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WHAT WRITTEN

KNOWLEDGE DOES

THREE EXAMPLES OF

ACADEMIC DISCOURSE

Knowledge produced by the academy is cast primarily in written language—now usually a national language augmented by mathematical and other specialized international symbols.[1] The written text, published in journal or book, serves as the definitive form of a claim or argument, following on earlier printed claims and leading to future claims. A traditional, although incomplete, form of history of knowledge has been simply to trace the record of printed claims. This book will argue that close attention to the textual form of written knowledge will tell us much about what kind of thing knowledge is, that the written form matters. The mode of argument here will be primarily close attention to the page, and persuasion (if it comes) will be through the force of what we find there.

But examination will not be of dormant symbols lying quietly on flat pages. The symbols will constantly lead us outward to the many worlds they interact with. Without use and activity there is no language. We will come to see how the word draws on and ties together writers, readers, prior texts, and experienced reality to constitute the domain symbolic knowledge.

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1. Of all the contemporary national languages, English is by far the most commonly used in scientific and technical publication (Swales, "English as the International Language of Research"). However, in examining the technical literature on fisheries, Baldauf and Jernudd find "that despite the dominance of English as an international communicative medium, there was a strong national usage pattern . . . [which] cut across issues of international importance"(245).

Three Criticisms

The idea that writing matters, that different choices of what to put on a page result in different meanings, has been subject to three kinds of criticism that would diminish our estimation of the power and importance of written language. Each of these types of criticism has a long history and has been presented in many variants. Being neither a philosopher nor a historian of ideas, I cannot hope and do not desire to address the criticisms successfully in general terms, nor add any abstract arguments to centuries-old debate. I place these criticisms here to acknowledge the issues and suggest an orientation toward them consonant with the data to be presented later. Each of the criticisms point to a truth whose proper meaning, however, is not revealed until it is seen enmeshed with other truths in the living practice of language. After I have presented the specific studies that constitute the main argument of the book, I will in chapter 11 offer a more complete theoretical statement of my view of language.

The first criticism against finding much significance in written formulations argues that the meaning of texts lies somewhere outside of the symbols used to clothe them in the text. Some philosophers, theologians, artists, psychologists, and others have believed in direct apprehension of truths, ideas, or realities through direct nonsymbolic means. Symbols, they claim, only remind us of these meanings that we know from elsewhere. This argument, of course, is ancient, dating back to Plato and Moses, but it has gone through many transformations, finding primary meanings in such things as presymbolic imagination, biologic imperatives, and sensory apprehension of reality. Meaning is said to lie in these primary referents; once we grasp these referents, we can discard the clothing of public language that allows us to locate this presymbolic reality. From this perspective, the problem of language is only one of clarity and precision—to help us locate what we need and then to vanish.

From a modern, nontheological perspective, it is easy to scoff at a shadowy world of essences, of things in themselves, of authentic feelings, of positive reality—tantalizing our reach, but beyond our grasp. Yet people do use language as though they were referring to something other than their own linguistic practices. They do seem to have some loose grasp of a world they live in and premonitions of meanings that seem to reside within them. They in fact struggle with language to capture these external worlds and internal meanings, to get the words right. They are frustrated when their words fail to communicate their experience and vision. Mature writing can be said to begin with the

realization of the need to struggle with words to make them do more fully what we wish them to do. The cases examined here indicate that this struggle is deeply conditioned in social and linguistic systems, and that the struggle only takes place at socially defined moments, around social activities, in social relations (no matter how displaced by internalization). Yet this struggle with meaning, a dialectic between the language system and the writer's knowledge, experience, ideas, and impressions of his reader, is a deeply creative force, constantly remaking our symbolic world.

The second criticism inverts the first. It claims the meaning of the text is enclosed entirely within a text, is purely a construct of the arbitrary signs brought together in a text. From this position, language becomes the entire contents of our minds and experience. Language, then unencumbered by any constraints other than the socially given linguistic system, can mean anything, which is as good as meaning nothing, for it is a web of illusions. Reference to objects, experiences, and ideas outside the sign system is only a deceiving appearance; the idea of reference is itself only a semiotic creation. With no grounding point of meaning outside the individual sign system, different sign systems create incomparably different worlds of consciousness. This vision of the world of human consciousness being constructed by human language-making goes back to the Sophists and to the Biblical description of Adam naming the animals, but finds its currently most influential form in the literary/linguistic theories of structuralism, poststructuralism, and deconstruction.

The power of language and other symbol systems to create our realities is certainly a cause for our fascination with language and an imperative for understanding. Otherwise language study would not extend beyond linguistics. The arts would be only an entertainment, literary studies would be trivial, and sociology, political science, anthropology, history, and philosophy would find no impulse to worry over our linguistic symbols. The symbol-makers of societies would neither be so adulated nor be so central in the operations of polity and culture. The cases examined in this volume indeed indicate how ways of perceiving and knowledge-making emerge out of sociolinguistic processes. Each community examined here finds its own way to formulate its knowledge and in so doing defines what it considers knowledge to be. As the community changes, so do the symbolic means.

Yet enough sharing of meaning occurs between communities of symbolic systems to make translation between Hindi and English a fruitful, although difficult and imperfect, endeavor. Certain common elements of life and the world allow occasional cooperation among people of different symbolic communities, although the meaning of such coopera-

tive events may be interpreted variously by the participants. Enmeshed as we are in our own symbolic systems we can even gain shadowy glimpses into the worlds of others and expand our own symbolic repertoire by contact with different systems.[2] In surveying the symbolic options, we find some more apt to our experiences and needs, and others less. We choose among various possible meanings and rise above being unreflective automatons of our linguistic system. And we find that certain formulations, although not writ eternal, do have more staying power and wider cultural dispersion.

The cases of scholarly and scientific formulations examined here indicate that the symbolic developments within communities may depend on something more than arbitrary swings of cultural fashion. Symbolic systems react to experiences and situations, to contact with different communities and the formation of new communities, to struggles with old meanings deemed inadequate to account for emerging ideas and experiences, to the need to create shared understanding and agreement where none existed previously. The world of symbols and consciousness here is no blindfold, but a dynamic means of acting in the world. In the course of acting, there is even seeing, partial (yet focused and goal directed) as it may be in any instance.

The third argument against putting much stock in written texts is an extension of the second. Accepting language as a structured social creation, this position claims that the significant social and creative action occurs in the living moment of spoken language instead of on the dead written page. In some versions, informal personal communication, such as in letters, is granted some breath of life. Generally, however, this argument considers written language an epiphenomenon, a pale reduction of the living language of personal presence. Written texts appear contextless and socially meaningless in comparision with spoken language that arises out of the needs of a moment and has an observable effect on identifiable listeners. In the interactive dialogue of spoken conversation, community and communication seem to be born. This idea also has an ancient history going back to the early period of literacy. Biblical concepts of divine presence and Plato's preference for living dialectic over the death of wisdom that occurs in writing find their echoes in modern valorization of oral over written language in theology, linguistics, anthropology, and ethnomethodological sociology.

The important truth brought home by this criticism is that the power of language can only be understood in the context of social action in

2. Linguists have, of course, long observed that contact between people of different linguistic and dialect groups affects the language of both groups and is one of the main forces for linguistic change.

specific situations. But we should not be fooled by the distances travelled by written language, carrying messages across many miles and many years. Writing and reading may take place in privacy and composure, and they may carry out distant social actions, but they are still highly contextualized social actions, speaking very directly to social context and social goals. If written language didn't do anything, people would treat it only as an idle pleasure. The cases examined here uniformly demonstrate how much the writing and reading of texts are enmeshed in social activities. Moreover, the essential social purpose of the communities examined here is to produce statements of knowledge. That is, text production is the goal, and the activity cannot be understood without seeing the centrality of texts. In fact, as I will argue in chapter 5, the organization of textual activity can help generate many other features of social structure. The emergence of certain patterns of written communication give generic qualities not only to texts, but to the way the texts are used in situations, and even to the character of the situations themselves. Writing is social action. Regularized forms of writing are social institutions, interacting with other social institutions.

In communities organized around the production, reception, and use of texts, as in the cases examined here, much of the spoken interaction and even nonverbal behavior can be seen as in fact secondary to the written interaction. For example, chapters 3, 4, 7, and 9 suggest that emerging standards for the reporting of experiments create imperatives for experiments to be done in certain ways, so that an acceptable account may be given of them in an article. Similarly, chapter 7 suggests that specific debates in the literature create the impetus for new experiments. It is not a great stretch of the imagination to see talk occurring over the laboratory bench and even over morning coffee as bound together by the goal of producing written statements that would be found acceptable by the relevant audience (see, for example, Latour and Woolgar 151–86).

Although less formal oral and written linguistic events within "invisible colleges" (Crane) constitute significant moments along the way toward the public statement, the printed statement circulates beyond the inner circle, creating public knowledge out of esoteric knowledge. In the public forum the printed statement is what is held accountable and becomes the reference point for future discussion. Even within those fast moving and tightly structured scientific communities where preprints, letters, and chalk talks may be the primary forms of publication, with judgment of peers being passed long before the article reaches the archive of journal publication, the prejournal forms of publication must meet the essentials of public written argument to gain approval. The

core of the argument must be inspected and approved by the relevant others.

Recent scholarship into the complex private and semiprivate activities of scientists has enriched our view of how knowledge is created, the impulses and processes that lead to public statements; these private moments indeed shed light on the public statement, and I shall often draw on such evidence (see, for example, Collins, *Changing Order*; Garfinkel et al.; Knorr-Cetina, *The Manufacture of Knowledge*; Latour and Woolgar; and Lynch). In helping show the construction of the public moment, insights into private activities do not deconstruct, devaluate, or invalidate the public moment. They would only be disillusioning if we held naive illusions that texts were to appear spontaneously and pristinely, and then were immediately to transsubstantiate, without being read, pondered, and acted on, into the pure world of truth. To recognize the rhetorical character of visually transmitted symbolic activity is only to recognize that we live and use our texts in a human world.

