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CONTENTS

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What Written Knowledge Does: Three Examples of Academic Discourse*

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Knowledge produced by the academy is cast primarily in written language—now usually a national language augmented by mathematical and other specialized international notations.[1] Language, however, is not an inert vessel. The ancient philosophic and aesthetic debate over the relationship of form and content should caution us to consider the influences the languages of knowledge might have on the shaping of knowledge.[2] Recently linguistic interest in scientific language has produced several descriptions of the syntax of scientific prose in English (Huddleston; Gopnik; Lee).[3] Syntactical studies, however, are concerned only with the patterns of symbols stripped of context and meaning. To understand what language conveys we must look to the contexts in which language operates and to which language refers. Statements do things and talk about things. To put it more formally, we may say that documents serve specific functions within historical and social situations to continue, add to, and transform a group interaction.[4] In carrying on the interaction, nevertheless,

* Fred Baumann, Robert Merton, Norman Storer, Harriet Zuckerman, and members of the Seminar in the Sociology of Science at Columbia University deserve credit for their extensive comments and suggestions on an earlier version of this paper. Responsibility for errors and opinions remains, of course, mine.

1 The limitation of this paper to consideration of the formal printed documents that comprise the permanent record of knowledge excludes consideration of the significant role of informal communication—both spoken and written—in the creation and dissemination of knowledge. Within limited communities informal communication may even serve as the primary channel of publication: informal communication also seems to influence citation patterns (and perhaps patterns of cognitive influence) in formal printed publications. See Diana Crane, *Invisible Colleges*, Chicago 1972; and Donald Edge and Michael Mulkay, *Astronomy Transformed: The Emergence of Radio Astronomy in England*, New York 1976. On the other hand, it may be argued that because talk and other informal communication rely on the prior literature of the field and are aimed at the eventual production of a new document, informal communication must be understood in relation to formal publication. The work of sorting out the full set of relations between formal and informal communication remains to be done.

2 The cognitive consequences of the advent of written forms of language are explored in Jack Goody, *The Domestication of the Savage Mind*, Cambridge 1977; and Eric Havelock, *The Greek Concept of Justice*, Cambridge, Mass. 1978, and *Origins of Western Literacy*, Toronto 1976. The cognitive consequences of the advent of printing are explored in Elizabeth Eisenstein, *The Printing Press as an Agent of Change*, 2 vols., Cambridge 1979.

3 R. D. Huddleston, *The Sentence in Written English*, Cambridge 1971; Myrna Gopnik, *Linguistic Structures in Scientific Texts*, The Hague 1972; and Lee Kok Cheong, *Syntax of Scientific English*, Singapore 1978.

4 See Ludwig Wittgenstein, *Philosophical Investigations*, New York 1953; J. L. Austin,

documents—particularly knowledge-bearing documents—make representations of objects, actions, and knowledge that exist beyond confines of the interaction. Fleck, Kuhn, Popper, Toulmin, and Ziman have each developed a theoretical model defining the respective roles of social situation and reference to the objects of nature within scientific communications.[5] More recently, Latour and Woolgar, and Knorr have examined actual texts to establish models of scientific activity.[6]

This essay continues the investigation of knowledge-bearing texts, but from a different vantage point. Rather than working from a theory of scientific activity, this essay starts with a minimal theory of language—actually little more than an orientation towards texts—in order to discover what the texts reveal about themselves. In particular, the texts are examined in relationship to four contexts: the object under study, the literature of the field, the anticipated audience, and the author's own self.[7] 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 essay 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.

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.[8] About explicit references ques-

How to do Things with Words, Cambridge, Mass. 1962; and John R. Searle, *Speech Acts*, Cambridge 1969.

5 Ludwik Fleck, *Genesis and Development of a Scientific Fact*, Chicago 1979; Thomas S. Kuhn, *The Structure of Scientific Revolutions*, Chicago 1962; Karl R. Popper, *Objective Knowledge*, Oxford 1979; Stephen Toulmin, *Human Understanding*, Princeton 1972; John Ziman, *Public Knowledge*, Cambridge 1968.

