
Documentation Redux: Prolegomenon to (Another) Philosophy of Information

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ABSTRACT

A PHILOSOPHY OF INFORMATION IS GROUNDED in a philosophy of documentation. Nunberg's conception of the phenomenon of information heralds a shift of attention away from the question "What is information?" toward a critical investigation of the sources and legitimation of the question itself. Analogies between Wittgenstein's deconstruction of philosophical accounts of meaning and a corresponding deconstruction of philosophical accounts of information suggest that because the informativeness of a document depends on certain kinds of practices with it, and because information emerges as an effect of such practices, documentary practices are ontologically primary to information. The informativeness of documents therefore refers us to the properties of documentary practices. These fall into four broad categories: their materiality; their institutional sites; the ways in which they are socially disciplined; and their historical contingency. Two examples from early modern science, which contrast the scholastic documentary practices of continental natural philosophers to those of their peers in Restoration England, illustrate the richness of the factors that must be taken into account to understand how documents become informing.

THE PHENOMENOLOGY OF INFORMATION

In his essay, "Farewell to the information age," Geoffrey Nunberg (1996) proposes a phenomenology of information. His proposal has important implications for a philosophy of information. Rather than posit a particular definition or argue what the nature of information might be, Nunberg directs our attention to the manner in which information presents itself at this particular historical moment. Instead of elaborating a theoretical model

of the essence of information, Nunberg asks, "How is the impression of 'information' constituted. . . ?" (p. 115). His reason for this approach is that the ambiguities, contradictions, and confusions inherent in the *phenomenon* of information account for its force and authority. Ideas of information that enjoy the theoretical rigor of definitions and essences are not useful in understanding the phenomenon of information, because "any effort to try to extract a coherent conceptual structure for the notion would be not just futile but false to its phenomenology: 'information' is able to perform the work it does precisely because it fuzzes the boundaries between several genetically distinct categories of experience" (p. 114). And the work it performs is significant, because the confusions between different senses of the word "information"—confusions that constitute information as a phenomenon—permit, *inter alia*, information age enthusiasts to use "information" in a sense "which bears the ideological burden in discussions of the new [information] technologies," discussions in which those technologies are believed to "usher in a new and epochal discursive order" (p. 110). Moreover, because quantifiability is one of the phenomenological characteristics of information, we tend, Nunberg notes, to take seriously such popular claims as "a daily issue of the *New York Times* contains more information than the average seventeenth-century Englishman came across in a lifetime" (p. 111). Once information presents itself in countable bits, we have a resource—the *amount* of information—that permits us to denominate not only new experiences, such as "information anxiety" (Wurman, 1989), but also new socio-historical phenomena such as an "information society," an "information age," or an expanding "infosphere" (Floridi, 1999). The study of the phenomenology of information can, therefore, help us trace the sources of the many imaginings associated with the word "information."

Nunberg's essay is important to the approach this paper takes to a philosophy of information, because the question "What *is* information?" which might be taken as the foundation of such a philosophy, belongs as much to our current phenomenon of information as does the idea of quantification. Information presents itself as a particular kind of thing; our impression of it is of a kind of substance. Since the grammar of "substance" and its cognates license conceptual explorations of what, precisely, the properties of the stuff in question might be, it legitimates the question "What *is* information?" Whereas the impression of information-as-substance leads the popular imagination toward pursuits of remedies for the deleterious psychic effects of being overwhelmed by too much of the stuff, it directs the theoretical and philosophical imagination toward puzzles posed by information imagined as a coherent *theoretical kind*, that is, the sort of thing about which general, theoretical knowledge may be gained. (Once substance presents itself, the quest for essence is not far behind.)

According to Nunberg's argument, the key properties of our abstract impression of information-as-substance, those he calls the syntactic prop-

erties of quantifiability, uniformity, and morselization (or boundedness), and the semantic properties of objectivity and autonomy, “are simply the reifications of the various principles of interpretation” (p. 116) we bring to reading specific, historically contingent document forms, most notably among them: the newspaper, the modern reference work, national dictionaries, and encyclopedias; travel guides, census and other statistical reports; the printed schedules, work rules, and forms of modern managerial organizations; and the modern novel (pp. 115–116). Our various impressions of information, he argues, “grow directly out of the material organization of [these] informational genres” (p. 117). In addition, he notes, there arose a set of institutions “charged with representing the modern world,” whose manner of representation “closely mirrored” these document forms (p. 116). They include various kinds of public museums, especially those devoted to representations of fine art, natural history, and science and industry, in addition to department stores and “public libraries, great and small, card catalogues, and the ‘library science’ (now ‘information science’) that grew up along with them” (p. 116). Because the properties of our current phenomenon of information that Nunberg reveals in his analysis of their documentary and institutional roots pertain to the category of substance, they lead, in spite of their contradictions and ambiguities, to ideas of information as a coherent theoretical kind. They lend a theoretical aura to the question “What *is* information?”

