Measurement as a Medium for Communication and Social Action I: A Phenomenological View of Science and Society

William P. Fisher Jr. and Robert F. Cavanagh

The Argument for a Phenomenological Approach

The point of entrée into this work is a view that science and scientific progress are inextricably linked with the role of technology in history and societal development. Sociological accounts of science have been transformed in recent studies of the history and philosophy of science, away from references to the social as causative to a new sense of the social as the product of technologically embodied and locally situated relationships (Crease 2011; Latour 1987, 1990, 2005, 2013). For example, the Strong Programme of the 1970s moved to replace the philosophy of science with a sociology of science (Bloor 1976). The resulting relativism led to a frustrating sense that "anything goes," with renewed efforts to either dig deeper into existing philosophies or to move past the modern-postmodern, and positivist-antipositivist divides. Accordingly, in many quarters, positivist conceptions of science that were developed centuries earlier in the Enlightenment persist in "popularist" notions of science, such as naïve realism (Michell 2003).

In the same way that some choose deeper entrenchment in positivism, Kampen and Tobi (2011), like many others before them (for instance, Martin and Sugarman 2001; Bryman 2007), are willing to allow the natural sciences a positivist cast. They espouse an irreconcilable ontological difference between the human and natural sciences, commenting that, "…there is a sharp divide between interpretavist and neo-positivist ontological world views which cannot be expected to be resolved in the near future" (Kampen and Tobi 2011, p. 1). This plurality has implications for

W.P. Fisher Jr. (✉)
University of California, Berkeley, CA, USA
e-mail: wfisher@berkeley.edu

R.F. Cavanagh
Curtin University, Bentley, WA, Australia
e-mail: R.Cavanagh@curtin.edu.au

the function of measurement in science. Instrumentalist or deterministic measure-
ment models are commonly associated with positivist ontologies; and probabilistic
measurement models can be more productively associated with anti-positivist or
post-positivist ontologies or stochastic world views. The strength of association
depends on the extent of congruence between respective ontological assumptions
and the theory within particular measurement models. Similarly, the ontologies
informing human science, social science and humanistic inquiry are related to the
respective theoretical bases for measurement in these three fields. So shifts in
philosophical orientation accompanying movement between different forms of
enquiry require concomitant reframing of the existing theory of measurement or
possibly development of a new theory. Adoption of a philosophical perspective on
measurement theory has the potential to provide new insights of theoretical sig-
nificance to measurement. This project adopts a philosophical view of measurement
and uses a phenomenological lens.

There are several reasons for the choice of phenomenology as the frame of
reference for working out ways past, over, or through the ontological divide
between positivism and anti-positivism. Some of these stem from a need to illu-
minate the three major substantive concerns of the project; concerns about mea-
surement, meaningful communication, and societal renewal. More specifically,
phenomenology is implicated in

- proposing hermeneutical insight into the reading of scientific measuring
  instruments (Heelan 1983);
- emphasizing meaning in communication, and the "commonality of language
  ensuring a shared acceptance of meaning and ability to vocalise thoughts"
  (Regan 2012, p. 288); and
- recognition of lifeworld as a fundamental construct in society, "an historically
  and culturally invariant structure, without which human life and its various
  modes of experience would be unimaginable" (Schieman 2014, p. 32).

Another reason for choosing phenomenology is its basis in geometry as a root
model of scientific conduct (Husserl 1954/1970; Gadamer 1980, pp. 100–101).
A major intention of Husserl's sense of pure or transcendental phenomenology is the
categorisation of lived experiences and mental activities in order to develop an
understanding of underlying order or coherence (Husserl 1913/1983). This process is
analogous to the development of the schema constituting the natural sciences, for
example, the taxonomies of Biology and Geology. Reduction into linguistic
expressions distils defining features proven invariant within the limits of the
stochastic nature of the subjective experiences. Yet other reasons stem from the need
to strengthen the philosophical foundations of the study of measurement, particularly
those underpinning the discipline of metrology as it is emerging in the social and
human sciences (Fisher and Stenner 2011; Fisher and Wilson 2015; Maul et al. 2016).