6 Bruno Latour and Steve Woolgar, *Laboratory Life: The Social Construction of Scientific Facts*, Beverly Hills, 1979; Karin D. Knorr, 'Producing and Reproducing Knowledge: Descriptive or Constructive?', *Social Science Information*, **16**, 1977, 669-96; and Karin D. Knorr and Dietrich W. Knorr, 'From Scenes to Scripts: On the Relationship Between Laboratory Research and Published Paper in Science', forthcoming.

7 This four part analysis is based on a modification of the model of communication process presented in James Kinneavy, *A Theory of Discourse*, Englewood Cliffs, N.J. 1971. Kinneavy sees language (or a text) mediating among an encoder (or writer), a decoder (or audience), and reality; I have added a fourth item to be mediated by language, the literature.

8 Karl Popper in 'Epistemology Without a Knowing Subject' in *Objective Knowledge* (see note 5) 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 a 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.

9 See also G. Nigel Gilbert, 'Referencing as Persuasion', *Social Studies of Science*, **7**, 1977, 113-22; and Henry G. Small, 'Cited Documents as Concept Symbols', *Social Studies of Science*, **8**, 1978, 327-40.

10 Harriet Zuckerman and Robert Merton discuss codification on pages 510-19 of 'Age, Aging, and Age Structure in Science', in Norman Storer (ed.), *The Sociology of Science*, Chicago 1973. Merton also discusses the implicit use of knowledge, or what he calls 'obliteration by incorporation', in *Social Theory and Social Structure*, New York 1968, chapter one; and in *Sociological Ambivalence and Other Essays*, New York 1976, p. 130.

11 Latour and Woolgar, and Knorr (see note 6) 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', *American Sociological Review*, **41**, 1976, 16-34.

tions arise concerning the precision of meaning conveyed by the reference, the relationship of the reference to the claim of the article, the use made of the reference, and the manner of discussion of the reference.[9] About implicitly used knowledge, questions arise concerning the extent of codification and the role the knowledge takes in the argument.[10]

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).[11]

Finally, the author is represented in several ways within the text. The human mind stands between the reality it perceives and the language it 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 idiosyncracies 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. On the other hand, 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 behaviour 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 over-read as typical of large divisions of knowledge. They represent only three spots on the map of knowledge, and it is as yet unclear where on the map they lie, or even what the map looks like.

I

The article 'A Structure for Deoxyribose Nucleic Acid' (see appendix) 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.[12] 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

12 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 unmistakeably appears, the more certain is the identification of its discrete existence.

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 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 author does, and persuasion may proceed by maintaining apparent focus on the object of study.[13] 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 above generalizations, to be specified through analysis of the text shortly, represent only the appearance of the document itself, and not the full range of actual activity of the scientists. The complex processes of discovery, isolation of phenomena, and interaction with colleagues are well known to involve many psychological, sociological and even random elements which do not appear in the final article.[14] Nonetheless, the role of the conventions of formal presentations should not be discounted as an important factor in sorting out these so-called 'non-scientific' elements of scientific work. The mechanisms of formal scientific communication may encourage the production of knowledge that extends beyond the human and social circumstances of its creation.

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.[15] 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

13 Latour and Woolgar (see note 6), pp. 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'.

14 The complex sociological, psychological, and historical specifics of the process of discovery in the case of D.N.A. are extensively recounted in James Watson, *The Double Helix*, New York 1968; Anne Sayre, *Rosalind Franklin and DNA*, New York 1975; and Horace Freeland Judson, *The Eighth Day of Creation*, New York 1979.

15 Ibid., p. 36. D.N.A. was, in fact, first extracted by Johann Friedrich Miescher in 1869 (ibid., p. 28).

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 identification purposes.

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 substnaces; and most recently, a molecule or ion that can combine with another by forming a covalent bond with two electrons of the other.[16] The tasting and taster vanish as the structure emerges.

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 behaviour 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.

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 usual convention of avoiding 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 D.N.A. 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.

16 *Oxford English Dictionary*, compact edition, New York 1971, p. 20; *Webster's New Collegiate Distionary*, Springfield, Mass. 1953, p. 8; *American Heritage Dictionary*, Boston 1976, p. 10.