There is another source, beyond the material organization of document forms and their supporting institutions, of our phenomenon of information. This second source has a venerable philosophical ancestry, and several remarks in Nunberg’s essay point in its direction, although he does not address it directly. He notes that authors of “manifestos issued on behalf of the new technologies” typically imagine the *content* of electronic media as “a noble substance that is indifferent to the transformation of its vehicles” (p. 107). Its nobility consists in its abstract, immaterial, and asocial nature: it “will be preserved intact when its material and social supports are stripped away” (p. 107), and it “doesn’t change its nature according to either the medium it is stored in or the way it is represented” (p. 117). “Information” in its abstract sense is the current name of this “noble substance,” because information, whether speeding through electronic media or transmitted at a more leisurely pace through print, is imagined as the content of a message or document. The connection between this sense of information and some deeply held philosophical convictions is suggested in Nunberg’s characterization of the phenomenon of information as “a kind of *intentional* substance that is present in the world” (p. 110; emphasis added). The reference to intentionality marks a connection between informational and mental substance. To imagine the information conveyed by a member of the rapidly expanding universe of documents as abstract, noble document content indifferent to the transformation of its vehicles and stripped

of all material, institutional, and social supports is to imagine it as belonging to the same ontological category as the immaterial, intentional, and mental substance present to an individual mind in a state of understanding that document. The document is imagined as the mere conveyance, or channel, for the transmission of intentional substance from the mind of the sender to the mind of the receiver, an idea implicit in Nunberg's observation that according to cyberspace enthusiasts, thanks to the new digital technologies, the content of documents now "can be liberated and manipulated as a kind of pure essence." John Perry Barlow, for example, is almost clear about the ontology of the "complex and highly liquid patterns of ones and zeros" flowing through the Internet; once it becomes "the principal medium of information conveyance, and perhaps eventually, the only one," then "all the goods of the Information Age—all of the expressions once contained in books or film strips or newsletters—will exist either as pure thought or something very much like thought" (Barlow, 1994). Information is thus already imagined, not only as material "voltage conditions darting around the Net at the speed of light" (*ibid.*), but also, modeled on a venerable philosophical paradigm, as belonging to the same ontological category as "immaterial and abstract representational entities, such as propositions, concepts, mental images, and the epistemic content of sentences or other sorts of signifiers" (Frohmann, 2001, p. 16).

The idea of life breathed into the spoken word, printed text, or any documentary form by mental activity is a central paradigm of the Western philosophical tradition, and it persists to the present day.¹ When this paradigm interacts with the impression of information as intentional substance—an impression that derives from the material properties of the document forms and institutions analyzed by Nunberg—there arises a complex and conflicted phenomenology of information, which crisscrosses concepts of meaning, the content of documents, what their authors intend in writing them, what a mind grasps in understanding them, and their interactions. This complex phenomenon licenses a range of theoretical controversies, among them: whether information inheres in documents or in the minds that understand them; how intentional substance is related to and how it can be transmitted through inert, dead, and lifeless matter; what it is for a person to be informed; what it is for a document to be informing; how the differences in the scope and range of the informativeness of documents may be explained; how we are to understand the relations between various social phenomena and the production, circulation, and reception of information.

MEANING, INFORMATION, AND PRACTICE

Nunberg's approach is one example of a promising philosophical approach to information: rather than take for granted the legitimacy of the question "What *is* information?"—thereby locating theories of information

at the center of investigation—focus instead on the sources and legitimation of the question itself. But other powerful models exist, and the one suggested in this section derives from the later philosophy of Ludwig Wittgenstein. It is well known that Wittgenstein often deflates philosophical versions of questions of the form “What *is* X?” One such question, central to his philosophical project, is “What is meaning?” His investigation of this question is important for information studies because it is closely connected to the question “What is information?” Moreover, in troubling the question of meaning, he targets the same deeply held philosophical conviction from whence, it was argued above, our current impression of information in large part derives.

Wittgenstein opens his *Philosophical Investigations* with a passage from Augustine’s *Confessions*, where Augustine imagines how he learned language as a child:

When they (my elders) named some object, and accordingly moved towards something, I saw this and I grasped that the thing was called by the sound they uttered when they meant to point it out. Their intention was shewn by their bodily movements, as it were the natural language of all peoples. . . . Thus, as I heard words repeatedly used in their proper places in various sentences, I gradually learnt to understand what objects they signified; and after I had trained my mouth to form these signs, I used them to express my own desires.

Immediately following this passage, Wittgenstein remarks,

These words, it seems to me, give us a particular picture of the essence of human language. It is this: the individual words in language name objects—sentences are combinations of such names. In this picture of language we find the roots of the following idea: Every word has a meaning. This meaning is correlated with the word. It is the object for which the word stands. (Wittgenstein, 1958, §1)

Wittgensteinian exegesis of this text is no less prodigious than that of many other parts of his corpus; readers who wish to pursue it can refer to Part I of *Wittgenstein: Meaning and Understanding* (Baker & Hacker, 1983). The aim here is modest: to focus just on those aspects most useful to a philosophy of information. The first thing to notice is that Wittgenstein’s target is not full-blown *theories* of meaning. He speaks instead of “a particular *picture* of the essence of human language,” distinguishing it from a particular *idea* rooted in it. The picture is that words stand for objects, and the idea rooted in it is that the word’s *meaning* is the object for which the word stands. Taken together, these two conceptions form a picture of language that precedes theories, as Baker and Hacker point out: “Augustine’s conception of language is an *Urbild*. The family of philosophical accounts of meaning that grow out of it are full-blown ‘theories’” (Baker & Hacker, 1983, p. 4). If Wittgenstein is right in supposing that the Augustinian picture is a deeply seated philosophical conviction underlying theories of meaning, and if this pa-

per's argument is plausible, that there is a close connection between the Augustinian picture and an analogous picture of information, then it's also plausible that to uproot the first, as Wittgenstein intends is, *ipso facto*, to uproot the second—together with the philosophical theories of information rooted in it. There is much at stake, therefore, for a philosophy of information, in Wittgenstein's attack on Augustine's *Urbild*.