These three arguments against granting substantial importance to written texts are illuminating rather than damning. They help reveal the dialectical interconnectedness of written language with the worlds around it and point to the danger of seeing the printed page as an isolated, internally whole phenomenon. Written language can decay faster than the page it is printed on, although a powerful text can outlast multiple editions, translations, and reconstructions. The force of written language only maintains to the degree that contextual factors are properly aligned and the text is able to capitalize on these factors. That is why writing is hard. When we write with any success, the success is likely to be weak and transient. Only the rare statement has long-lasting social force.[3]

The regularization of writing genres and situations within specific communities can increase the likelihood of successful, forceful communication, as several of the case studies below will illustrate. If the communal wisdom of a discipline has stabilized the rhetorical situation, rhetorical goals, and rhetorical solutions for accomplishing those goals in those situations, the individual writer and reader no longer need make so many fundamental choices and perform virtuosities of communication. Writing up an experiment on visual perception may seem a more transparently easy activity to an experimental psychologist than framing an argument in aesthetics to a philosopher, but that has more to do

3. Our current eclectic hunger for texts from distant times and societies is a recent, sporadic, and incomplete phenomenon. Because a text exists in some archive does not mean it has living meaning for any readers.

with the stabilization of the rhetorical world in one than the innate depth in the other.

This book examines the amount of difference writing makes in constituting what we consider knowledge. The different choices made in formulating knowledge under different conditions, the regularization of choices and contexts within communities, the modification of these regularities as they disperse through time and domain, and the implications of the rhetorical choices of individuals and communities, will I hope reveal how important it is that we attend to the rhetorical process in our understanding and production of knowledge texts. I doubt the fundamental philosophic questions surrounding language and knowledge will evaporate in confrontation with the evidence here; certainly since this book is not framed as an argument in philosophy, I would be surprised if it actually engaged recognizable philosophic questions. Yet I do hope that the concrete sense of the relations between language, social action, empirical experience, and knowledge will help us control our symbolic attempts at knowledge with increased skill.

Texts and Contexts

Here begins the examination of the ways in which writing matters. Three texts, from different sorts of knowledge creating communities, will be examined in relation to four contexts, as these contexts are referred to, invoked, or acted on in the texts: the object under study, the literature of the field, the anticipated audience, and the author's own self.[4] By examining how these four contexts are brought together in each text, we can see what is embodied in the language of the statement of knowledge. This method, although it gives no firm evidence about the actual intentions of the authors and the actual understanding of the readers, does nonetheless reveal the intentions and meanings available in the text.

This study also ranges beyond the scientific paper to examine knowledge-bearing texts in other disciplines in order to explore the possibilities of variation in what constitutes a statement of knowledge and to accentuate textual features through contrast. The differences in the examples reveal the resources of language to mediate the four contexts examined. The examples are not claimed to be typical of their disciplines, nor are the analyses to be taken as a simple model of the spectrum of knowledge.

4. This four-part analysis is a modification James Kinneavy's communication triangle. He sees language (or text) mediating among an encoder (or writer), a decoder (or audience) and reality; I have added the fourth item of the literature.

How a text refers to, invokes, or responds to each context is explored here through specific features of language. First, the lexicon of an article is examined to find the types of information conveyed about the objects under discussion. The nature of the symbolization, the frameworks in which the objects are identified, the precision of identification, and the tightness of fit between name and object indicate the quality of tie between text and the world.

Second, explicit citation and implicit knowledge indicate an article's relationship to the previous literature on the subject.[5] About explicit references questions arise concerning the precision of meaning conveyed by the reference, the relation of the reference to the claim of the article, the use made of the reference, and the manner of discussion of the reference.[6] About implicitly used knowledge, questions arise concerning the extent of codification and the role the knowledge takes in the argument.[7]

Third, each article's attention to the anticipated audience can be seen in the knowledge and attitudes the text assumes that the readers will have, in the types of persuasion attempted, in the structuring of the argument, and in the charge given by the author to the readers (i.e., what the author would like the readers to do after being convinced by the article).[8]

Finally, the author is represented in several ways within the text. The human mind stands between the reality it perceives and the language it

5. Karl Popper in "Epistemology Without a Knowing Subject" in *Objective Knowledge* argues similarly that knowledge once created becomes largely autonomous, something separate from either reality or our subjective sense of it. Once created, knowledge can be treated as an object, upon which further intellectual operations may be made, much as a spider web once woven becomes an object in the world. In like manner, I consider the literature of the field as a fact in itself, a fact with which all new publications must contend, just as they must contend with the objects they presume to study. With respect to new publication the literature of the field has a status beyond simply the record of past subjective perception. The new publication, in criticizing, correcting, extending, and simply using the prior literature treats that literature as the "third world" Popper describes.

6. See G. Nigel Gilbert, "Referencing as Persuasion"; Henry G. Small, "Cited Documents as Concept Symbols"; and Susan Cozzens, "Comparing the Sciences" and "Life History of a Knowledge Claim."

7. Harriet Zuckerman and Robert Merton discuss codification in "Age, Aging, and Age Structure in Science," in Norman Storer, ed., *The Sociology of Science*, 510–19. Merton also discusses the implicit use of knowledge, or what he calls "obliteration by incorporation," in *Social Theory and Social Structure*, chap. 1, and in *Sociological Ambivalence and Other Essays*, 130.

8. Latour and Woolgar, Knorr-Cetina, "Producing and Reproducing Knowledge," and Knorr and Knorr, *From Scenes to Scripts*, seem most interested in the persuasive and other effects texts have on their audiences; the process of text creation is seen to have the primary goal of persuasion. In this they follow Joseph Gusfield, "The Literary Rhetoric of Science."

speaks in; statements reflect the thoughts, purposes, observations, and quirks of the individual. The individual can be seen in the breadth and originality of the article's claims, in the idiosyncrasies of cognitive framework, in reports of introspection, experience, and observation, and in value assumptions. These features add up to a persona, a public face, which makes the reader aware of the author as an individual statement-maker coming to terms with reality from a distinctive perspective.

Although the four contexts (and the features that indicate them) are separated here for analysis, they are mutually dependent in each text. An observation concerning one has implications for the others. The depth of the interdependence is evident if one considers that the perception and thought of both author and audience are shaped for the most part by the same literature, and that literature provides the accepted definition of the objects discussed. Similarly, shared interest in and observation of objects of study draw the literature, author, and audience together.

An author, in deciding which words to commit to paper, must weigh these four contexts and establish a workable balance among them. A text is, in a sense, a solution to the problem of how to make a statement that attends through the symbols of language to all essential contexts appropriately. More explicitly, an article is an answer to the question, Against the background of accumulated knowledge of the discipline, how can I present an original claim about a phenomenon to the appropriate audience convincingly so that thinking and behavior will be modified accordingly? A successful answer is rewarded by its becoming an accepted formulation.

Each of the contexts, when abstracted from the writer's task of embodying complex meaning in a specific text and when viewed singly as a theoretical problem in communication, can appear to raise overwhelming epistemological difficulties. The kinds of difficulties that arise from such monochrome analysis are suggested by a slight renaming of the four factors we have been considering: language and reality; language and tradition; language and society; and language and mind. Exclusive concern with the language-creating mind leads to a subjective view of knowledge which makes uncertain the reality perceived and which rejects the cognitive growth of cultures. Viewing in isolation the effect of tradition on statement-making may lead one to misjudge accumulated statements—whether called paradigms or authority—as juggernauts, flattening out observed anomalies and individual thought. Perceiving statements only within the process of social negotiation of a socially constructed reality ignores the individual's powers of observation and language's ability to adjust to observed reality. But the most common

errors arise from language considered only in relation to reality: on one side the naive error of assuming that language is an unproblematic reflection of reality, and on the other side the sophistry that language is arbitrary, radically split from nature, with no perceiving cognitive selves and no trace of rational community to heal the split.

The three texts examined below represent three different solutions to the problem of writing knowledge: James Watson and Francis Crick, "A Structure for Deoxyribose Nucleic Acid"; Robert K. Merton, "The Ambivalence of Scientists"; and Geoffrey H. Hartman, "Blessing the Torrent: On Wordsworth's Later Style." The different balance of contexts established in each article derives in part from the differences in contexts—different types of objects studied, differently structured literatures, audiences of differing homogeneity, and different role expectations for the authors. The origin of the papers in separate fields (molecular biology, sociology, and literary criticism) representing the three traditional divisions of the academy (sciences, social sciences, and humanities) of course accentuates the differences on all fronts; however, these examples should not be overread as typical of large divisions of knowledge.

Suggesting a Molecular Structure

The article "A Structure for Deoxyribose Nucleic Acid" (see pp. 49–50) primarily describes a geometric model, elaborated in quantitative and qualitative terms, that is claimed to correspond to the structure of a substance found in nature. This act of geometric naming depends on the substance being discrete and robust and its structure being consistent through repeated observations, for otherwise the names will not convey a distinct and stable meaning to all observers.[9] Thus the primary context explicitly attended to by the language of the paper is the context of the objects of nature.

All other contexts are subordinated to this primary one so that the article may appear to speak univocally about nature. The previous literature on the subject is sorted out according to the criterion of closeness of fit between the observed phenomena and the claims made, and the accepted claims in the literature become assimilated into the language

9. Here I am not concerned with the reproducibility of individual experiments, but rather with the appearance of the phenomenon under a variety of circumstances. The more situations in which the phenomenon unmistakably appears, the more certain is the identification of its discrete existence.

used to describe the phenomena. The audience is assumed to share the same criteria of closeness of fit, discreteness, robustness, and reproducibility for acceptance of claims (or symbolic formulations) about phenomena; therefore, the audience can be relied on to have much the same assessment of the literature as the authors do, and persuasion may proceed by maintaining apparent focus on the object of study.[10] Further, because the audience has a well-established frame of reference in which to fit the new claim, they do not need to be given much guidance about the claim's implications. Finally, the authors' apparent presence is minimized by the common pursuit of authors, literature, and audience to establish a common, codified, symbolic analogue for nature. The authors seem only to be contributing a filler for a defined slot, and they are only in competition with a few other authors who are trying to fill the same slot. The persona, although proud among colleagues, is humbled before nature.

The opening sentence of Watson and Crick's article sets the task: "We wish to suggest a structure for the salt of deoxyribose nucleic acid." The task of identifying a structure assumes, first, that there is a distinct substance which can be isolated and inspected and which has qualities distinguishing it from other substances. By 1944 Avery, MacLeod, and McCarty had extracted a substance which they called "the transforming principle" and the method of extraction was standard by the time Watson and Crick began work.[11] Further, this substance is assumed to preexist the historical, human act of isolating and identifying the substance.