This first paper, *A Phenomenological View of Science and Society*, elaborates on
these rationales. A multidimensional analytic frame was applied to inform assaying
of classical and modern phenomenology. The frame comprises four characteristics

of phenomenology: *Back to the Things Themselves*; *Authentic Method*; *Unity of Subject and Object*; and *The World of the Text*. The essence of each was distilled to identify the qualities considered essential when specifying a science grounded in phenomenological precepts. The paper concludes with the introduction of the notion of an unmodern or amodern perspective on measurement.

First Characteristic of Phenomenology: Back to the Things Themselves

Phenomenology describes phenomena as they are manifest in the convergence of things themselves with the consciousness of the experiencer. It requires the phenomena to be understood in their own terms, which in the sense of phenomenology advanced by Husserl and retained in the Husserlian tradition, focuses on a transcendental consciousness, a mode of thought not influenced by preconceptions, misconstructions, or the imposition of explanations, including scientific theories (Moran 2000). Heidegger (1962, p. 50), however, took a different path, and elaborates:

> Thus the term 'phenomenology' expresses a maxim which can be formulated as 'To the things themselves!' It is opposed to all free-floating constructions and accidental findings; it is opposed to taking over any conceptions which only seem to have been demonstrated; it is opposed to those pseudo-questions which parade themselves as 'problems', often for generations at a time.

In Heidegger's view, this opposition does not necessitate the rejection or dismissal of fore-structures. Instead, they are understood by reference to the experience:

> Our first, last, and constant task is never to allow our fore-having, fore-sight, and fore-conception to be presented to us by fancies and popular conceptions, but rather to make the scientific theme secure by working out these fore-structures in terms of the things themselves (Heidegger 1962, p. 195).

Husserl (1911/1965, p. 108) emphasizes the absolute nature of such a conception in contrast to conceptions derived from relativistic comparisons and contrasts:

> 'To the things themselves!' Not, however, to things as they are 'in themselves' (*an sich*), where their being is relative, but in the psychic flow, where their being is absolute, an essential being with the absoluteness of subjectivity.

Heidegger, on a page in his personal copy of a book of Husserl's emphasizing the return to the things themselves, in frustration with what he saw as the inconsistency of advising a return to the things themselves with Husserl's overriding focus on transcendental consciousness, wrote in the margins, "Let us take Husserl at his word!" (Gadamer 1991a, p. 14). Phenomenological reduction is employed to identify features of our experience that are both necessary and invariant, the eidos or essence of a particular subjective experience. But where Husserl conceives

reduction in terms of a bracketing of presuppositions, as though all of them can be identified and set aside through an effort of will, Heidegger conceives reduction in terms of the way things come into words. A potentially infinite array of variations in experience is expressed in a spoken or written form of limited length. This first moment in the phenomenological method is then applied in the construction of meaning, the second moment, which in turn may eventually be followed by a dismantling or deconstruction of the original concept, with the aim of resolving inconsistencies and returning to a new reduction (Heidegger 1982, pp. 19–23, 320–330; Fisher and Stenner 2011).

The phenomenological method is, then, complemented by the way prejudgments and moving closer to the "thing itself" are experienced in the hermeneutic circle:

> Each circle - or cycle - follows a sequence of four phases - a. *experiencing/observing,* b. *theory-making*, c. *theory-testing,* and d. *deciding* - each phase giving access to new insights; each cycle leading to a partially transformed beginning of a new cycle in which further development is made. Each cycle revises and improves the previous cycles of inquiry until the basic queries have been sufficiently explored dialogically. (Heelan 2014, p. 95)

In summary, the notion of "back to the things themselves" has implications for how we approach the object of inquiry: "we always come to our object of study with a set of prejudgments: an idea of what the problem is, what type of information we are looking for, and what will count as an answer" (Frodeman 2014, p. 74). It also has implications for how we exploit emergent understanding of the object of inquiry: "we remain open to correction, allowing the text or object to instruct us and suggest new meanings and approaches" (Frodeman 2014, p. 74).