One of the main features of the Augustinian picture that ties it closely to an analogous picture of information is the role of mental activity in transforming dead, lifeless matter—whether marks on a page, images on a computer screen, or the spoken word—into meaningful signs. According to the Augustinian picture, it takes a mind to make the connection between a sign and its meaning. Because the sign, so it appears, stands for its meaning, *understanding* a sign appears to consist in a mental projection of the sign onto its *sense* by means of *thought*—an idea Wittgenstein addresses in many places but especially lucidly in his comments on Frege's impatience with mathematical formalists:

Frege ridiculed the formalist conception of mathematics by saying that the formalists confused the unimportant thing, the sign, with the important, the meaning. Surely, one wishes to say, mathematics does not treat of dashes on a bit of paper. Frege's idea could be expressed thus: the propositions of mathematics, if they were just complexes of dashes, would be dead and utterly uninteresting, whereas they obviously have a kind of life. And the same, of course, could be said of any proposition: Without a sense, or without the thought, a proposition would be an utterly dead and trivial thing. And further it seems clear that no adding of inorganic signs can make the proposition live. And the conclusion which one draws from this is that what must be added to the dead signs in order to make a live proposition is something immaterial, with properties different from all mere signs. (Wittgenstein, 1969, p. 4)

Baker and Hacker's gloss on the Augustinian picture also emphasizes its mentalistic aspects:

Since understanding seems to be a mental activity, we are inclined to characterize the content of understanding as being "in the mind." Understanding consists in a *mental* association of a word with an object. . . . The word is correlated with its meaning by means of the *intention* that it should stand for this thing. . . . Understanding is, as it were, a form of mental pointing at an object, a way of projecting language on to the world. . . . Meaning and understanding are activities separate from the physical activity of uttering or writing words; they take place in the medium of the mind, give life to language. . . . (Baker & Hacker, 1983, pp. 6–7)

The deeply seated conviction that life is breathed into language by the mental act of connecting signs to meanings—a conviction Wittgenstein calls "a disease of thinking which always looks for (and finds) what would be

called a mental state from which all our acts spring as from a reservoir" (Wittgenstein, 1969, p. 143)—is closely related to the idea that the informativeness of a document also requires the mental act of projecting its signs onto their sense (or meaning). In other words, it takes *thought* to transform documents from lifeless matter into living information. A document, so it seems, can be *informing* only if the reader is mentally *formed*, a process imagined as the content of the document becoming present to readers' minds when they are in the mental state of understanding the document. The document itself seems to be just a disposable medium that simply transmits the genuine object of theoretical desire: *information itself*, Nunberg's noble, intentional substance, present in the world as the content of documents, and owing its indifference to the transformation of its vehicles to its ontological status as mental substance.

This picture of information sows the seeds of theories of information. By licensing appeals to the presence of the document's content to a mind in a state of understanding, it warrants mentalistic explanations of what it is for a person to be informed by a document. It licenses explanations of differences in the informativeness of documents by appealing to individual differences in the properties of the mediating entity—the human mind—that account for variations in the abilities of individual minds to successfully transform dead, lifeless marks on a page into an informing document, such as the intelligence, degree of education, innate cognitive ability, and so on, of the readers of documents. The idea that information is a theoretical kind populates the world with subjects who pursue it, now familiar to us as "information seekers," a term of the art of library and information science. When the informativeness of a document is seen as the content present to a mind in a state of understanding it, then "information uses" gain the stability they need to be counted, tabulated, and processed by statistical methods. Relations between various social phenomena and the production, circulation, and reception of information can be similarly explained; for example, the popular view of the direct function between increased access to information and the spread of democracy often appeals to the rise of a literate, enlightened citizenry, on the assumption that without the progressive development of the minds from whose mental acts the informativeness of documents depends, the mere spread of the documents themselves can have but little effect.² The close connection between the Augustinian picture of meaning and the mentalistic picture of information is important, because insofar as being informed seems to consist in the presence of meaning to consciousness, to deflate meaning as a theoretical object is also to deflate information as a theoretical object.

Wittgenstein's treatment of the Augustinian *Urbild* is to set beside it a very simple, imagined use of language—a language-game—which is worth quoting in full:

Now think of the following use of language: I send someone shopping. I give him a slip marked "five red apples." He takes the slip to the shopkeeper, who opens the drawer marked "apples"; then he looks up the word "red" in a table and finds a colour sample opposite it; then he says the series of cardinal numbers—I assume that he knows them by heart—up to the word "five" and for each number he takes an apple of the same colour as the sample out of the drawer.—It is in this and similar ways that one operates with words.—"But how does he know where and how he is to look up the word 'red' and what he is to do with the word 'five?'"—Well, I assume that he *acts* as I have described. Explanations come to an end somewhere.—But what is the meaning of the word "five?"—No such thing was in question here, only how the word "five" is used. (Wittgenstein, 1958, §1).

In this example, Wittgenstein erases all vestiges of the Augustinian picture of meaning that lies at the root of the idea that a mental act projects a sign onto its sense. The shopkeeper moves directly, with no mental intermediary, from the word "red" to the color sample, and then to the apple matching it; he moves directly, with no mental intermediary, from the word "five" to a rote utterance of the numerals from one to five, each time taking an apple from the drawer. In this picture, as Wittgenstein remarks, no such thing as the meaning of a word is in question. It is a fact that human beings operate with words as described. It is a fact that there exist such language-games, or *practices* with words. "When we look at such simple forms of language the mental mist which seems to enshroud our ordinary use of language disappears." (Wittgenstein, 1969, p. 17)

The Augustinian picture assumes that there *must* be a mental intermediary between word and deed, because, otherwise, how could the shopkeeper know what he is to do? Words, after all, are arbitrary conventions, mere marks on a slip of paper in this example, with no *essential* connection to the world. Only a *mind*, we think, can make the kind of connection required. The wonderful thing about a mind, it seems, is that it can correlate arbitrary symbols with *meanings*. Meanings are something like symbols, but differ in a crucial respect: they are not arbitrary—they seem to reach right out to the world by *thought*, a kind of mental projection or pointing. But the idea of a mental pointing that correlates mental content present to consciousness directly to the world is a *superstition*:

If the meaning of the sign (roughly, that which is of importance about the sign) is an image built up in our minds when we see or hear the sign, then first let us adopt the method . . . of replacing this mental image by some outward object seen, e.g., a painted or modeled image. Then why should the written sign plus this painted image be alive if the written sign alone was dead?—In fact, as soon as you think of replacing the mental image by, say, a painted one, and as soon as the image thereby loses its occult character, it ceases to seem to impart any life to the sentence at all. (It was in fact just the occult character of the mental process which you needed for your purposes.) (p. 5)

Wittgenstein's point in this passage is made at many other places in his writings. It can be easily adapted to the simple language-game of the shopkeeper. If there is no problem about how the shopkeeper fetches a *red* apple on the basis of the presence to his mind of the *meaning* of the word "red," then why is there a problem of doing so just upon his looking at the *word* "red"? To insist that the problem simply doesn't arise for *meanings* is to impute magical or occult properties to them. We are also tempted to impute the same occult properties to rules when we try to explain meaning by appeal to rules governing the use of language. Rules, like meanings, are pictured as magical when imagined as anticipating what is in accordance with them. Regarding the +1 rule for extending the series, 1,2,3 . . . , Wittgenstein remarks: "The expression 'The rule meant him to follow up 100 by 101' makes it appear that this rule, as it was meant, *foreshadowed* all the transitions which were to be made according to it. But the assumption of a shadow of a transition does not get us any further, because it does not bridge the gulf between it and the real transition. If the mere words of the rule could not anticipate a future transition, no more could any mental act accompanying these words" (Wittgenstein, 1969, p. 143).

Wittgenstein's pursuit of the myriad and labyrinthian ramifications of the conceptual confusions surrounding the Augustinian picture of language has generated a monument of philosophical exegesis. For the purposes of this paper, it is enough to provide a brief sense of his argument and to apply it to our thinking about information. Wittgenstein's description of the simple language-game of the shopkeeper shows that, in philosophical reflection on what *meaning itself* might be, the idea of the presence to consciousness of a particular kind of mental entity that attaches words, sentences, rules, or other elements of a language to the world is idle. The upshot of his investigations is that when meant philosophically, the question "What *is* meaning?" expresses a confusion. Once it is recognized that the shopkeeper acts as described, then the generalized idea of meaning evaporates, thus eliminating the source of philosophical *angst* about the definition, nature, or essence of meaning. Meaning is not a coherent theoretical kind awaiting explication. Wittgenstein deflates the very idea of a theory of meaning: "meaning" is a garden-variety word whose purposes and uses are open to view.

Because "meaning" is grammatically related to "information" by virtue of the unexciting truth that a meaningless sign can not be informing, similar conclusions follow for a philosophy of information. If the shopkeeper acts as described, *we say* he knows the meaning of the words "five," "red," and "apples"—to say so is to know the meaning of "meaning." And if the shopkeeper's knowledge of these words is shown by his actions, then it is his actions that also show that the shopkeeper is *informed* by the phrase "five red apples"—as opposed to a meaningless mark on the slip of paper. The *informativeness* of the phrase has as little to do with any mental process as does its meaningfulness. Once the philosophical idea of *meaning* as a theo-

retical kind drops out of the picture of the shopkeeper's way of operating with words, so too does the corresponding idea of *information*. In neither case is there anything like a particular *kind of thing* answering to the words "meaning" and "information": neither meaning nor information is a *theoretical kind*. Similarly, no substantive answers exist to the questions "What is meaning?" and "What is information?"

When we look at Wittgenstein's example, we do not see minds engaged in cerebration but embodied persons engaged in activities of operating with words. Wittgenstein calls such activities language-games; at other places, he uses different terms: "To obey a rule, to make a report, to give an order, to play a game of chess, are *customs* (uses, institutions). To understand a sentence means to understand a language. To understand a language means to be master of a technique" (Wittgenstein, 1958, § 199). We can bring these ideas together under the category of *practice*: for Wittgenstein, attention to the actual practices with language deflates philosophical ideas of meaning by exposing them as occult and magical fantasies of essential connections undergirding language use. And since informativeness follows from meaningfulness, attention to practice also deflates ideas of information as the equally occult, noble, and intentional substance by virtue of which a document is informing.

Wittgenstein's examples of simple language games are especially useful for thinking about information because they often involve, as in the case of the shopkeeper, familiar items such as written words on slips of paper, color charts, tables, geometrical figures, and so on (see especially Part I of *The Brown Book*; Wittgenstein, 1969, pp. 77–125). Many of his cases therefore involve *practices* with *documents*. Just as Wittgenstein's treatment of the Augustinian picture shifts our attention away from mentalistic pictures of meaning and toward practices with language, so too does it shift our attention away from mentalistic pictures of information and toward practices with documents. The Wittgensteinian perspective heralds a shift from *theories of information* to *descriptions of documentary practices*.

Certain properties of practices are especially salient in such descriptions. The first is materiality: since documents exist in some material form, their materiality configures practices with them. (The shopkeeper's language game excludes persons afflicted with color blindness from learning and engaging in it because it involves color samples.) A familiar example of constraints imposed by the materiality of documents is the difficulty of coordinating meetings when committee members rely upon their "hard copy" of the same Web document, each with unique pagination, thus exposing a minor advantage of typographical fixity, a feature of the printing press championed by Eisenstein (1979) and challenged by Johns (1998). Brown and Duguid (2000) provide similar examples. A second property of documentary practices is how deeply embedded they are in institutions. Much of the authority of the informativeness of documents depends on the

institutional sites of their production, a point made by Foucault in his discussion of the importance of institutions to the formation of enunciative modalities (Foucault, 1972, pp. 51–52). A third property is social discipline: documentary practices, like most others, require training, teaching, correction, and other disciplinary measures; the point is reinforced by the role of training in many of Wittgenstein's language-games and emphasized by Foucault's link between disciplinary apparatus and the field of documentation (Foucault, 1979, pp. 189–194, 197). A fourth property is historicity: practices arise, develop, decline, and vanish—all under specific historical circumstances. These four constraining properties of documentary practices are only analytical notions; full descriptions of such practices will feature interactions between some or all of them. Nor is this short list meant to be exhaustive. But the ideas of materiality, institutions, social discipline, and history provide a useful beginning for a philosophy of information whose point of departure is the concept of documentary practices. The next section presents two historical examples from the history of early modern science to show that a document becomes *informing* only given certain kinds of documentary practices.