The ability to isolate the substance under repeatable conditions gives an ostensiveness to the name. Since the name only serves to point out or tag something distinctly and unmistakeably observable, the name need not convey any particular information. It can be arbitrary, whimsical, eponymic, or otherwise accidental; it need only be distinctive. The name, however, can do double service, conveying information as well as identifying. The name deoxyribose nucleic acid identifies elements of structure—e.g., the ribose configuration without an oxygen—as well as letting us know that the substance is to be found within cell nuclei. Thus the name is in this case overdetermined with respect to reality; we know more about the substance than we need to for purely identificatory purposes.

10. Latour and Woolgar, 75–76, suggest that scientific persuasion is successful when attention is drawn away from the circumstances of statement creation toward a "fact," which appears to be above the particularities of a specific circumstance. In the authors' terms, "the processes of literary inscription are forgotten."

11. Judson, 36. DNA was, in fact, first extracted by Johann Friedrich Miescher in 1869 (28). A more detailed account of the complex history of DNA can be found in Robert Olby, *The Road to the Double Helix*.

At this point we can see how the accumulated knowledge of the field (represented by the literature) is incorporated into the language. The isolation of elements and the theory of chemical combination, as well as the idea that substances can be analyzed chemically, are all implicit in the name of the object. More than that, the name reveals the gradually emerging orientation of chemistry to describe most features and processes through structure. Even the linguistically oldest component of the name, *acid*, has been transformed through redefinition as chemical knowledge and orientation have changed. In Bacon's day the word *acid* meant only sour-tasting; then it came to mean a sour-tasting substance; then, a substance which reddens litmus; then, a compound that dissociates in aqueous solution to produce hydrogen ions; then, a compound or ion that can give protons to other substances; and most recently, a molecule or ion that can combine with another by forming a covalent bond with two electrons of the other (Oxford English Dictionary, 20; Webster's Collegiate Dictionary, 8; American Heritage Dictionary, 10). The tasting and taster vanish as the structure emerges.[12]

The task of assigning a structure relies on a further assumption, that nature arranges itself in geometrical ways; theories of forces account for this remarkable correspondence between the symbolic representation of geometric shapes and the repeating arrangement of matter in nature. Geometry as a study is the product of human consciousness, but geometric forms are claimed to preexist human invention. Thus the task of the molecular biologist is not to create a structure that approximates nature, but to discover and express in human terms the actual structure resulting from all the forces and accounting for the behavior and appearance of the molecule. The claim of representing an actual structure rather than creating an approximate model results in a strong requirement for correspondence between data and claim. This correspondence, as we shall see below, is the main criterion of persuasion offered to the audience.

The few words of text discussed so far convey much about the object and the knowledge developed through the history of chemistry and biology, yet such compact transmission of information reveals no literary genius on the part of the authors. The dense communication is inherent in the names of objects and tasks. That a mere naming of parts conveys such precise and full meaning indicates how much the historical genius of the discipline is embodied in the development of its language.

12. Notice also how the changing definitions of acid are tied to changing contextual knowledge as well as to changing procedures of identification of phenomena and interpretation of data.

The analysis of the first sentence is not yet finished. The first five words, "we wish to suggest a . . . ," reveal much about the joint persona and contribution of the two authors. Despite the folk belief about the absence of the first person in scientific papers, the authors do assert their presence through the word *we*. That direct presence, however, is immediately subordinated to the object under consideration, the structure of DNA. Moreover, the authors are only *suggesting*, and the suggestion has only an indefinite article; whether *a* suggestion turns out to be *the* structure depends on nature. *Wish to suggest* is a form which implies humility before the facticity of the object, yet the phrase also has the boldness of the authors' presumption that their claim indeed will be confirmed by nature. Mild speech is possible because the suggestion will gain all the force it needs from the observation of reality; nature will stand up for scientists. The locution *wish to suggest,* appropriate here, might sound pompous in a branch of knowledge which does not find such immediate confirmation in nature.

Science will as well stand up for scientists, for the authors also subordinate themselves to scientific knowledge as currently constituted. By identifying their subject within the language of scientific disciplines, they are implicitly putting their original contribution within the framework of existing scientific knowledge. The placement and titling of the paper itself suggest how much the originality of the paper is subsumed within a highly structured framework of knowledge. The article is within a section entitled "Molecular Structure of Nucleic Acids" and is followed by another article of the same class, " Molecular Structure of Deoxypentose Nucleic Acid." The Watson-Crick article discusses only one particular substance in a larger class of substances, all being studied by colleagues to determine the same type of information.

The second sentence—"This structure has novel features which are of considerable biological interest"—places the chemical claim in the context of biological knowledge; this added context identifies the great importance of the paper. The knowledge of one field is not treated as the hermetic creation of that field, liable only to internal consistency within that field. Rather, other disciplines are subject to the discoveries about nature. Yet the specific implications of the discovery need not be discussed, for once the novel features of the structure are made known and referred to the codified knowledge of biology, any competent biologist would see a wide range of implications. Later in the article the authors comment, "It has not escaped our notice that the specific pairing we have postulated immediately suggests a copying mechanism for the genetic material." This brief comment invokes the knowledge of genetics and cellular mechanics and tells the biologist where to fit this struc-

ture into the open claims of the field. The single added piece of information will allow biology to move forward in directions determined by its own logic. It would be presumptuous, tedious, and unnecessary for Watson and Crick to lecture on the subject.

It is worth noting that although the subject of the paper is structural, the consequences and import are functional. From the shape of things, one can better understand how things happen.

It is also worth noting that all the uses of the first person are to indicate intellectual activities: statement making (opening words of paragraphs 1 and 4), making assumptions (later in paragraph 4), criticizing statements (paragraph 2), and placing knowledge claims within other intellectual frameworks (paragraphs 11 and 12). None of the first-person uses imply inconstancy in the object studied, but only changes or development of the authors' beliefs of what the appropriate claims about the object should be. The object is taken as given, independent of perception and knowing; all the human action is only in the process of coming to know the object—that is, in constructing, criticizing, and manipulating claims.

Once the claim about the object has been placed into its chemical slot, to define the inquiry, and its biological slot, to define the significant consequences, the competing claims that would fill the same slots must be eliminated. If the codified literatures of the relevant disciplines aim to represent the way nature is, a multiplicity of claims about the same phenomenon indicates an unresolved issue. Until a univocal formulation that describes the phenomenon in all its features is found, the phenomenon is not fully understood.

The grounds on which the two competing structures for DNA are rapidly dismissed in the second and third paragraphs reveal the central role of specific knowledge about the object of study. How any claim fits with what is or can be known about the object forms the chief constraint for originality, codification of the literature, and persuasion of the readers. The Pauling and Corey model, defined by a quick geometric description, is dismissed as impossible on two counts, both based on knowledge of features of such molecules well established in the literature: binding forces and van der Waals distances. Because Watson and Crick do not present their exact calculations, their criticisms must rely on the presumption that the features they invoke are commonly accepted and similarly understood well enough to allow reproducible calculations that will satisfy other researchers in the field. The codified knowledge about all aspects of the object presents clear constraints that must be met by any potential model. If a model does not match existing theory which is believed to accurately describe nature, then the model

must be dismissed. If later the dismissed model is strongly supported by other evidence, the dismissing theory must be called into question.

The dismissal of the Fraser model on the grounds that it is "rather ill-defined" is even more interesting, for the ill-defined does not allow calculations of the kind invoked for the Pauling-Corey model. The Fraser model is not consequential enough. Since the model cannot then be discussed against the framework of codified knowledge or against measurable aspects of the object, there is no profit looking into it.

With the competition disposed of, Watson and Crick can proceed to the core of the paper, their suggested structure. The diagram to the left of the fourth paragraph gives the geometrical essence of the solution; the fourth through eighth paragraphs cast the geometry into words, add details, and clarify elements of the structure through reference to accepted causal statements, prior work, and other models. The five paragraphs are descriptive, recreating physical presence through the symbolic systems of words and numbers, but the symbols are more than approximate metaphors. The names point to discrete objects, and the geometry is of nature itself. Scientific language, as a symbolic system with a commitment to reform itself in accordance with replicable observation of nature, becomes more than an arbitrary symbolic system.[13]

After this long description of the model, only brief mention is made in paragraphs 9 and 11 of the evidence in hand that confirms the model and the evidence still needed to provide a rigorous test. Acceptance of the model depends on the confirming evidence; therefore, the sketchiness of the discussion of evidence might seem surprising. But once the model is described, the existing evidence needs only be referred to because it is generally available and can be interpreted by any competent molecular biologist. Similarly, the construction of new tests is within current technology. The other researchers must satisfy themselves that the model fits past evidence and new tests. It is up to nature to persuade the readers, not the authors.

Just as the ninth and eleventh paragraphs present only limited per-

13. Harriet Zuckerman, "Cognitive and Social Processes in Scientific Discovery: Recombination in Bacteria as a Prototypical Case," discusses the resistance to discovery created by misleading names and the processes by which definition is corrected through discovery. The inaccurate naming impedes, but does not prevent, discovery; ultimately, observation of the object leads to corrected knowledge. In the case Zuckerman studies, "bacteriologists believed that bacteria were asexual *by definition*" (emphasis hers) because bacteria were classified as schizomycetes, from the Greek meaning "fission fungi" (8). In 1946 Joshua Lederberg's discovery of sexual recombination in the bacteria *E. coli,* however, led to a revised definition of the classification schizomycetes, despite the literal meaning of the etymology.

suasion, the tenth paragraph presents only limited guidance to the readers about how the model might be applied. The comment that the model is probably not applicable to RNA may be primarily to eliminate RNA as a competitor for the biological slot of genetic carrier (as was then thought more likely than DNA).

After mentioning the genetic implications of the structure, the paper has finished its primary scientific business. The thirteenth paragraph promises greater detail in later publication. Later publications primarily were devoted to spelling out the genetic copying mechanisms (Watson and Crick, "Genetical Implications" and "Structures"; Crick and Watson, "Complementary Structure"). Nonetheless, it is this first short article that counts as the primary statement of knowledge and is the one usually cited.

The last paragraph pays its respects to some aspects of the social system of science: prepublication criticism, access to unpublished evidence and ideas, and funding. To those who know the history of this discovery, these few thanks and the earlier criticisms of competitive work recall a web of social intricacies and inchoate psychological reaching toward discovery.[14] These prepublication facts of life are recognized by working scientists as necessary preconditions of publishable work; nonetheless, these preconditions of discovery do not enter the actual argument of the publication. In the article, competition is dealt with only in cognitive terms, discovery is presented as a fait accompli, and the social system is appended only as a courtesy, a polite nod at the end.