Second Characteristic of Phenomenology: Authentic Method

Genuine method is intimately integrated with the way we come to terms with things themselves and with the principles on which science is conducted. Working through the presuppositions brought to bear in observation in terms of the things themselves means subjecting thought to the activity, behavior or movement of the object of interest. Instead of applying subjective, externally determined processes to a separate object, authentic method begins from a unity of subject and object caught up together in a flow of experience (Gadamer 1989, pp. 463–464). Method as a concept is a following along after (*meta-*) on the path (*odos*) of the thing itself experienced in thought via interactions with it (Heidegger 1991, p. 63; Gadamer 1989, pp. 459–461).

Phenomenology is primarily a way of conceptualizing method in this sense (Heidegger 1962, p. 50, 1977, p. 32), where we come into contact with things before they have been fixed as abstract, theoretical, conceptual entities removed from the concrete local experience of human praxis, history, and culture (Heelan 1994, p. 369;

Gadamer 1976). All observations are informed by ideas that focus attention and that effectively model things in the world in particular ways. Scientific observations are informed by models positing what are in fact unrealistic ideals (Butterfield 1957, pp. 16–17), such as Galileo's sense of the uniform acceleration of perfectly smooth balls rolling on frictionless planes, or Rasch's sense of reading comprehension being a function only of the reader's ability and text complexity. To communicate and work with unrealistically ideal models, they have to be embodied in linguistic and technological forms. Western philosophy originated in the capacity to look through geometric and numeric figures illustrating and representing mathematical relationships to those relationships themselves (Gadamer 1980, pp. 100–101; Heidegger 1977). Much remains to be done in the way of extending these philosophical considerations into the domains of mathematical psychology and sociology (Fisher 1992, 2003, 2004).

Newton's laws, and the resulting textbook engineering methods, have succeeded in uprooting conceptualizations of mass, force, and acceleration from the undifferentiated earth of "the concrete plurality of particular existents" (Gadamer 1976, p. 9) that remained systematically ungrasped and unrepresented in premodern history. Heidegger (1977, p. 32) uses poetic language to describe "catching sight of what comes into presence in technology," and asking "how the instrumental comes to presence as a kind of causality," points us toward possibilities for experiencing "this coming to presence as the destining of a revealing." In other words, when we pay close attention to the ways in which technologies (overtly scientific instruments, as well as alphabets, grammars, and syntax of language) frame experience and perception, we apprehend something methodologically important, the projecting into history of something new coming into words.

But authentic method is not a panacea. Both the strength and the danger of method lies in the way it narrows thought and focuses attention:

> There always remains the constant danger of the systematic problem of philosophy itself: that the part of lived reality that can enter into the concept is always a flattened version-like every projection of a living bodily existence onto a surface. The gain in unambiguous comprehensibility and repeatable certainty is matched by a loss in stimulating multiplicity of meaning. (Gadamer 1991b, p. 7)

In other words, "all interpretation makes its object univocal and, by providing access to it, necessarily also obstructs access to it" (Gadamer 1991b, p. 8; also see Gasché 2014). To the extent a method is authentic, when we succeed in abstracting general concepts from the mixtures of undifferentiated experiences, we also tend to selectively ignore everything that does not fit.

This unidimensional leveling of differences is not, however, completely inevitable, necessary, or total. If it were, we would have no concept of exceptions that prove (in the sense of test) the rule, or of the anomalies that accumulate and call for the reconceptualization of one or another domain of experience. In quite fundamental ways, stochastic processes signal the demise of reductionism, as they are unavoidable even in areas as seemingly deterministic as arithmetic and Newtonian

physics (Chaitin 1994), and the implementation of uniform laboratory standards (Berg and Timmermans 2000). We will return to these issues of authentic method, especially in the context of the world of the text.

Third Characteristic of Phenomenology: Unity of Subject and Object

The unity of subject and object characterizing phenomenology rejects separation between mind and world, between language and reality, and between subject and object. In order to understand the ontological and epistemological consequences of rejecting the dichotomies, it is informative to examine their origins. The history of the separation extends back to ancient Greece and can be tracked through the enlightenment into the modern era. The Greek philosopher Plato advocated the need to transcend human knowledge and for our minds to represent a reality that exists independently of our minds. This is a metaphysical realist view of the natural world. While "desires" and "reason" existed in the Greek culture, as Hegel (1910/2003) noted, these were in harmony. Hegel also noted the harmony persisted until the emergence of "individual conscience" in protestant Europe in the eighteenth century and the rise of the "new science." The new science was in tension with the "omniscience of the metaphysical tradition," there was an imbalance between "a science of reason based on concepts and a science based on experience" (Gadamer 1970/ 2006, p. 16). A solution to this problem was found by Kant who formulated another dualism:

> By getting straight the distinction between sensibility and the understanding and by keeping straight the sources of our concepts, we can protect the claims of geometry from those of metaphysics. Geometry applies to the objects of sensibility, objects given in space and time, metaphysics applies to the objects of the understanding, that is, God and moral perfection. (Carson 2011, p. 30)

Kant also contrasted metaphysical idealism with realism: "Metaphysical idealism is the view that the ultimate nature of reality is constituted by minds or ideas. Realism holds, on the contrary, that the nature of reality is mind-independent" (Dudley and Engelhard 2011, p. 3). A related more general issue is the relation between one's experiences, and the world, that is, between phenomena and reality. Dilworth (2007, p. 9) attested to the attention this has been given:

> At one time or another virtually every conceivable line has been taken on the issue, from the view that there is no reality other than phenomena [empiricism], to the view that reality, while different from phenomena, alone causes and is perfectly represented by them [realism].

For example, empiricism is "broadly speaking, the view that scientific investigation be confined to phenomena and their formal relations" (Dilworth 2007, p. 9). An extreme form of empiricism is the positivism developed by Comte. He was insistent that understanding nature and discovering its laws must commence with,

and be restricted to, the analysis of phenomena. Ontological questions are neither asked nor answered; instead the focus is epistemological concerns, particularly how to develop theory from observations. A central tenet of logical positivism/ empiricism is the theory/observation distinction. "It is only because observations are independent of theories that they could serve as evidential warrants to appraise the adequacy of theories, to ground theory comparisons" (Zammito 2004, p. 10). The fidelity of the distinction and its empirical consequences are threatened by the more recent recognition that observations cannot be completely independent of theory, the theory-laden nature of observations (Shapere 1984). Another criticism of positivism is its inadequacy in understanding human behavior, particularly when applied in the social sciences.

> Positivist social science is an impossible construction for human inquiry. Not only does it belie a bureaucratic market mentality (research is big business), but in its legitimation of social structures and practices that deny intersubjective meanings, it fails as a discourse for personal agency, moral obligation and political responsibility. (Brieschke 1992, p. 178)

Kuhn (1970) recognized the limitations of the assumption of universality underpinning positivism.

> Kuhn noted that scientific methods and practices were not universal, but localized within quite tightly bounded communities of practitioners. He acknowledged that phenomena could not be observed raw, but were always interpreted through a framework of preconceptions and according to assumptions bound up with the use of certain instruments. And he recognized that, while paradigms guided scientific research, they did not determine what sense could be made of new experiences. (Golinski 2012, p. 31)

These criticisms of positivism constitute some of the arguments of anti-positivism that led to a move beyond positivism to post-positivism, sometimes called post-modernism. However, the boundaries between positivism, anti-positivism and post-positivism are difficult to define. Cohen (1989 cited in Heidtman et al. 2000, p. 2) illustrates the confusion:

> If Positivism means a commitment to using evidence, then this author is a Positivist; if it means that nonobservable entities are inadmissible, then the present writer is an Anti-Positivist. If Post-Positivism represents a concern with the theoretical relevance of observables, then this analyst is a Post-Positivist; and so on.

Notwithstanding, Heidtman et al. (2000, p. 17) identified three principles of a post-positivist perspective: "All scientific data are theoretically informed," "empirical commitments are not based solely on experimental evidence"; and "fundamental shifts of scientific belief occur only when empirical changes are matched by the availability of alternative theoretical commitments." The principles posit that science does not proceed through inductive processes or that a theory can ever be conclusively validated by empirical means (see Kuhn 1970; Lakatos 1970). This is a unified orientation because in "rejecting the epistemological distinction between observation statements, grounded in experience, and theoretical statements, based on conjecture, post-positivists identified knowledge with theory" (McEvoy 2007, p. 386).

