psychological concepts in particular, appear to be so very difficult to come to grips with: it is said that these meanings are unobservable.[8] Thus, says Lubinski in the first quote above, "'Horsepower' is a postulated attribute, you can't 'see' horsepower", and, in the second quote, "The discipline of psychometrics has developed instruments for dealing with psychological phenomena remote from personal experience."

Not everything encountered in empirical science can be legitimately placed on the dimension that runs from the perceptually unobservable to the perceptually observable. Material and other entities that are extended in space can legitimately be characterized as observable or unobservable in relation to particular observational setups. However, hopes, dreams, desires, intelligence, concepts, and units of measurement such as horsepower can neither be correctly said to be perceptually unobservable, nor observable. They are not the right kind of thing to be placed on the unobservability continuum. To observe "big horsepower" is not to observe indicators of an unobservable entity called "big horsepower", but, rather, to observe what a work-producing entity can do as a result of its capacity to generate big horsepower (as when one observes a speedboat with a 300 hp engine racing over the water. One is here observing what the boat can do as a result of its engine's 300 hp rating).

Psychological phenomena are just those phenomena that are denoted by psychological concepts. The rules of language fix the correct employments of psychological concepts, and, hence, settle the phenomena to which these concepts can be correctly ascribed. These phenomena (e.g., anxiety, anger, intelligence) are not, however, "removed" or "remote" from experience, but rather are precisely what we do experience when we experience others' psychologies. The *causes* of these phenomena (e.g., neurochemical processes) are, on the other hand, often "removed from experience" in the sense that we do not typically witness their operation. Finally, it makes absolutely no sense to claim that psychological phenomena are removed from experience because they co-occur. This view is based on an unacknowledged (and indefensible) premise that "true" psychological phenomena (constructs) are the unobservable essences that lie "behind" co-varying observables. In discovering the causes of the co-occurrence of the members of some set of psychological phenomena, the researcher has not discovered the "true psychological phenomena", but simply the causes of these phenomena.

To say that there are different components of horsepower might mean that:

a There are different components to the concept *horsepower*. Indeed, these components are the concepts work and unit of time;
b There are multiple components to a satisfactory causal account of the amount of horsepower that particular entities can generate under particular conditions.

However, on no coherent account are, as Lubinski suggests in the third quote above, carburetors, cylinders, and fuel "components of horsepower." They are components of the operation of combustion engines, and properly functioning combustion engines have the capacity to generate power, and the power that combustion engines can generate can be expressed in horsepower. As a consequence, carburetors, cylinders, and fuel must be part of a proper causal account of the amounts of horsepower that combustion engines can generate under particular conditions. Thus, it may be true that switching from fuel B to fuel A results in engine B's being able to deliver an additional 5 hp, or, less controversially, that a combustion engine without a carburetor will be unable to generate any horsepower (i.e., it will be

[8] In fact, it is only the behavioural and social sciences that seem to see a need for the notion of *construct*. Other sciences get by perfectly well with traditional pairings such as *concept* (or *term*) and *referent*. We believe (see Maraun, 2007, for a more detailed analysis) that the special term *construct* is invoked just because it is employed within a setting of ACL-induced incoherence that includes the eradication of the distinction between a concept and its referents and the associated nonsense of "unobservable meanings."

unable to do any work). Horsepower is not an abstraction of any sort. It is a unit in which measurements of power may legitimately be expressed.

After observing the fact that combustion engines are comprised of multiple parts that jointly play a role in the capacity of the combustion engine to generate power, Professor Lubinski concludes, in reference to horsepower, "but still there is a general property" (p. 28). The "general property" is not horsepower (a unit of measurement), but, rather, power, and its role in science is ensured by the fact that language contains a property-term power that can legitimately be ascribed to entities on the basis of the work that they produce per unit of time (i.e., in accord with the linguistic rules that fix the correct employments of the term power). The *number* of distinct components of a satisfactory causal account of the power outputs of particular entities has no bearing on this (i.e., it is not a startling fact that there is the single concept power even though the causal account of power generation is complicated and involves many elements). Linguistic rules are autonomous of facts. If it weren't for the fact that humans possessed the concept *power* (measurements of power expressible in horsepower), there certainly could be no investigations into the causal story of the power productions of, say, combustion engines. This is why Bueche begins his chapter on work with definitions of power and horsepower, before moving on to facts that physicists have learned about the laws governing the power outputs of various types of entities.

In the first quote given above, Lubinski refers to horsepower as a "postulated attribute." It is badly confused to believe that a unit of measurement is a "postulated attribute." It is also a direct consequence of adherence to the ACL: concept meanings are unobservable constituents of natural reality the existences of which must, therefore, be postulated. In fact, horsepower is simply a unit of measurement in terms of which claims about the power that work-producing entities can generate, can be expressed. This is all fixed in language and there is nothing postulated about it. One might, on the other hand, coherently postulate something about the work (expressed in horsepower) that can be done by some particular class of work-producing entities under some particular set of conditions. This is because, in contrast to issues bearing on the *concept* horsepower, this latter issue is an empirical issue about which scientists may currently know very little, and, hence, about which they may legitimately form hypotheses. The lesson to be taken from Lubinski's confusion is that, if a scientist cannot identify what can and cannot legitimately be postulated, what can and cannot legitimately be theorized about, what can and cannot be defined, then he is in trouble. If he cannot correctly diagnose the natures of the issues that he will encounter in the doing of science, then he is destined to take the wrong approach in his attempts at formulating solutions.

11. Conclusion

Scientists of all sorts are capable of misidentifying the natures of the components of their investigations, or of conflating conceptual and empirical issues. Bennett and Hacker's *Philosophical Foundations of Neuroscience* documents many confusions drawn from the work of biologists; Newton's definition of mass, as Mach established, was circular, and, as shown by Einstein, physicists had been employing the concept of *simultaneous* in an incoherent manner. However, it is also the case within the majority of domains of scientific inquiry that when such conceptual difficulties are identified, they are seen as militating against scientific progress and are summarily purged. What makes the social and behavioural sciences unique is that, in weaving the ACL into the fabric of preferred methodological orientations, these sciences have enshrined the conflation of conceptual and empirical issues as a fundamental postulate of scientific investigation.

Wittgenstein focused on the psychological sciences because it was within these sciences that conceptual/empirical conflations seemed to be particularly commonplace. Scientists within other disciplines seem to have less difficulty in identifying and distinguishing between the distinct components of science, and in recognizing when the tools of empirical science are applicable and when they are irrelevant. Undoubtedly, this is in part because the conceptual foundations of the psychological sciences are vastly more complex. However, there really is no excuse for the wilfull resistance of psychological researchers to the guidance that Wittgenstein, and his scholarly descendants, have provided. For, so long as psychological researchers can confusedly describe the fact that "Jost and Thompson (1997) have argued, for example, that the existing measure of SDO [social dominance

orientation] confounds two distinct response tendencies, one of which captures a desire for ingroup superiority, and the other of which captures a desire to preserve existing hierarchical relationships" as a "conceptual critique" (Jost & Gustafson, 1998, p. 473), or take features of the grammars of concepts, i.e., their meanings, to be "platitudes of common sense" (Jost & Gustafson, 1998, p. 475), or anchor their research to the members of the AMF, they are, indeed, in desperate need of such guidance.

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