Dependence on the community of the discipline is even more fundamental in the language used, the prior knowledge, and the accepted perception of the object of study, yet even this cognitive dependence on the scientific community is not given explicit recognition. The article cites only work immediately relevant to the assessment of claims made in the article. The six footnotes document only articles presenting competing claims that were criticized or offering supporting data.

In order to maximize the tightness of fit between nature and its symbolic representation, all the relations between language and other contexts—the literature, the audience, and the authors—are both harnessed to and driven by the relationship between language and nature. Society, self, and received knowledge are present in the research report, but they

14. The complex sociological, psychological, and historical specifics of the process of discovery in the case of DNA are extensively recounted in James Watson, *The Double Helix*; Anne Sayre, *Rosalind Franklin and DNA*; and Horace Judson, *The Eighth Day of Creation*.

are subordinated to the representation of nature. The criterion of correspondence between statement and object governs all of the contexts.

Establishing the Ground beneath a Phenomenon

Robert K. Merton's essay in the sociology of science, "The Ambivalence of Scientists" (see pp. 51–53 for the beginning of this essay), presents a different kind of linguistic solution to a different kind of linguistic problem. In the DNA paper, except for the specific structure proposed, all aspects of the symbolic formulation are shared by author, audience, and literature. At the beginning of the ambivalence paper much less is shared; Merton must establish the ground on which his claim is to rest. The phenomenon which is the object of study is not universally recognized as a discrete phenomenon, and much of the language needed in the discussion does not have unmistakable ostensive reference. The literature of the field does not provide a generally recognized framework in which to place the current claim. The criteria the audience will apply are not clear-cut and universal, nor is it certain what intellectual framework they will bring to the reading. The author's perspective is, then, in many respects individual; nonetheless, through the medium of the paper he hopes to establish his claims as shared knowledge.

The particular subject of the article—the ambivalence of scientists (including social scientists) in observing and reporting certain aspects of behavior—adds an additional level of problem to be solved in the paper. The subject concerns the process of statement making and applies in a self-exemplifying fashion to the author's work in this essay, the statements in the literature, and the statements made by the readers. Thus, if the claims of the paper are correct, then the literature must be reinterpreted, the author must take into account his own ambivalence, and the readers must question their own statement making. Not only must Merton establish the grounds of the claim, he must carry the claim across shifting grounds.

In this article a wide range of linguistic choice is open to the author; little is predetermined by a knowledge of reality codified in language, literature, and criteria of judgment. Merton must develop at length original formulations to represent the phenomenon, to assemble and interpret the relevant literature, to establish his perspective, and to attend to the audience's perception.

The first specific difficulty faced by the essay is the identification of the

topic and its placement in the discipline. Unlike the Watson-Crick topic, which is located at the intersection of two terms already within the lexicon of the discipline (i.e., "structure" and "DNA"), Merton's topic is doubly alien to his discipline. First, the topic depends on the recognition of a prior topic—multiples and priorities—not previously in the discipline;[15] then the topic inquires into why the prior topic has not obtained due recognition. Merton's solution to the importation of a topic which he claims to be indigenous, necessary just to set the stage for the true topic of the paper, is to rely on his own prior work on multiples and priorities and then to suggest that enough evidence already existed within documents familiar to the field such that the topic should have been raised earlier, except for the impeding mechanism of ambivalence.

The fact that the prior topic of multiples and priorities has a clear and substantial place in the author's own framework of knowledge, but does not yet have a fixed place in the codified literature of the discipline, leads to three consequences common in the social sciences. First, for clarification, readers are referred to the author's own works rather than the shared knowledge of the discipline. Second, the readers must be persuaded not only of the specific claims of the essay, but of the author's larger framework of thought in which the claims are placed. Finally, the author's new construction of the knowledge of the field requires a reconsideration of the validity of wide parts of the literature and not just of the specifically competing claims. Without a fixed, codified literature to place and constrain topics and claims, authors are both free and encouraged to frame their contributions in broad revolutionary terms, reordering large segments of knowledge. Paradoxically, the great power and broad implications of Watson and Crick's structure of DNA result from the claim's tight constraint within a highly elaborated framework of thought; the narrow claim reverberates through the whole system. A broader claim in a less tightly strung system may have a more damped effect.

In order to establish the phenomenon to be discussed, the opening paragraph of the ambivalence paper asks the scholarly reader to recall a wide range of evidentiary documents: "the diaries and letters, the notebooks, the scientific papers, and biographies of scientists" as well as the scholarly discussion of these documents. The reader of the Watson-

15. Brannigan (47) cites several precursors and sources for Merton's analysis of multiples, but these earlier discussions do not establish that multiples was a firmly entrenched topic in sociological discourse at the time of Merton's writing. Our concern here is with the rhetorical situation as perceived by the author.

Crick article must only make a highly directed scan of codified knowledge to locate and accept the topic. Here, however, the reader must review the literature from a critical perspective incorporating a new topic of priorities before he can place and accept the topic of ambivalence as worthy of study. Indeed, the large quantity of examples of the phenomenon cited throughout the essay are, in part, necessary to confirm to the reader that this topic does exist.

Since the topic of ambivalence involves a critique of the field, the writer has a special problem with respect to the scholarly audience, all of whom presumably are subject to the cognitive lapse which is under discussion. Merton must challenge the readers while still maintaining their good will and attentiveness. To overcome audience resistance and ease the shock of self-recognition, Merton creates a strong presence of his own viewpoint and an atmosphere of camaraderie that assumes temporarily that the audience is already with him. He begins with statements of great certitude and only later fills in the background of concepts that make the opening statement possible. This technique bears similarity to the way Hemingway opens *To Have and Have Not:* "You know how it is there early in the morning in Havana with the bums still asleep against the walls of the buildings; before even the ice wagons come by with ice for the bars" (1). The reader is drafted into a club, and only gradually is the reader filled in on the experience that reader presumably shared from the beginning. The reader is companionably drawn into the world populated by sleeping bums and bars and early morning adventures in Havana. In Merton's essay, the atmosphere of agreement takes the edge off the challenge and creates enough good will for the argument to unfold. Further, Merton withholds explicit discussion of sociologists' group involvement in the problem until the entire mechanism has been laid out, the giants of science implicated, a few confessions cited, and dispassion praised. Moreover, eminent psychologists and sociologists are identified as having the courage of self-examination on this matter before the readers are asked to consider their own cases.

After introducing the problem, in the second paragraph Merton identifies the mechanism of the ambivalence, thereby localizing the phenomenon in a theory of the operations of science. The metaphor of conflict of forces is drawn from physics, and Merton is careful to label it as metaphor by the phrase "can be conceived of." There is no claim here of measurable forces as there would be in physics. Metaphors are underconstrained in meaning; by their nature they are only suggestive and approximate. One resorts to metaphor only when the thing to be described is partially or imprecisely known, and one must look to correspondences with better known objects. Even in the best of meta-

phors the correspondence between the thing being described and the metaphorical representation is only partial. In any specific case, however, the metaphor may be the best available description and, when combined with other underconstrained terms and contextural clues, may create a web of approximate meanings surrounding the actual thing, such that a meaning develops adequate to the situation. The second sentence provides a second underconstrained meaning to support the metaphor of resistance: "Such resistance is a sign of malintegration of the social institution of science which incorporates potentially incompatible values. . . ." Of all the sentences in the article, this sounds the most typically sociological, precisely because it attaches the topic to familiar sociological concepts. The terms of this sentence, however, are abstract, some of variable or disputed meaning, some metaphoric, and all in a complex syntactical relationship that makes the imprecision additive, if not geometrical. Further, resistance is only "a sign," not a particular sign or the only sign. Here the indefinite article is a true indefinite, unlike Watson and Crick's "a structure," where near at hand observations of nature can fix the structure as unique.

Such underdetermination of language provides further reason for requiring the good will of the audience. A sympathetic audience is more likely to expend the effort to reconstruct from partial indicators the meaning most congruent to the argument—a process that may be called reading in the intended spirit. The unsympathetic reader, however, can find in underconstrained meanings enough inconsistency, contradiction, and unacceptable thought to mount a serious attack. Even such ordinary appearing terms as "scientific accomplishment" or turns of phrases as "as happy as a scientist can be" rely on many loosely defined conceptual assumptions; they can easily disintegrate under a hostile reading.

In the third paragraph the author turns from an invisible social structure which is claimed to generate the ambivalence to the more visible "overt behavior that can be interpreted as expressions of such resistance." Even these overt manifestations of trivialization and distortion, nonetheless, are not directly measurable and discrete. Distortion, for example, is a conceptual term, requiring comparative judgments against a normative model, application of judgment criteria, imputation of thought, and similar interpretive procedures. The interpretation of the concrete evidence of contradictory statements by or about scientists on the matter of priorities requires the kind of analysis employed by psychologists and literary critics. Simple claims become indications of internal processes within the makers of the claims. Even the simple claims, that Halsted was overmodest about his work or Freud found

questions of priority boring, are based on human judgment and the imputation of attitude.

The only direct evidentiary statements of the primary phenomenon of ambivalence are the confessions of the professionals of introspection, Freud and Moreno. On the less deeply embarrassing emotional conflicts discussed in the later part of the paper—fear of the joy of discovery being dashed and fear of unconscious plagiary—Merton is able to cite direct confessions of ambivalence by less trained observers of themselves. But even the evidence of introspection involves judgment, conceptual categories, and the naming of transitory and evanescent phenomena by the introspector. Claims of reproducibility of phenomena within the self require a kind of phenomenological sense memory, and claims of similarity between observers raises even greater difficulties of matching affect to language. On many levels we have only the introspectors' words to go by.

As the essay reaches its midpoint, the samples of irrational statement-making (analyzed as evidence of ambivalence) start coming from sociological sources: the literature of the discipline has become the evidentiary document. The practice of imputing psychological phenomena into the very record of the discipline is justifiable on the basis of social science's own discoveries, but it makes for great difficulties in establishing a codified body of knowledge from the literature. To draw the paradox more strongly, the desire to establish a professional literature that rises above the cognitive and perceptual limitations of individuals leads to self-examination, but that reflexivity only reveals the difficulty of codifying statements made by humans about human behavior.