What remains missing in this anti-positivist perspective is the role of technologically embodied knowledge (Dewey 2012; Galison 1997; Golinksi 2012; Heelan 1983; Ihde 1991; Latour 1990, 1993, 2013). Technologies and instruments, including phonemes, movable type, diagrams, books, and thermometers, must be accounted for, since they embody the media through which meanings are communicated and shared.

The dualistic reasoning of classical Western philosophy (modernism) and the fragmentation of separated subjects and objects are shown to be fundamentally flawed by deconstructions elaborating the unified subject–object approaches typical of phenomenology [anti-positivism, in Galison's (1997) terms]. Gadamer (1989, p. 459), for instance, points out that,

> In this thinking [of Plato and Aristotle presuming method as dialectically absorbing thought into the movement of things themselves] there is no question of a self-conscious spirit without world which would have to find its way to worldly being; both belong originally to each other. The relationship is primary.

Accordingly, "Dialectic, this expression of the logos, was not for the Greeks a movement performed by thought; what thought experiences is the movement of the thing itself" (Gadamer 1989, p. 460). And so, "We are simply following an internal necessity of the thing itself if we go beyond the idea of the object and the objectivity of understanding toward the idea that subject and object belong together" (Gadamer 1989, p. 461). What we are doing, then, is "…thinking out the consequences of language as medium" (Gadamer 1989, p. 461), moving past the modern and the postmodern to an unmodern (Dewey 2012) or amodern (Latour 1990, 1993, 2013) embodiment of understanding in the fused horizons of unified subject–objects.

Fourth Characteristic of Phenomenology: The World of the Text

When we intentionally focus on things themselves in relation to words and concepts, when method is understood as the activity of the thing itself experienced in thought, and when fused subject–object horizons are embodied in the technical media of words and instruments, we arrive at a productive perspective on Ricoeur's sense of the world of the text. As Ricoeur (1981, pp. 192–193) puts it, in appropriating meaning,

> …what is 'made our own' is not something mental, not the intention of another subject, nor some design supposedly hidden behind the text; rather, it is the projection of a world, the proposal of a mode of being in the world, which the text discloses in front of itself by means of its non-ostensive references. Far from saying that a subject, who already masters his own being-in-the-world, projects the a priori of his own understanding and interpolates this a priori in the text, I shall say that appropriation is the process by which the revelation of new modes of being—or if you prefer Wittgenstein to Heidegger, new 'forms of life'—gives the subject new capacities for knowing himself. If the reference of a text is the

projection of a world, then it is not in the first instance the reader who projects himself. The reader is rather broadened in his capacity to project himself by receiving a new mode of being from the text itself.

Everyday language has the capacity to make ostensive references, pointing to features of the environment shared by speakers situated in a common location. But writing makes non-ostensive references, pointing at people, places, and things disconnected from the here and now of both the reader and the writer, introducing a new distance between signs and referents and broader horizons within which interlocuters belong to a shared community. Ricoeur describes this "distanciation phenomenologically, from the perspective of hermeneutics; we are more interested in it as a social process, to produce, through a sequence of mediations, the embedded system of meanings" (Taylor et al. 1996, p. 35). Latour (1987, p. 25) similarly takes up this distanciation as a key marker of factuality, pointing out that the more the credibility or meaning of a statement depends on who said it, and when and where, the less generalizable it is (Taylor et al. 1996, pp. 35–36).

Learning from a text involves the capacity to bring broad, contextual, linguistic expectations and specific, local expectations to bear in a way that both allows those expectations to be satisfied and makes them fluid and alive to new possibilities in the moment. The reader's lived world horizons are broadened via a pragmatic expansion of behavioral options opened up by the text. Different possible foundations for decisions, greater compassion for the plights of others, more forbearance in the face of complex circumstances, and innumerable other directions for action can follow from the reading of a text, whether it is a novel, a poem, a thermometer, a speedometer, or a look on someone's face.