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'.[17] 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 structure 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 unnecesary 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 one and four), making assumptions (later in paragraph four), criticizing statements (paragraph two), and placing knowledge claims within other intellectual frameworks (paragraphs eleven and twelve). 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 D.N.A. 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,

17 *Nature*, **171** (April 25, 1953), pp. 737, 738.

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-definition 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.[18]

After this long description of the model, only brief mention is made in paragraphs nine and eleven 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 persuasion, the tenth paragraph presents only limited guidance to the readers about how the

18 Harriet Zuckerman, 'Cognitive and Social Processes in Scientific Discovery: Recombination in Bacteria as a Prototypical Case' (unpublished manuscript, 1974; revised 1975), discusses the resistances 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' (p. 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.

model might be applied. The comment that the model is probably not applicable to R.N.A. may be primarily to eliminate R.N.A. as a competitor for the biological slot of genetic carrier (as was then thought more likely than D.N.A.).

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. This later publication primarily was devoted to spelling out the genetic copying mechanisms.[19] 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.[20] 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 are subordinated to the representation of nature. The criterion of correspondence between statement and object governs all of the contexts.

II

Robert K. Merton's essay in the sociology of science, 'The Ambivalence of Scientists' (see appendix), presents a different kind of linguistic solution to a different kind of linguistic problem. In the D.N.A. 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.

19 J. D. Watson and F. H. C. Crick, 'Genetical Implications of the Structure of Deoxyribonucleic Acid', *Nature*, **171**, May 30, 1953, 942-67; J. D. Watson and F. H. C. Crick, 'The Structure of DNA', *Cold Spring Harbor Symposia on Quantitative Biology*, **18**, 1953, 123-31; and F. H. C. Crick and J. D. Watson, 'The Complementary Structure of Deoxyribonucleic Acid', *Proceedings of the Royal Society*, **A223**, 1954, 80-96.

20 See note 14.

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 behaviour—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 judgement. 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 'D.N.A.'), 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; 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 D.N.A. 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 scienitsts' as well as the scholarly discussion of these documents. The reader of the Watson-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'.[21] The reader is drafted into a club, and only gradually is he filled in on the experience he 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 metaphors 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 contextual 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

21 Ernest Hemingway, *To Have and Have Not*, New York 1937, p. 1.

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 judgements against a normative model, application of judgement 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 judgement 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 latter 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 judgement, 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 mid-point, 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 behaviour.

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.

III

Unlike the previous two articles, Geoffrey Hartman's 'Blessing the Torrent: On Wordsworth's Later Style' (see appendix) 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 judgement 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 Wordsworth; apparently no scholar has questioned the attribution to Wordsworth, the dating, or the purity of the text. The poem is easily reproduced, as is done at the beginning of the essay. Moreover, some elementary 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, consequently, appears to be fixed in a framework even more complete than that

which surrounds D.N.A., 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 naming. 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 personal situation, that is easily described, though less easily understood'. The outside of the situation, captured in the description, is distinguished from the inside of the moment, which counts as understanding. 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 sections 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 vessel of a similar moment. This reading of one sonnet can only provide an analogy for the reading of others, making the other poems more accessible; any more specific claim of equivalence among poems would suggest 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 consciousness of the central issue of the poem. The essay opens with a consideration 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 question. 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 gentle 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 extensive 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 endeavour to feel a connectedness with nature through the poetic imagination.[22] 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. First, 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*. Second, 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

22 See, for example, Geoffrey H. Hartman, *Wordsworth's Poetry 1787-1814*, New Haven, Conn. 1964.

from Wordsworth's time. The argument does rely on this historical, non-literary 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 examply—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 habits. 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' term 'negative capability'. The verbal play suggests a deep transformation of Keats' 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 *lucy-feric* (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.

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 D.N.A. 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 D.N.A. 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 behaviour 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 judgement 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 judgement 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 judgement 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 judgement.