Once Merton has indicated a similarity of structure in many examples and has moved the examples to the readers' discipline, he is ready to call on the readers for further analysis of this issue. Before the final peroration on the therapeutic value of the study of multiples, he has already steeled the courage and minds of those he wants to carry forth the investigation. He has also suggested the method: dispassionate observation of the self and others, aided upon occasion by collaboration. The final charge to the audience is quite directive: have courage to overcome your own ambivalence to begin a systematic study of priorities, for not only will this study add to knowledge, it will be therapeutic for all of science, including sociology. This kind of "follow my lead" is very different than the implicit charge to the reader offered by Watson and Crick: gather more evidence to see if we are right, then use the knowledge to advance science according to its own dictates.

The strength of Merton's directiveness at the end is typical of the entire essay, for he must establish a perception of reality and terms of

discourse not universally shared in the discipline. He must persuade the readers not just of a specific claim, but an entire framework of knowledge. Language, rather than being highly determined by the discipline's shared perception of reality as it is in the Watson-Crick article, must be carefully shaped by the author to turn his own vision into the shared one of the discipline. Because of the originality of formulations, the author's presence is inevitably strong. If this were typical of the social sciences, one might see the consequences in authors being noted for a point of view or method of perception rather than a specific claim and in a greater tendency for schools to be formed around the most original authors. The differences in formulations among original authors may make reconciliation of viewpoints difficult, and many researchers may find the clearest direction by following in the footsteps of only a limited number of originators. There are, of course, many other economic, social, and cognitive reasons for the formation of schools in all disciplines.

Reading a Poem

Unlike the previous two articles, Geoffrey Hartman's "Blessing the Torrent: On Wordsworth's Later Style" (see pp. 54–55 for the beginning of the essay) unfixes our knowledge of its subject (a poem), to suggest an experience that goes beyond any claim we can make. Rather than taming its subject by creating a representation that will count as knowledge, the essay seeks to reinvigorate the poem by aiding the reader to experience the imaginative life embodied in it. Insofar as the poem can be reduced to easily understood, verifiable claims— "normalized," in Hartman's term—the poem is of little interest.

This concern with the aesthetic moment of the poem requires that an existential bond be created among poet, critic, and reader. In the process of conveying the poetic moment, the critic's sensibility plays the central role. The poem, the literature, and the audience's perception are all mediated through the critic's vision. The critic perceives new dimensions of the poem, uses the literature to allude to his own aesthetic experience, and asks the audience to accept a new way of reading the poem. The poetic text and its context, the accumulated experience of literary criticism and literary texts, and the audience's critical judgment and expectation of poetry do constrain what the critic can persuasively state, yet the critic has considerable power to transform all of them.

In one sense the object of investigation, a sonnet entitled "To the Torrent at the Devil's Bridge, North Wales, 1824," is a known and discrete

phenomenon. It is printed in the collected works of William Words-worth; apparently no scholar has questioned the attribution to Words-worth, the dating, or the purity of the text. The poem is easily repro-duced, as is done at the beginning of the essay. Moreover, some elemen-tary literary techniques and a few well-known biographical facts seem to explain the apparent features of the poem, as Hartman demonstrates in the third through the sixth paragraphs. The topic of the essay, conse-quently, appears to be fixed in a framework even more complete than that which surrounds DNA, to the point where the topic appears trivial. Here, though, the essay sets the framework aside as not revealing the important knowledge of the poem.

That important knowledge is a complex state of mind beyond nam-ing. Hartman can only try to reevoke it through description, contrast, analogy, and reconstruction of context. As Hartman states at the end of the second paragraph in what is the closest approximation of a thesis in the essay, "Uncertainty of reference gives way to a well-defined per-sonal situation, that is easily described, though less easily understood." The outside of the situation, captured in the description, is dis-tinguished from the inside of the moment, which counts as understand-ing. The poem, as verbal artifice, conveys something beyond the words.

The title of the essay indicates the true subject: "Blessing the Torrent" is an act accomplished through the poem. Six of the essay's seven sec-tions are devoted to recreating the existential moment of blessing. The subtitle, "On Wordsworth's Later Style," indicates that the act of this poem is similar to the acts of others of Wordsworth's later poems, but this similarity is only discussed in the last section of the paper, and no other poem is examined in sufficient detail to establish that it is the ves-sel of a similar moment. This reading of one sonnet can only provide an analogy for the reading of others, making the other poems more accessi-ble; any more specific claim of equivalence among poems would sug-gest a reductive normalization. Each poetic moment is itself and no other.

The essay is structured to make the poet's state of mind accessible in all its fullness to the reader, to widen gradually the reader's conscious-ness of the central issue of the poem. The essay opens with a considera-tion of the literal meaning of the opening question of the poem: "How art thou named?" Each of the following sections grows out of an issue raised in the previous one in order to open up the central, opening ques-tion. In a sense, each section progressively uncontains the flood.

The epigraphs of Hölderlin, Stevens, and Joyce prepare a first reading of the poem by setting the river in motion as one of a poetic family of floods, puzzling and uncontainable. The first section by raising issues

of form—the untitled, unplaceable fragment versus the named, closed sonnet—localizes this particular flood, but raises the problem of understanding the localization. The second section takes up the theme of localization to examine biographical information that raises problems about what the poet could be meaning. At this point the critic brings in other samples of Wordsworth's writing to show the poet's way of thinking about these issues. The writings of other poets are examined to show what Wordsworth did not mean. By the end of the second section the formal solution to naming collapses as the critic points to the inadequacy of the poet's diction to fulfill the domesticating function of the sonnet.

The third section examines this dilemma through the text of the first half of the poem, where the poet explains the problem and proposes a first, inadequate solution. The fourth section discusses the acceptance of the inability of language to localize, as developed in the second half of the poem. Against this reading of the whole poem, Hartman reexamines a few phrases that appear to be clichés, but which now are seen to have unexpected depth, particularly in the context of Wordsworth's other writing. These phrases lead to a return to the problem of naming in the sixth section. Only after the full dynamics of the poem are revealed is the poem seen to represent a key part of Wordsworth's consciousness in his later career, deriving from the realizations of *The Prelude*.

The structure of Hartman's essay differs substantially from the structures of the two essays discussed earlier. In both of the earlier cases the arguments are built on claims to be placed, established, and applied—thereby achieving closure within a framework of knowledge. The two earlier essays differ primarily in the amount and directiveness of text required to define the framework and phenomenon, to establish the claim, and to indicate the applications of the claim. Hartman's essay, however, denies the reader the closure of a specific claim fixed within a coherent framework of knowledge. The essay only prepares the reader's sensibility to relive imaginatively the Wordsworthian sensibility. The essay ends with a method of reading and a promise of pleasure: "The later poems often require from us something close to a suppression of the image of creativity as 'burning bright' or full of glitter and communicated strife. Wordsworth's lucy-feric style, in its discretion and reserve, appears to be the opposite of luciferic. Can we say there is blessing in its gently breeze?"

The essay also denies closure in another way. The final test of Hartman's argument is whether it illuminates the poems. No hard evidence will determine whether he is right or wrong. Certain kinds of evidence

are available to convince the reader of the plausibility of the argument, which evidence the critic violates only at his own risk. Hartman must show his reading is consistent with the wording and structure of the poems and harmonious with what we know of the poet and his period. Further, each interpretation has an implicit psychology and aesthetic which cannot, without extension rationale, violate readers' ideas of how people read and write poems; in his extensive writings on Wordsworth, Hartman has presented an intriguing and plausible phenomenological aesthetic, based on the Wordsworthian endeavor to feel a connectedness with nature through the poetic imagination (for example, *Wordsworth's Poetry, 1787-1814*). But all the argument is based on plausibility with no hard, provable answers. And even notions of plausibility can be changed if the essay succeeds in expanding the reader's poetic imagination.

As the object of investigation, the poem only gains importance in its subjective experience, so also with the literature, of which there are four relevant types. First is the critical literature, toward which Hartman's essay contributes. Yet the critical literature is used neither as a groundwork out of which the ideas of the essay grow nor as an orderly body of information into which the essay fits. The accumulated knowledge of the critical literature is implicitly dismissed in several ways, and the whole of Wordsworth criticism is treated as so inconsequential as not to require explicit discussion. In finding this one poem (and most of the other later poems as well) worth serious study, Hartman challenges the conventional wisdom which sees a collapse in Wordsworth's poetic powers after *The Prelude*. In addition, Hartman criticizes a normalized reading—i.e., conventional criticism—as inadequate to the poem. Finally, by locating the genesis of the later style in the perceptions of *The Prelude*, Hartman reverses the common view that the epic was the culmination of the early period and that Wordsworth almost immediately turned away from the great poem's realizations. In the text of the essay no explicit mention of Wordsworth criticism is made, and in the notes the only reference to any critics are to Longinus and Kenneth Burke, both of whom discussed concepts analogous to Hartman's. The references are brief, and serve only to illuminate Hartman's ideas. D. V. Erdman is also thanked for calling Hartman's "attention to a topographical tract published in London, 1796."

The second type of literature, used more extensively, provides contextual information, such as Wordsworth's activities at the time of the poem's composition and the typography of the poem's setting. These documents date primarily from Wordsworth's time. The argument does

rely on this historical, nonliterary information, but only in service of Hartman's literary perception.

Third is the corpus of world poetry, quoted substantially throughout. The works of other poets are used to illuminate Wordsworth's work by analogy and contrast. Wordsworth's poetic moment is identified by setting it against other poetic moments. Even though a Hölderlin poem may shed light on a Wordsworth poem, however, they remain separate, with separate lives to be evoked and with no fixed relationship to each other. Hartman does not even attend to the historical task of tracing influence and literary tradition, which would establish at least some formal connections between poems.

The last type of literature is the testimony of Wordsworth and his intimates concerning his state of mind and poetic intentions. This category includes letters, journals, and Wordsworth's other poems when they are used in an evidentiary way. As with the previous types of literature, these documents are used only to illuminate Hartman's perception of the dynamics of the poem under study, and they are interpreted through that perception. Thus Hartman uses a letter in which Wordsworth copied the poem not as an honest reflection of the poet's state of mind, but to recall another time when Wordsworth criticized just such attitudes as expressed in the letter. This juxtaposition, not at all evident in Wordsworth's letter by itself, prepares Hartman's criticism of the absurdity of the conventional reading and introduces the existential paradox which becomes Hartman's theme. Thus all the references, from the most scholary historical geography to the most poetic evocations, serve only to recreate the consciousness Hartman perceives embodied in the poem.