The enframing of the world accomplished by language lifts the burden of initiation (Gadamer 1989, p. 104) from the reader by absorbing her or him into the play of signifiers, thereby providing new possibilities for thinking and acting. And it is here, where the advance work performed by language in making the world thinkable becomes apparent and useful, that the pragmatic overlap of the hermeneutic and the sociotechnical resides, with one caveat. For Ricoeur (1981, p. 191), "The ideality of the text remains the mediator in this process of the fusion of horizons," but for us, that ideality, like Latour's (1986, pp. 7–14) sense of the "immutable mobile," has to be recast as a boundary object seen in different ways from the varying perspectives of every stakeholder interacting with it (Star and Griesemer 1989; Fenwick 2010, p. 129; Fisher and Wilson 2015; Gooday 1997, p. 411). That said, Ricoeur (1981, p. 219), quite in harmony with Latour (2005), well states the fact that:

> …the function of substituting signs for things and of representing things by the means of signs, appears to be more than a mere effect in social life. It is its very foundation. We should have to say, according to this generalized function of the semiotic, not only that the symbolic function is social, but that social reality is fundamentally symbolic.

Like Gadamer's, Ricoeur's investigations stop with this realization of language as the medium of social life. Each understands in his own way that "the use and development of language is a process which has no single knowing and choosing

consciousness standing over against it" (Gadamer 1989, p. 463). But instead of taking up the question Hayek (1948, p. 54) regarded the central question of all social science, Gadamer and Ricoeur both choose to focus on what they consider the hermeneutic event proper, the coming into language of what has been said in the tradition, an event that is simultaneously appropriation and interpretation, the act of the thing itself that thought experiences.

Latour, however, goes in the opposite direction, implicitly taking up Hayek's (1948, p. 54) question, which Hayek posed, asking,

> How can the combination of fragments of knowledge existing in different minds bring about results which, if they were to be brought about deliberately, would require a knowledge on the part of the directing mind which no single person can possess? To show that in this sense the spontaneous actions of individuals will, under conditions which we can define, bring about a distribution of resources which can be understood as if it were made according to a single plan, although nobody has planned it, seems to me indeed an answer to the problem which has sometimes been metaphorically described as that of the 'social mind.' But we must not be surprised that such claims have usually been rejected, since we have not based them on the right grounds.

In their pursuit of answers to Hayek's question, Latour, Hutchins, and others working in science and technology studies have documented in exacting detail multiple instances of the processes through which metrological standards and traceability to them have brought about results via locally and spontaneously coordinated decisions and behaviors that nonetheless appear to follow a single centrally administered plan. Their pragmatic focus on what is said and done in the reading of instruments and the writing of memos, grant applications, conference presentations, reviews, letters of recommendation, and publications provides a wealth of material on the ways in which worlds are projected in front of texts, and are inhabited, even by those unversed in the language of mathematics that the Book of Nature is written in.

An Unmodern or Amodern Frame of Reference

Following Einstein's insight that major problems cannot be solved from within the frame of reference that provoked them, a profoundly different way of thinking and acting is required to initiate a new paradigm of scientific productivity, measurement, and innovation in the social sciences. The consequences of language as medium, as knowledge embodied in the technologies of standardized alphabets, grammars, phonemes, syntaxes, printing presses, books, web pages, and digital fonts, stands in radical contrast with the "fatal conceit" (Hayek 1988) of the modern Cartesian presumption of an independent subject making its own way to worldly being. Continued reliance on modern and postmodern conceptions advocating or criticizing subjectivities over against objects prevents us from formulating the concepts, methods, and tools needed for paradigm-shifting broad scale improvements in the quality of psychological and social measurement.

An alternative unmodern (Dewey 2012) or amodern (Latour 1990, 1993) frame of reference offers a fundamentally different basis for thinking about science and doing measurement. This alternative focuses

- on knowledge as technology,
- on the lack of a central authority over the use and development of language,
- on its recognition of end users as having little or no understanding of how language and technology work,
- on its acceptance of genuine method as a playful captivation in the flow of mutually implicated subjects and objects, and
- on its focus on the wide distribution of standardized tools as providing the language unifying fields of research and practice.

Thus, rather than continue waiting indefinitely for the modern project to arrive at its perpetually deferred fulfillment in an complete picture of the objective world, the unmodern perspective suggests we should instead define the terrain, the equipment, and the rules, roles, and responsibilities of teams and players in the language game of measurement. These matters will be further explored in the second paper, *The Promise and Power of Being Amodern.*

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