WRITING THE BOOK OF NATURE

Something new, we know, occurred in the early-sixteenth- to the late-eighteenth century with respect to our knowledge of the natural world. The story—the narrative of the scientific revolution—has been told many times. A popular version goes something like this: inspired by thinkers such as Bacon and experimenters such as Boyle and Galileo, the natural philosophers of the period opened their eyes to the natural world, gathering observations to support inductive generalizations, thereby rejecting their predecessors' habit of drawing deductive conclusions from Aristotelian "essences" or "natures" (for a dissenting view, see Shapin, 1996). As a familiar metaphor would have it, they turned from the books of the philosophers to the book of nature. Robert Boyle made his reading preferences quite clear: ". . . I could be very well content to be thought to have scarce looked upon any other book than that of nature" (quoted in Shapin, 1984, p. 496). Peter Dear, whose analysis of the relationship between experiment and documentation is very useful for understanding the historical dimensions of documentary practices, puts it this way:

Historians routinely refer to Baconianism, the Royal Society, and the metaphor of reading the book of nature . . . to argue that the seventeenth century saw a move towards discovering nature through the senses, using observation and experiment. Certainly, something happened to experience in the seventeenth century; talk of experimental and experiential demonstration, or sometimes "ocular" demonstration—culminating in the term "experimental philosophy"—rapidly became widespread. (Dear, 1991, p. 135)

The metaphor of the book of nature can be recast from the perspective of an admittedly anachronistic philosophy of information: in the period of the scientific revolution, natural philosophers opened their eyes to observe the information nature had to offer—the noble substance inscribed in the book of nature by nature itself. When present to minds tuned to sensory experience, observation, and experiment, nature's information is reinscribed in the burgeoning scientific documentation of the age, thus precipitating a seventeenth-century version of an information revolution.

It is not so easy, however, to transcribe the book of nature into the books of mankind. The story gets more complicated when institutionalized documentary practices are taken into account. For the natural philosophers of the time, it was not at all obvious how to document the new kinds of observations—especially those generated by lashing nature to the rack of experiment; as Francis Bacon put it, phenomena revealed by “nature under constraint and vexed; that is to say, when by art and the hand of man she is forced out of her natural state, squeezed, and moulded” (Bacon, 1960, p. 25)—as revealing nature's secrets rather than freaks spawned by mysterious manipulations of fantastic instruments by devotees of a secret cult. While it is common today to accept that laboratory phenomena produced by an elite cadre expert in the techniques of recondite apparatus can speak for nature, it was anything but common in the mid-seventeenth century. The idea that an event produced by experiment could generate truths of nature was entirely new. From the perspective of a PI, the natural philosophers of the seventeenth century faced the challenge of how to make their written reports of observations *informative* or how to convey the *information* inscribed in the book of nature.

The difficulty may be seen as a case of the familiar Aristotelian problem of the possibility and legitimacy of a science of the individual. Experimental results are singular, individual events. But Aristotelian science derives its conclusions from universal principles. These principles draw their certainty and authority from *common experience*; they are what *everyone knows*, such as “Heavy bodies fall,” or “The sun rises in the east.” In Aristotelian science, an “experience” was “a universal statement of how things are” (Dear, 1995, p. 22)—“a statement of *how things happen* in nature, rather than a statement of *how something had happened* on a particular occasion” (p. 4). And, although the truth of such experience is known by the senses, “one did not need to have acquired such experiences personally in order to use them in argumentation, provided that they were commonly accepted, either through daily familiarity or through the statements of a weighty authority” (p. 22). The stability of such “experience” rested upon the *obviousness* of the universal statement, which was underwritten by common consent and which warranted its use in deductive reasoning—the Aristotelian way of true science. Since singular, individual, historical events cannot reveal how nature behaves *normally*, they cannot provide grounds for natural knowledge. Moreover,

because occasional deviations from the regular course of nature are not ruled out by the Aristotelian conception, a ready explanation for laboratory events inaccessible to common experience was available: "they might be classified as 'monsters' or even 'miracles'" (p. 14).

How, then, did the natural philosophers of the early seventeenth century, dedicated as they were to observing nature through new instruments (such as Galileo's telescope) and forcing nature to yield new phenomena through new devices (such as Boyle's air-pump; see Shapin & Schaffer, 1985), manage to make their claims credible when reports of singular historical events had no epistemic status? "How could 'experiences' be established as common property," Dear asks, "if most people lacked direct access to them?" (1995, p. 59). The answer relies upon his insight that experiment and its documentation are closely linked. Scientific literary practice, he argues, is "a crucial feature of scientific practice as a whole . . . an account of an experiment is an essential part of its performance" (Dear, 1991, p. 135). Documents are credible only given certain kinds of documentary practices, and in the early seventeenth century, "epistemology, method, and text were woven together in the assumptions of that dominant scholastic pedagogy which took Aristotle as its touchstone of legitimacy" (Dear, 1991, p. 137). The purported "observations" yielded by experiments and new instruments had, somehow, to be documented as Aristotelian "common experiences." Since the only discursive resources available to convey the information revealed by nature to the private experiences of specialists working with mysterious instruments were deeply embedded in the institutions of Aristotelian scholarship, the manufacture of credibility fell to the documentary task of mutating Aristotelian discursive resources such that the discrete observations of a few could express the common experiences of the many. It was not enough simply to present the observations of an experiment, or the new kinds of observations made available by new kinds of instruments, as if they belonged to a book written by nature itself. In other words, when it came to the manufacture of knowledge, it was not possible to suppose that nature's information could speak for itself. The experiment had first to be "constructed linguistically as a historical account of a specific event that acts as a warrant for the truth of a universal knowledge-claim" (Dear, 1995, p. 6). The unwritten, undocumented experiment could not stand on its own: "For the singular experiment to stand for the universal experience, an appropriate kind of argumentative framework needs to be in place, explicitly or implicitly, within which it can play that role" (Dear, 1991, p. 162). Such linguistic construction, however, took much labor, especially for scholars working within the documentary practices of scholastic science and pedagogy. How did they struggle to make their documents credible? Posed in the terms of a philosophy of information, how did they manage to make their documents *informative*?