The critical and poetic literatures have an additional important, but implicit, role: the language of the essay invokes and evokes concepts and aesthetic experiences from the entire history of poetry and poetic criticism. The literary vocabulary on one level appears to be purely technical, not unlike the technical vocabularies of molecular biology or sociology. Terms such as *topos, apostrophe, sonnet, turn, enjambment,* and *sublime* are the critic's basic conceptual equipment, learned as part of professional training. On another level, however, the literary terms are more than technical, for each reverberates with former uses and examples. One can know and understand *deoxyribose* on the basis of modern chemistry alone, but to understand the *sublime* one must not only have read Longinus and be familiar with the ensuing critical debate to modern times, one must have experienced a wide range of poems that embody the development and variation of that concept. Even terms that do

not refer directly to experience—*sonnet*, for example—rely on wide literary experience. That a poem has fourteen lines, particular rhymes and meters, and a turn is of some outward interest, but of greater importance is that the poem stands in a tradition that began as a representation of love, became increasingly introspective and confessional, then took on religious and philosophic concerns, fell into disuse as uncongenial to the concerns of the eighteenth century, and was finally revived by the romantics. To understand the term *sonnet* is to be sensitive to the wide range of consciousness and experience it has served to realize. Moreover, to understand the term's use in a phrase such as "Though the sonnet as a form is a domesticating device . . ." one must remember the courtly lover torn by love yet graceful in his meters, Donne in religious turmoil tearing at the form, Herbert turning the sonnet in on itself, and Milton in grief, blindness, and civil war finding repose for the space of fourteen lines. In comparison, the sociological and psychological terms used by Merton—e.g., *ambivalence, denial,* and *integration*—do have histories in the literature, and familiarity with the original texts helps reveal how the terms are used, yet the history of the field and the experience of reading the entire corpus is not evoked in the use of the terms.

Because the experience embodied in the poetic literature and interpreted through the critical literature is implicit in the literary vocabulary, the terms take on an added subjective element. Not only does Hartman use the critical vocabulary to elucidate the subjective experience of the poem as he perceives it, his use embodies his own entire experience of literature—his experience of Longinus, Milton, and even Joyce. Moreover, in trying to communicate his perceptions he is relying on the subjective experiences each of his readers have of literature. Each reader has intimate familiarity with a different range of literature, and each reader gives each text a different reading. One's personal anthology personally interpreted comprises the individual's share of the corporate knowledge and is the basis of that individual's sensibility.

In the chain of consciousness from poet to critic to reader, the enterprise rests on the quality of the mediating critic's sensibility. Of course one can read a poem without benefit of a mediating critic, and some schools of thought suggest the best reading is the least tutored. If one turns to a critic, however, the reader must believe that the critic perceives things that would not be apparent to the reader. A critic's persuasiveness, therefore, depends in part on establishing a persona of perceptivity, if not brilliance. Reputation, which is prior to any given article, no doubt plays a significant role in fostering the persona. The content of the essay itself also provides a substantive basis for judging insight. But a persona of sensitivity and brilliance can also be fostered by stylistic hab-

its. Hartman uses several techniques to increase the appearance of density of thought. First, like many critics, he prefers the elliptical argument to the fully delineated. Consider, for example, this sentence: "The word 'Viamala' has punctuated a pathfinding movement of thought and suggests a final station or resting point as it turns the sonnet toward the description of a single scene—though a scene that turns out to be a prospect rather than a terminus, with features that reach beyond time." The single sentence moves through many concepts cast in metaphorical terms, modifying and by the end even reversing the original imagery. A number of the key phrases, such as *pathfinding movement* and *features that reach beyond time*, are neither prepared for earlier in the paper nor spelled out later. No specifics are attached to any of the generalizations of the sentence; the reader is left to figure out how the complex point of the sentence applies to both the rest of the article and to the poem. The interpretation required of the reader is increased because the metaphor of the critical sentence turns the imagery of the poem around, suggesting that the poet, and not the river, is on a pathfinding journey. The sentence can suggest many thoughts to the reader, not all of which may be intended or supported by the argument. In contrast, although the Watson and Crick article does employ ellipsis, the items not spelled out, such as *van der Waals distances*, do have specific, univocal meanings with clear-cut application to the argument of the paper. The ellipsis runs through a single meaning rapidly rather than reverberating with many possible suggested meanings.

In the literary essay reverberative density is also achieved through allusive language, invoking concepts and experiences of other poets and implying connections between words. The *capable negativity* Hartman mentions at the beginning of section III is a Spoonerism for Keats's term "negative capability." The verbal play suggests a deep transformation of Keats's poetics, but the phrase seems actually to have only the simple meaning in the essay that the poem recognizes the impossibility of its task. The last sentence of the essay—"Can we say there is a blessing in its gentle breeze?"—refers to the opening line of *The Prelude* and the title of the essay as well as a contrast to the torrent. Puns run throughout the essay from the first epigraph (where the double meaning of the German *entsprungen* ties the river to a puzzle), through "the chasm that is like a chiasmus" in the fourth section, to the contrast of *luciferic* and *lucyferic* (referring to Wordsworth's Lucy poems) in the next to the last sentence of the essay. A plethora of connections attests to the fertile sensibility of the critic, and sensibility is essentially what the critic has to offer in the essay.

Final Comparisons

To recapitulate the major points of comparison among the three texts analyzed is to notice that the three statements of knowledge are three different things. In mediating reality, literature, audience, and self, each text seems to be making a different kind of move in a different kind of game. All three texts appear to show interest in phenomena which form the topics for the essays (as well as provide the titles). But the phenomena are not equally fixed prior to the essays. The substance DNA and the concept genetic carrier were well known (although not agreed to be synonymous) prior to Watson and Crick's essay. The Wordsworth poem was also well known, but Hartman claims what was known should not count as true knowledge, which can only come in the subjective recreation of the poetic moment. In the ambivalence essay Merton must first establish that the phenomenon exists and is consequential.

The chemical and biological literatures are codified and embedded in the language, problematics, and accepted modes of argumentation; consequently, the DNA essay does not need to discuss explicitly most of the relevant literature except for claims and evidence immediately bearing on the essay's claim. The sociological literature on scientific behavior is more diverse, unsettled, and open to interpretation; therefore, the essay must reconstruct the literature to establish a framework for discussion. The author attempts codification because codification is not a fact going into the essay. The literatures of poetry and its criticism tend to be particularistic and used in particularistic ways; the Wordsworth essay invokes both literatures idiosyncratically and only in support of the critic's vision of the particular poetic moment of consciousness being investigated. Codification, if it can be called that, is entirely personal.

The biological and biochemical audiences share an acceptance of much knowledge, evidence gathering techniques, and criteria of judgment against which to measure Watson and Crick's claims and to suggest how the claims might be applied; therefore, the authors do not urge, but rather leave the audience to judge and act according to the dictates of science. The sociological audience, sharing no uniform framework of thought or criteria of proof, must be urged, persuaded, and directed along the lines of the author's thoughts. The literary audience, concerned with private aesthetic experience, must find the critic's comments plausible, but more important must find the comments enriching the experience of reading; evocation of the richest experience is persuasion.

In their essay Watson and Crick take on a humble yet proud authorial

presence: the humble servants of nature and their discipline, filling in only a small piece of a vast puzzle and subject to the hard evidence of nature and the cold judgment of their peers—yet the proud originators of claims that have the potential ring of natural truth and nearly universal professional acceptance. Merton stands more uncertainly before his discipline and nature, neither of which holds the promise of clear-cut judgment and unequivocal support, yet through the force of argument he hopes to establish some certainty. Curiously, the literary critic Hartman, who has the least responsibility to establish certainty, must take on the most demanding role: appearing to have insight greater than that of his readers. Since his contribution cannot be measured in terms of a claim to be judged right or wrong, the quality of his whole sensibility is up for judgment.

The diversity of the knowledge-producing activity embodied in these three texts suggests how important the form of knowledge is. Getting the words right is more than a fine tuning of grace and clarity; it is defining the entire enterprise. And getting the words right depends not just on an individual's choice. The words are shaped by the discipline—in its communally developed linguistic resources and expectations; in its stylized identification and structuring of realities to be discussed; in its literature; in its active procedures of reading, evaluating, and using texts; in its structured interactions between writer and reader. The words arise out of the activity, procedures, and relationships within the community.[16]

The solutions to the problem of how to write embodied in these articles are unique, even within their respective disciplines. Each article speaks to its own moment and own intellectual space; each actively realizes its own goals in that moment and space. Judgments about typicality and typologies of textual forms in different disciplines must be made cautiously, if at all. Certainly to declare any features of these three isolated articles as typical of their disciplines would be folly. Yet each does reveal something about its discipline, not so much in the specific writing choices as in the context in which each of those moves make sense; not in the moves, but in the hints about the gameboard revealed by the moves.

The gameboard of biochemistry as revealed by Watson and Crick's moves is far more defined and stable than the sociological gameboard Merton works on. Watson and Crick can count on many more regularities of the game than Merton can. And the most fundamental of those regularities have to do with the empirical basis of the game. Wat-

16. Other insights into disciplinary differences may be found in Becher.

son and Crick can rely on great agreement as to what empirical evidence is relevant to the claim and how that evidence is to be produced, represented, and applied in this situation. All the dimensions of Merton's game, however, are more fluid because of the lack of agreement over the relevant empirical experience, its production, its application, and its representation. And Hartman's game is open to even more idiosyncratic moves because the grounding evidence is displaced from the gameboard into the player; the fundamental reality to be experienced resides within the critic.

The contrasts among these three articles bring sharply into relief the accomplishment of the stable (though not static) rhetorical universe which makes possible Watson and Crick's precise, powerful, and highly successful formulation. The emergence of this rhetorical universe, its implications, and its variations will be the subject of the ensuing chapters. We will see the central role of text and genre not just in responding to the emerging regularities of rhetorical universe, but in helping indeed to create that rhetorical universe.

Appendix

equipment, and to Dr. G. E. R. Deacon and the captain and officers of R.R.S. *Discovery II* for their part in making the observations.

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MOLECULAR STRUCTURE OF NUCLEIC ACIDS

A Structure for Deoxyribose Nucleic Acid

WE wish to suggest a structure for the salt of deoxyribose nucleic acid (D.N.A.). This structure has novel features which are of considerable biological interest.

A structure for nucleic acid has already been proposed by Pauling and Corey[1]. They kindly made their manuscript available to us in advance of publication. Their model consists of three intertwined chains, with the phosphates near the fibre axis, and the bases on the outside. In our opinion, this structure is unsatisfactory for two reasons : (1) We believe that the material which gives the X-ray diagrams is the salt, not the free acid. Without the acidic hydrogen atoms it is not clear what forces would hold the structure together, especially as the negatively charged phosphates near the axis will repel each other. (2) Some of the van der Waals distances appear to be too small.