As stated at the beginning of the essay, the texts examined are not necessarily typical of their fields and the contrasts revealed by analysis cannot be taken as defining the features of a spectrum of knowledge. We cannot even begin to speculate on what uniformities with what variations exist within disciplines or whether patterns of differences emerge among disciplines until many more examples have been examined and statistical indicators found to test the generality of conclusions. This analysis, nonetheless, does suggest terms on which typicality can be explored and through which the symbolic knowledge of different disciplines can be compared. The terms of the analysis here provide concrete means for investigating the character of the endeavours of different disciplines, at least as those endeavours appear through the public record of publication.

Moreover, the terms of this analysis suggest how texts serve as dynamic mediating mechanisms, creating those elusive linguistic products we call knowledge. In focusing attention on texts, this analysis looks through the texts to the realms represented in the texts. Texts bring together worlds of reality, mind, tradition, and society in complex and varying configurations, and knowledge is in those words that sit in the middle.

APPENDIX

I J. D. Watson and F. H. C. Crick, 'A Structure for Deoxyribose Nucleic Acid', *Nature*, **171**, April 25, 1953, pp. 737-38, complete.

II Robert K. Merton, 'The Ambivalence of Scientists' in Norman Storer (ed.), *The Sociology of Science*, Chicago 1973, pp. 383-412. Excerpted, pp. 383-85.

III Geoffrey H. Hartman, 'Blessing the Torrent: On Wordsworth's Later Style', *Publications of the Modern Language Assocation*, **93**, March 1978, pp. 196-204. Excerpted, pp. 196-97.

No. 4356 April 25, 1953 NATURE 737

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.

[1] Young, F. B., Gerrard, H., and Jevons, W., *Phil. Mag.*, **40**, 149 (1920).
[2] Longuet-Higgins, M. S., *Mon. Not. Roy. Astro. Soc., Geophys. Supp.*, **5**, 285 (1949).
[3] Von Arx, W. S., Woods Hole Papers in Phys. Oceanog. Meteor., **11** (3) (1950).
[4] Ekman, V. W., *Arkiv. Mat. Astron. Fysik. (Stockholm)*, **2** (11) (1905).

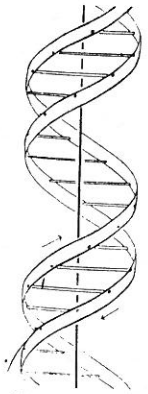
MOLECULAR STRUCTURE OF NUCLEIC ACIDS

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.



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

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 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[1,4] 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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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[4]) 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[5] (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

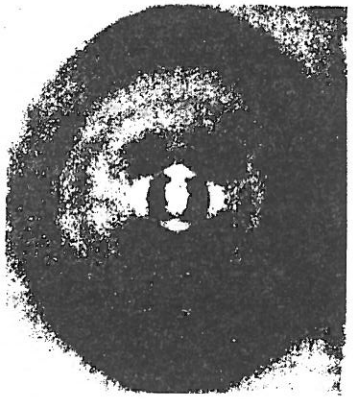

Fig. 1. Fibre diagram of deoxypentose nucleic acid from *B. coli*. Fibre axis vertical

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_n^2) on the nth layer line. The helical configuration produces side-bands on this fundamental frequency, the effect[5] 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 for the inner-

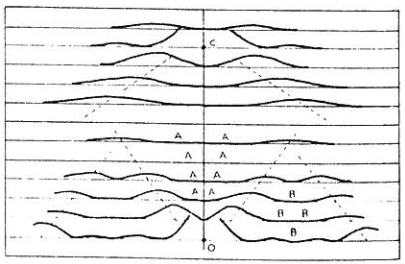

Fig. 2. Diffraction pattern of system of helices corresponding to structure of deoxypentose nucleic acid. The squares of Bessel functions are plotted about 0 on the equator and on the first, second, third and fifth layer lines for half of the nucleotide mass at 20 A. diameter and remainder distributed along a radius, the mass at a given radius being proportional to the radius. About C on the tenth layer line similar functions are plotted for an outer diameter of 12 A.

18

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

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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 specifically "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 naming 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 described, though less easily understood.

II

In September 1824 Wordsworth traveled through North Wales on one of the many sentimental 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, Robert Jones, who had shared with him two determining moments in his life: the ascent of Snowdon in 1791 and the tour of 1790 through revolutionary France and the Alps, with its complex 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, Wordsworth 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 described 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