One technique was to draw upon the familiar literary device of the

geometrical *problema*. Geometry was a model of the Aristotelian ideal “to have principles, or premises, that were *evident* and therefore immediately conceded by all. In the case of geometry, Euclid’s ‘common opinions’—what Aristotle called ‘axioms’—represent the concept precisely” (Dear, 1995, p. 42). If the familiar, institutionalized literary form of the geometrical construction could be used successfully to document empirical statements as clearly *evident* as Euclid’s “common opinions,” then the “common consent” enjoyed by the latter could be transferred to the former. Moreover, the already recognized geometrical expertise of the writer is extended at the same time to natural-scientific investigations. The new sciences of astronomy and optics, although driven by new instruments, were especially amenable to the geometrical form of documentation. The transparency of the geometrical construction, where “in following its steps one sees the outcome generated inevitably before one’s eyes; even recourse to compass and ruler is unnecessary” (p. 60), was used to link the procedures and outcomes of optical experiences: “Just as constructions in geometry were generated from postulates that expressed conceded possibilities, so the use of a geometrical paradigm served to re-create unfamiliar experience by generating it from familiar experience—that is, easily picturable operations” (p. 60). By yoking the documentary practices of the geometrical *problema* to the presentation of their experiments, the contemporary natural philosophers could enact a literary *performance* of the experiment such that the experimental phenomena—the observations—could become as evident and as obvious as geometrical axioms. The problem, says Dear, was clear: “The deductive, demonstrative model of natural knowledge meant that empirical statements had to play the part of axioms; that is, they had to look like universal statements of the way everyone knows how things are—like geometrical axioms” (Dear, 1991, p. 162). Nature’s information could emerge only as an effect of prevailing documentary practices, together with the social and pedagogical disciplines that maintained them. Far from being a noble substance indifferent to the transformation of its vehicles, the information about nature conveyed by the documents of seventeenth-century astronomy and optics emerged only as an effect of the labor expended on adapting the existing conventions of Aristotelian documentary practices to new situations. The book of nature turns out to be a multiple-authored product of socially disciplined literary practices. Written according to institutionalized documentary practices, it is informative; written by nature itself, it is unintelligible.

A second technique used to render empirical statements with the obviousness of Aristotelian first principles was multiple repetition. This stratagem merits mention especially because its use was not driven by anything like our modern understanding of the role of repeated experimental trials. The aim was not to strengthen hypothetical claims, but to place an observation in the same class as the “experiences” authenticated by com-

mon consent, many of which, like “The sun rises in the east,” are exemplars of multiple repetition. Dear explains that the

justification of multiple repetition has nothing to do with epistemological problems of induction; it concerns simply the avoidance of deception by the senses or by choice of an atypical instance, so as to ensure a reliable report of how nature actually behaves “always or for the most part,” as Aristotle put it. The relevant aspects of nature are themselves neither opaque nor capricious—if they were, there could be no question of making a science of them by having their characterizations pass into “common assent.” (Dear, 1991, p. 139)

The idea was not to record the degree of agreement between the outcomes of specific historical events repeated many times, but to describe experimental phenomena in the manner characteristic of scholastic documentation of first principles.

This technique was deployed by Galileo.

Instead of describing a specific experiment or set of experiments carried out at a particular time, together with a detailed quantitative record of the outcomes, Galileo merely says that, with apparatus of a certain sort, he found the results to agree exactly with his theoretical assumptions—having, he says, repeated the trial “a full hundred times.” He had shortly before claimed to have done this “often.” Both phrases are just ways of saying, in effect, “again and again as much as you like.” Galileo thus establishes the authenticity of the experience that falling bodies do behave as he asserts by basing it on the memory of *many instances*—a multiplicity of unspecified instances adding up to experiential conviction. (Dear, 1995, p. 125)

If successful, Galileo’s strategy presents his experimental observations as *typical*. The literary appeal to typicality is a mode of documentation: it is the use of a “familiar rhetorical tactic of appealing to common experience . . . to establish . . . empirical assertions, appropriately, as things that ‘everyone knows’” (p. 90). Galileo does not provide narrative reports of specific instances of what he had done and seen at specific times, but instead tells his readers *what happens* in the *kind of situation* he presents; he documents a *recurring phenomenon* of nature: a *type*, one constructed wholly in keeping with Aristotelian documentary practices. The documentary transformation of experimental statements into “experience” of how nature typically behaves thus converts empirical assertions into Aristotelian first principles: “Galileo’s use of experience [is] tantamount to the invocation of thought experiments: the reader is reassured that the world’s working in a particular way is entirely to be expected, entirely consonant with ordinary events” (Dear, 1995, p. 126). Employing once again the anachronistic language of information, we can say that the information about nature emerges as an effect of these institutionalized documentary practices. Far from *conveying* nature’s information—the noble substance first presented by nature to the newly tuned minds of natural philosophers

who then communicated it to others through writing—the documentary practices of the period *constituted* it.