Another three-chain structure has also been suggested by Fraser (in the press). In his model the phosphates are on the outside and the bases on the inside, linked together by hydrogen bonds. This structure as described is rather ill-defined, and for this reason we shall not comment on it.

We wish to put forward a radically different structure for the salt of deoxyribose nucleic acid. This structure has two helical chains each coiled round the same axis (see diagram). We have made the usual chemical assumptions, namely, that each chain consists of phosphate diester groups joining β-D-deoxyribofuranose residues with 3′,5′ linkages. The two chains (but not their bases) are related by a dyad perpendicular to the fibre axis. Both chains follow right-handed helices, but owing to the dyad the sequences of the atoms in the two chains run in opposite directions. Each chain loosely resembles Furberg's[2] model No. 1 ; that is, the bases are on the inside of the helix and the phosphates on the outside. The configuration of the sugar and the atoms near it is close to Furberg's 'standard configuration', the sugar being roughly perpendicular to the attached base. There
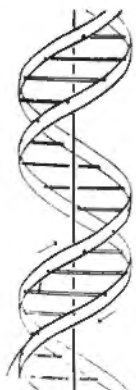
This figure is purely diagrammatic. The two ribbons symbolize the two phosphate—sugar chains, and the horizontal rods the pairs of bases holding the chains together. The vertical line marks the fibre axis.

is a residue on each chain every 3·4 A. in the z-direction. We have assumed an angle of 36° between adjacent residues in the same chain, so that the structure repeats after 10 residues on each chain, that is, after 34 A. The distance of a phosphorus atom from the fibre axis is 10 A. As the phosphates are on the outside, cations have easy access to them.

The structure is an open one, and its water content is rather high. At lower water contents we would expect the bases to tilt so that the structure could become more compact.

The novel feature of the structure is the manner in which the two chains are held together by the purine and pyrimidine bases. The planes of the bases are perpendicular to the fibre axis. They are joined together in pairs, a single base from one chain being hydrogen-bonded to a single base from the other chain, so that the two lie side by side with identical z-co-ordinates. One of the pair must be a purine and the other a pyrimidine for bonding to occur. The hydrogen bonds are made as follows : purine position 1 to pyrimidine position 1 ; purine position 6 to pyrimidine position 6.

If it is assumed that the bases only occur in the structure in the most plausible tautomeric forms (that is, with the keto rather than the enol configurations) it is found that only specific pairs of bases can bond together. These pairs are : adenine (purine) with thymine (pyrimidine), and guanine (purine) with cytosine (pyrimidine).

In other words, if an adenine forms one member of a pair, on either chain, then on these assumptions the other member must be thymine ; similarly for guanine and cytosine. The sequence of bases on a single chain does not appear to be restricted in any way. However, if only specific pairs of bases can be formed, it follows that if the sequence of bases on one chain is given, then the sequence on the other chain is automatically determined.

It has been found experimentally[3,4] that the ratio of the amounts of adenine to thymine, and the ratio of guanine to cytosine, are always very close to unity for deoxyribose nucleic acid.

It is probably impossible to build this structure with a ribose sugar in place of the deoxyribose, as the extra oxygen atom would make too close a van der Waals contact.

The previously published X-ray data[5,6] on deoxyribose nucleic acid are insufficient for a rigorous test of our structure. So far as we can tell, it is roughly compatible with the experimental data, but it must be regarded as unproved until it has been checked against more exact results. Some of these are given in the following communications. We were not aware of the details of the results presented there when we devised our structure, which rests mainly though not entirely on published experimental data and stereochemical arguments.

It has not escaped our notice that the specific pairing we have postulated immediately suggests a possible copying mechanism for the genetic material.

Full details of the structure, including the conditions assumed in building it, together with a set of co-ordinates for the atoms, will be published elsewhere.

We are much indebted to Dr. Jerry Donohue for constant advice and criticism, especially on interatomic distances. We have also been stimulated by a knowledge of the general nature of the unpublished experimental results and ideas of Dr. M. H. F. Wilkins, Dr. R. E. Franklin and their co-workers at

King's College, London. One of us (J. D. W.) has been aided by a fellowship from the National Foundation for Infantile Paralysis.

J. D. WATSON
F. H. C. CRICK

Medical Research Council Unit for the
Study of the Molecular Structure of
Biological Systems.
Cavendish Laboratory, Cambridge.
April 2.

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[6] Wilkins, M. H. F., and Randall, J. T., *Biochim. et Biophys. Acta*, **10**, 192 (1953).

Molecular Structure of Deoxypentose Nucleic Acids

WHILE the biological properties of deoxypentose nucleic acid suggest a molecular structure containing great complexity, X-ray diffraction studies described here (cf. Astbury[5]) show the basic molecular configuration has great simplicity. The purpose of this communication is to describe, in a preliminary way, some of the experimental evidence for the polynucleotide chain configuration being helical, and existing in this form when in the natural state. A fuller account of the work will be published shortly.

The structure of deoxypentose nucleic acid is the same in all species (although the nitrogen base ratios alter considerably) in nucleoprotein, extracted or in cells, and in purified nucleate. The same linear group of polynucleotide chains may pack together parallel in different ways to give crystalline[1-3], semi-crystalline or paracrystalline material. In all cases the X-ray diffraction photograph consists of two regions, one determined largely by the regular spacing of nucleotides along the chain, and the other by the longer spacings of the chain configuration. The sequence of different nitrogen bases along the chain is not made visible.

Oriented paracrystalline deoxypentose nucleic acid ('structure B' in the following communication by Franklin and Gosling) gives a fibre diagram as shown in Fig. 1 (cf. ref. 4). Astbury suggested that the strong 3·4-A. reflexion corresponded to the internucleotide repeat along the fibre axis. The ~ 34 A. layer lines, however, are not due to a repeat of a polynucleotide composition, but to the chain configuration repeat, which causes strong diffraction as the nucleotide chains have higher density than the interstitial water. The absence of reflexions on or near the meridian immediately suggests a helical structure with axis parallel to fibre length.

Diffraction by Helices

It may be shown[6] (also Stokes, unpublished) that the intensity distribution in the diffraction pattern of a series of points equally spaced along a helix is given by the squares of Bessel functions. A uniform continuous helix gives a series of layer lines of spacing corresponding to the helix pitch, the intensity distribution along the nth layer line being proportional to the square of J_n, the nth order Bessel function. A straight line may be drawn approximately through

the innermost maxima of each Bessel function and the origin. The angle this line makes with the equator is roughly equal to the angle between an element of the helix and the helix axis. If a unit repeats n times along the helix there will be a meridional reflexion (J_0^2) on the nth layer line. The helical configuration produces side-bands on this fundamental frequency, the effect[6] being to reproduce the intensity distribution about the origin around the new origin, on the nth layer line, corresponding to C in Fig. 2.

We will now briefly analyse in physical terms some of the effects of the shape and size of the repeat unit or nucleotide on the diffraction pattern. First, if the nucleotide consists of a unit having circular symmetry about an axis parallel to the helix axis, the whole diffraction pattern is modified by the form factor of the nucleotide. Second, if the nucleotide consists of a series of points on a radius at right-angles to the helix axis, the phases of radiation scattered by the helices of different diameter passing through each point are the same. Summation of the corresponding Bessel functions gives reinforcement[6] for the inner-
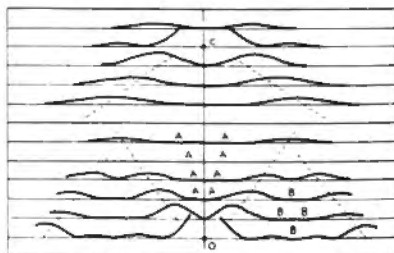
The Ambivalence of Scientists

1963

Many of the endlessly recurrent facts about multiples and priorities are readily accessible—in the diaries and letters, the note-books, scientific papers, and biographies of scientists. This only compounds the mystery of why so little systematic attention has been accorded the subject. The facts have been noted, for they are too conspicuous to remain unobserved, but then they have been quickly put aside, swept under the rug, and forgotten. We seem to have here something like motivated neglect of this aspect of the behavior of scientists and that is precisely the hypothesis I want to examine now.

This resistance to the study of multiples and priorities can be conceived as a resultant of intense forces pressing for public recognition of scientific accomplishments that are held in check by countervailing forces, inherent in the social role of scientists, which press for the modest acknowledgment of limitations, if not for downright humility. Such resistance is a sign of malintegration of the social institution of science which incorporates potentially incompatible values: among them, the value set upon originality, which leads scientists to want their priority to be recognized, and the value set upon due humility, which leads them to insist on how little they have in fact been able to accomplish. To blend these potential incompatibles into a single orientation and to reconcile them in practice is no easy matter. Rather, as we shall now see, the tension between these kindred values creates an inner conflict among men of science who have internalized both of them. Among other things, the tension generates a

distinct resistance to the systematic study of multiples and often associated conflicts over priority.[1]

Various kinds of overt behavior can be interpreted as expressions of such resistance. For one thing, it is expressed in the recurrent pattern of trying to trivialize or to incidentalize the facts of multiples and priority in science. When these matters are discussed in print, they are typically treated as though they were either rare and aberrant (although they are extraordinarily frequent and typical) or as though they were inconsequential both for the lives of scientists and for the advancement of science (although they are demonstrably significant for both).

Understandably enough, many scientists themselves regard these matters as unfortunate interruptions to their getting on with the main job. Kelvin, for example, remarks that "questions of priority, however interesting they may be to the persons concerned, sink into insignificance" as one turns to the proper concern of advancing knowledge.[2] As indeed they do: but sentiments such as these also pervade the historical and sociological study of the behavior of scientists so that systematic inquiry into these matters also goes by default. Or again, it is felt that "the question of priority plays only an insignificant role in the scientific literature of our time"[3] so that, once again, this becomes regarded as a subject which can no longer provide a basis for clarifying the complex motivations and behavior of scientists (if indeed it ever was so regarded).

Now the practice of seeking to trivialize what can be shown to be significant is a well-known manifestation of resistance. Statements of this sort read almost as though they were a paraphrase of the old maxim that the law does not concern itself with exceedingly small matters; *de minimis non curat scientia [lex]*. Not that there has been a conspiracy of silence about these intensely human conflicts in the world of the intellect and especially in science. These have been far too conspicuous to be denied altogether. Rather, the repeated conflict behavior of great and small men of science has been incidentalized as not reflecting any conceivably significant aspects of their role as scientists.