Dear's investigations reveal the role, at a particular time and place, of the institutions that disciplined the manner in which the science of nature was documented, and how they provided a particular set of discursive resources for the articulation of scientific truth. Different times and different places exhibit different kinds of documentary practices and different kinds of institutions—think of the corporate form of the scientific enterprise in our own time (Galison & Hevly, 1992). A nice contrast to the continental natural philosophers' deployments of Aristotelian practices of inscribing nature is the production of knowledge in Restoration England. Working in the absence of the strong scholastic pedagogical and academic institutions of their continental counterparts, Robert Boyle and the Fellows of the early Royal Society could legitimate alternatives to demonstrative methods of knowledge production modeled after logic and geometry. True to their Baconian practice of building knowledge from the certified occurrence, at a particular time and place, of the granular, theory-resistant *fact of nature* rather than from the certainty of axioms or "essences," they saw the form of Aristotelian accounts of scientific results as a surrender to discredited authority. Rejecting certainty as the standard of natural knowledge, they adopted the more modest criterion of high probability. Steven Shapin puts it this way:

Physical hypotheses were provisional and revisable; assent to them was not necessary, as it was to mathematical demonstration; and physical science was, to varying degrees, removed from the realm of the demonstrative. The probabilistic conception of physical knowledge was not regarded as a regrettable retreat from more ambitious goals; it was celebrated by its proponents as a wise rejection of failed dogmatism. The quest for necessary and universal assent to physical propositions was seen as improper and impolitic. (Shapin, 1984, p. 483)

Having abandoned Aristotelian conventions for articulating natural knowledge, the members of the Royal Society did not attempt to make their singular experiment stand for universal experience. Their problem was different: how to court trust in reports of what had happened on particular occasions under highly contrived circumstances using recondite apparatus. "The probabilistic model of Boyle," Dear writes, "required a category of the 'matter of fact,' the legitimacy of which depended precisely on accredited, and therefore specifiable, occurrences" (Dear, 1991, p. 162). Continental and English practices were radically different: "Boyle did not use axiomatic deductive argumentative structures, which were supposed to constitute science in an Aristotelian sense, whereas Galileo and the Jesuits did. The difference is of great significance. . . . Boyle reported singular historical events; they needed universal statements of behavior even when giving historical accounts by way of collateral" (Dear, 1991, p. 162). To the continental

philosophers, a “historical report of a specific event, of the kind that Boyle wrote endlessly, would have been scientifically meaningless; it would have been philosophical antiquarianism” (Dear, 1995, p. 209).

The literary practices of scientific report writing of the early period of the Royal Society were therefore quite different from the scholastic practices pursued on the continent. Since the aim was to engender the reader’s trust that the singular, historical event presented in the scientific report was indeed as it was purported to be—that it was a fact of nature, a matter of fact, rather than a man-made artifact of the laboratory—a literary technique was designed to put the reader at the scene, to have the reader perform a *virtual witnessing* of the event occurring in the laboratory (Shapin & Schaffer, 1985, pp. 60–65). Boyle realized that if “one wrote experimental reports in the correct way, the reader could take on trust that these things happened. Further, it would be as if that reader had been present at the proceedings. He would be recruited as a witness and be put in a position where he could validate experimental phenomena as matters of fact” (pp. 62–63). There developed a style of writing that presented the experiment by an “ornate sentence structure, with appositive clauses piled on top of each other,” in order “to convey circumstantial details and to give the impression of verisimilitude” (p. 63). This ornate rather than succinct style was required to present simultaneously, in one snapshot as it were, all of the details required for virtual witnessing: “Elaborate sentences, with circumstantial details encompassed within the confines of one grammatical entity, might mimic that immediacy and simultaneity of experience afforded by pictorial representations” (Shapin & Schaffer, 1985, p. 64). Dear makes the same point this way: “The credentials that established the actuality of the event were provided by surrounding the description by a wealth of circumstantial detail. This detail generally included information regarding time, place, and participants, together with extraneous remarks about the experience, all serving to add verisimilitude” (Dear, 1995, pp. 229–230).

A second feature of this literary style was *modesty*, which was not only a documentary performance of the very qualities of the civility and gentlemanly posture of the actual witnesses Boyle brought to the real experimental scene to assure others of the veracity of experimental phenomena, but also an exemplar of the properly Baconian nondogmatic attitude appropriate to inductive and probabilistic, rather than demonstrative and axiomatic, assertions of natural science. Here is Boyle’s advice to his nephew on the proper style for venturing what he calls “opinions” in the experimental report: “in almost every one of the following essays I . . . speak so doubtfully, and use so often, *perhaps, it seems, it is not improbable*, and other such expressions, as argue a diffidence of the truth of the opinions I incline to, and that I should be so shy of laying down principles, and sometimes of so much as venturing at explications” (Shapin & Schaffer, 1985, p. 67). Immodesty is a sign of scholastic dogmatism; it signals the performance of individual

conjecture. Modesty is the appropriate intellectual posture of a natural scientist who would soberly and with circumspection document the matters of fact that nature presents. The documentary practices of the Reformation transform readers into participants in a literary performance of the experiment through the eyes of credible witnesses. Stated once again from the perspective of a philosophy of information: nature's information emerges from the documentary practices of the early Royal Society as a singular historical event authenticated and certified as a *matter of fact* that did indeed occur as documented.