Resistance is expressed also in various kinds of distortions: in motivated misperceptions or in an hiatus in recall and reporting. It often leads to those wish-fulfilling beliefs and false memories that we describe as illusions. And of such behavior the annals that treat of multiples and priorities are uncommonly full. So much so that I have arrived at a rule of thumb that

1. This paragraph draws upon a fuller account of the workings of these values in the social institution of science in "Priorities in Scientific Discovery," chapter 14 of this volume.

2. Silvanus P. Thompson, *The Life of William Thomson, Baron Kelvin of Largs* (London: Macmillan, 1910), 2:602.

3. Otto Blüh, "The Value of Inspiration: A Study of Julius Robert Mayer and Josef Popper-Lynkeus," *Isis* 43 (1952): 211–20, at 211.

seems to work out fairly well. The rule is this: whenever the biography or autobiography of a scientist announces that he had little or no concern with priority of discovery, there is a reasonably good chance that, not many pages later in the book, we shall find him deeply embroiled in one or another battle over priority. A few cases must stand here for many:

Of the great surgeon, W. S. Halsted (who together with Osler, Kelly, and Welch founded the Johns Hopkins Medical School), Harvey Cushing writes: he was "overmodest about his work, indifferent to matters of priority."[4] Our rule of thumb leads us to expect what we find: some twenty pages later in the book in which this is cited, we find a letter by Halsted about his work on cocaine as an anesthesia: "I anticipated all of Schleich's work by about six years (or five). . . . [In Vienna,] I showed Wölfler how to use cocaine. He had declared that it was useless in surgery. But before I left Vienna he published an enthusiastic article in one of the daily papers on the subject. It did not, however, occur to him to mention my name."[5]

Or again, the authoritative biography of that great psychiatrist of the Salpêtrière, Charcot, approvingly quotes the eulogy which says, among other things, that despite his many discoveries, Charcot "never thought for a moment to claim priority or reward." Alerted by our rule of thumb, we find some thirty pages later an account of Charcot insisting on his having been the first to recognize exophthalmic goiter and, a little later, emphatically affirming that he "would like to claim priority" for the idea of isolating patients who are suffering from hysteria.[6]

But perhaps the most apt case of such denial of an accessible reality is that of Ernest Jones, writing in his comprehensive biography that "although Freud was never interested in questions of priority, which he found merely boring"—surely this is a classic case of trivialization at work— "he was fond of exploring the source of what appeared to be original ideas, particularly his own."[7] This is an extraordinarily illuminating statement. For, of course, no one could have "known" better than Jones—"known" in the narrowly cognitive sense—how very often Freud turned to matters of priority: in his own work, in the work of his colleagues (both friends and enemies), and in the history of psychology altogether.

4. In his magisterial biography, *Harvey Cushing* (Springfield: Charles C. Thomas, 1946), pp. 119–20, John F. Fulton describes Cushing's biographical sketch of Halsted, from which this excerpt is quoted, as "an excellent description."

5. Ibid., p. 142.

6. Georges Gullain, *J.-M. Charcot: His Life, His Work*, ed. and trans. Pearce Bailey (New York: Paul B. Hoeber, 1959), pp. 61, 95–96, 142–43.

7. Ernest Jones, *Sigmund Freud: Life and Work*, 3 vols. (London: Hogarth Press, 1957), 3:105. Contrast David Riesman, who takes ample note of Freud's interest in priority, in *Individualism Reconsidered* (Glencoe: The Free Press, 1954), pp. 314–15, 378.

GEOFFREY H. HARTMAN

Blessing the Torrent: On Wordsworth's Later Style

Ein Räthsel ist Reinentsprungenes

Hölderlin

The river is fateful,
Like the last one. But there is no ferryman.
He could not bend against its propelling force.

Wallace Stevens

riverrun, past Eve and Adam's

James Joyce

I

How art thou named? In search of what strange
    land,
From what huge height, descending? Can such
    force
Of waters issue from a British source,
Or hath not Pindus fed thee, where the band
Of Patriots scoop their freedom out, with hand
Desperate as thine? Or come the incessant
    shocks
From that young Stream, that smites the
    throbbing rocks,
Of Viamala? There I seem to stand,
As in life's morn; permitted to behold,
From the dread chasm, woods climbing above
    woods,
In pomp that fades not; everlasting snows;
And skies that ne'er relinquish their repose;
Such power possess the family of floods
Over the minds of Poets, young or old!

IF THE TWO opening lines of this sonnet had
been an untitled fragment, their referent
would be uncertain. Whom is the poet talking
to, what "thou" is addressed? Is the force natural
or divine? And why should the act of naming
be important?

But the lines are part of a sonnet titled specifi-
cally "To the Torrent at the Devil's Bridge,
North Wales, 1824."[1] Moreover, as line 2 runs
into line 3, the "force" is identified as a "force
of waters," that is, a river or, more precisely, a
waterfall. ("Force" was dialect in the North of
England for "waterfall.") Describing the impact
of a different sight, though it also involves nam-

ing or labeling, Wordsworth writes: "My mind
turned round / As with the might of waters."[2]
In the present poem the verse line itself turns
round and naturalizes the poet's wonderment.
Uncertainty of reference gives way to a well-
defined personal situation that is easily de-
scribed, though less easily understood.

II

In September 1824 Wordsworth traveled
through North Wales on one of the many senti-
mental journeys he was fond of taking. They
were sentimental in the sense of covering old
ground in order to reflect on the changes time
had wrought in him or the scene; and "Tintern
Abbey" was the earliest and most remarkable
issue of such memorial visits. On this particular
trip Wordsworth saw a friend of his youth, Rob-
ert Jones, who had shared with him two deter-
mining moments in his life: the ascent of Snow-
don in 1791 and the tour of 1790 through
revolutionary France and the Alps, with its com-
plex seeding in his mind of experiences in the
Simplon/Viamala region. Both journeys were
now over thirty years old, and had already been
described: the Snowdon climb in Book XIII of
the unpublished *Prelude*, and the Continental
tour in Book VI, as well as in *Descriptive
Sketches* (1793). In 1820, moreover, Words-
worth retraced his journey through the Alps with
his sister, Dorothy, and his wife, Mary, both of
whom kept journals of the visit.

On a portion of this new trip to Wales the
poet was accompanied by Robert Jones; and it
was with him (as well as with Mary and Dora
Wordsworth) that he viewed the waterfall de-
scribed in the sonnet. No wonder, then, that as
he stands at the torrent's edge, he feels he is
back "in life's morn," and what he sees with the
eyes of an aging man (he is fifty-four years old)
is not a local river but "the young stream that
smites the throbbing rocks, / Of Viamala,"

which had giddied him when his own mind was young and in turmoil.

We can normalize this sonnet then; and the fact that it is a sonnet, one of so many written during the poet's later career, tempts us to give it a nod of esteem and pass on. There is little on first reading to hold the attention. Formal features of a conventional sort abound: opening and closing apostrophes; a first half comprising a cascade of questions that receive their resolution or coda in the second half, which is introduced by an efficient turn in the eighth line; enjambments that reflect the passion or perplexity of the utterance; and the abbreviated effect of sublimity created by a broken series of descriptive phrases characterizing his memory of the Viamala region (ll. 10–12).

In line with this we can also normalize the initial "How art thou named?" as a rhetorical or animating movement that is a residue of sublime style and so risks bathos. The poet must have known the name; he is obtruding the question to express a momentary ecstacy or disorientation. Still, this trace of sublime diction makes us uneasy; and the discomfort spreads if we read the letter Wordsworth wrote to his noble painter friend, Sir George Beaumont. We learn that "It rained heavily in the night, and we saw the waterfalls in perfection. While Dora was attempting to make a sketch from the chasm in the rain, I composed by her side the following address to the torrent."[3] There is a calming or distancing effect in the phrase "waterfalls in perfection" that reminds us of Wordsworth's own earlier critique of the picturesque artist's superficial mastery of landscape; there is also the subdued paradox of making "a sketch from the chasm" and "composing" an "address to the torrent."

Even if "compose" is used here without the overtone of "repose," two further sonnets written during the visit to Wales stress that "expression of repose" with which nature or time endows wild places.[4] And there is, I would suggest, something faintly absurd about an "address to the torrent." How does one address a *torrent*? To do so, one hears Alice or some Wonderland Creature saying—to do so one must have its name and know where it lives. And, indeed, Wordsworth is not asking for an actual name. His opening question is in search of something

existential rather than informational. If Lucy lives among untrodden ways near the Springs of Dove, where do I live? Where now, in 1824? Near what springs or feeding-sources? Like the torrent itself, he seems uncertain of origin or direction, and the questioning mood of the next lines confirms that.

Yet his opening cry is not "What art thou?" nor as in a moving poem of Hölderlin's "Where art thou?" ("Wo bist Du? Trunken dämmert die Seele mir . . ."). It is "How art thou named?" What force, then, lies in the naming of a force? One of the other sonnets written in Wales describes a stream that mingles with the Dee and flows along the "Vale of Meditation," or "Glyn Myrvr"—a "sanctifying name," comments Wordsworth. As in his early "Poems on the Naming of Places" (1800), he then invents a name in Welsh for the place he wishes to single out. Yet the sonnet before us bestows no name, even though "Devil's Bridge" and "Viamala" might have encouraged a man called Wordsworth.

To "address the torrent" means, clearly enough, to domesticate the sublime: to contain it in the form of picturesque sketch or reflective sonnet; and the opening exclamation, at once perplexed and marveling, is expressive of Wordsworth's problem. The sublime, moreover, is not a quality of place alone but also of time: a bewildering memory seems to decompose the name of the torrent or any that might be given. Though the sonnet as a form is a domesticating device and though Wordsworth emulates Milton's "soul-animating strains" when he first chooses the sonnet as a verse instrument, his diction falters or condenses under the strain. But the significance of this cannot be discussed without attending carefully to the strangeness of Wordsworth's later verse, indeed to the verbal style of the sonnet in its entirety, from title to final exclamation. The title already suggests the problems of (1) naming and (2) localization. It anticipates the question of how a "force" can be localized in place, time, or language.

III

It is when we realize what naming implies that this poem betrays its significant failure, its capable negativity: it cannot name the stream. Acts