For both the Fellows of the Royal Society and their continental peers, the question of whether their reports were scientifically meaningful—hence, whether they communicated the information nature had to give—depended on institutionally disciplined and historically contingent documentary practices. On the continent, the documentary practices of scholasticism had to be exploited under new conditions, whereas in Reformation England the relevant practices first had to be created. The book of nature, it turns out, is not only hospitable to a wide variety of human authors and institutions, but also incorporates novelty, conflict, and strife.

CONCLUSION

The aim of this paper is to point toward some useful avenues for philosophizing about information. Much more work needs to be done to follow up the suggestions presented here, in what is intended merely as a prolegomenon to a philosophy of information. Two main directions have been indicated.

The first direction points toward a phenomenology of information and away from a philosophical theory of information. Nunberg's essay is presented as a useful example of a way of thinking about information, one that shifts our attention away from questions of what information itself, as a theoretical kind, might be, and toward questions of how, in both our own but also at other times and places, the phenomenon of information is constructed. A promising conclusion for thinking about information philosophically is that a phenomenology of information implies that the very question "What *is* information?" is itself an aspect of a contemporary cultural space in which information is conceived as a theoretical kind—the sort of thing about which it makes sense to ask such a question in a philosophico-theoretical vein. More studies along the lines of the cultural phenomenology practiced by Nunberg should help us gain a broader, and certainly historically deeper, understanding of how an underlying picture of information arises as the self-sufficient sort of substance about whose nature it makes sense to theorize.

The second fruitful direction is a pursuit of the implications of Wittgensteinian ideas about language-games, or language-practices. The chief implications are that the study of practices with documents should yield a more

promising set of concepts for thinking philosophically about information than studies centered upon a theoretical, philosophical excogitation of the nature of information. The reason for this conclusion is that a Wittgensteinian approach suggests that practices and documents—by which we mean inscriptions, occasioned utterances, and the wide variety of records that circulate in a myriad of formats—are more fundamental concepts than information. Attention to practices with documents reveals how it is that particular documents, at particular times and places and in particular areas of the social and cultural terrain, become informative. Wittgenstein himself was not interested in pursuing the variations or historical contingencies of the many social and political forces that configure practices. But once they are seen as fundamental, then the genie is out of the bottle: the informativeness of documents, when recognized as dependent on practices, is also dependent on what shapes and configures them. The promising directions to take to look for the configuring factors are the materiality of the documents studied, their histories, the institutions in which they are embedded, and the social discipline shaping practices with them.

The brief examples presented here from the early history of modern science are intended to indicate some of the institutional factors and historical contingencies that must be taken into account to show how scientific documents become informative. Examples from science are especially germane to an approach to information that begins from Wittgensteinian ideas about language-practices, because the information nature conveys is a paradigm case of objective, culturally independent, epistemic content. If any sort of information were to be a noble substance independent of the transformations of its vehicles, this would be it. Social studies of science show that even scientific information depends for its emergence on culturally specific, historically determined, and institutionally disciplined documentary practices. If the case can be made here, it is much easier to make it elsewhere.

An implication of a focus on documentary practices for a philosophy of information is that such a philosophy is subordinate to a philosophy of documentation. Informativeness is not the only property of documentary practices worthy of study. Many practices with documents have little, if anything, to do with informing anyone about anything. An example is the role of popular music in articulating social difference in youth culture (Frohmann, 2001). The uses of such documents are many and deserving of study even when their informativeness is not the issue. Social studies of science and sociological studies of knowledge production provide further examples, such as those that rely on concepts like trading zones (Galison, 1997) and boundary objects (Star & Griesemer, 1989)—where the idiom of conveying information is not rich enough to capture the role of such documents in coordinating work among members of different social worlds. Contemporary information studies owe much to the documentalist movement of the late nineteenth and early twentieth centuries (Rayward, 1975; Rayward,

1991; Buckland, 1996; Rayward, 1997), but documentation as envisaged here covers more territory than information studies. Although the subject of this issue of *Library Trends* is the PI, the title of this paper signals its intention to recuperate and rethink the early documentalists' concern for documentary practices, and to situate the philosophy of information as but one, although important, aspect of a philosophy of documentation.

A final word concerns the historical imperative for a PI. Some thinkers, prominent among them Luciano Floridi, Rafael Capurro, and Michael Eldred, believe that a philosophy of information is especially urgent in the digital age. The claim is that because of the expanding "infosphere" (Floridi, 1999) or the "digital casting of being" (Capurro; Eldred), the need for a new digital ontology constitutes an imperative to philosophize anew about information. The implication of a philosophy of documentation as presented here dissents. Documentation recognizes as urgent an imperative to study ancient, medieval, or early modern documentary practices as those that feature electronic documents. What we do with electronic documents, how such practices are configured, and what they do to us are eminently worthy of study. But the digital form of contemporary documents creates no special philosophical imperatives, since the concept of documentary practices was there all along.

NOTES

1. A vigorous e-mail correspondence on the JESSE listserv in the spring of 2002 attests to the strength of the paradigm in library and information science (LIS). The chief protagonists were Loet Leydesdorff and Tom Wilson, with the latter championing the Cartesian view that mental representations, such as those present to the mind in the state of understanding meanings, inhabit an immaterial realm. According to Wilson, the material properties of documents that account for the squiggles of print that constitute their texts, the curves that constitute their graphs, and so on, are dead, inert, and meaningless in themselves, because they are simply material. It takes minds to breathe life into them; only when the mind interprets these marks does "meaning" come into being. (Unlike some of his LIS colleagues who would use the word "information" as he uses "meaning," Wilson reserves the former for the dead, inert graphemes.)
2. This popular view is refuted in a work whose analysis of the materiality of writing is germane to the themes of this paper: "an ever-widening educational apparatus has always secured power and privilege for a small number to the exclusion of many," and "[w]herever we look, in every period, social stratification presides over the history of literacy" (Goldberg, 1990, pp. 47–48).

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