

CHAPTER FOUR

Gender and Science

The requirements of . . . correctness in practical judgments and objectivity in theoretical knowledge . . . belong as it were in their form and their claims to humanity in general, but in their actual historical configuration they are masculine throughout. Supposing that we describe these things, viewed as absolute ideas, by the single word "objective," we then find that in the history of our race the equation objective = masculine is a valid one.

SIMMEL, quoted by Horney (1926, p. 200)

In articulating the commonplace, Simmel steps outside the convention of academic discourse. The historically pervasive association between masculine and objective, more specifically between masculine and scientific, is a topic that academic critics resist taking seriously. Why is that? Is it not odd that an association so familiar and so deeply entrenched is a topic only for informal discourse, literary allusion, and popular criticism? How is it that formal criticism in the philosophy and sociology of science has failed to see here a topic requiring analysis? The virtual silence of at least the nonfeminist academic community on this subject suggests that the association of masculinity with scientific thought has the status of a myth which either cannot or should not be examined seriously. It has simultaneously the air of being "self-evident" and "nonsensical"—the former by virtue of existing in the realm of common knowledge (that is, everyone knows it), and the latter by virtue of lying outside

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the realm of formal knowledge, indeed conflicting with our image of science as emotionally and sexually neutral. Taken seriously, it would suggest that, were more women to engage in science, a different science might emerge. Such an idea, although sometimes expressed by nonscientists, clashes openly with the formal view of science as being uniquely determined by its own logical and empirical methodology.

The survival of mythlike beliefs in our thinking about science, the very archetype of antimyth, ought, it would seem, to invite our curiosity and demand investigation. Unexamined myths, wherever they survive, have a subterranean potency; they affect our thinking in ways we are not aware of, and to the extent that we lack awareness, our capacity to resist their influence is undermined. The presence of the mythical in science seems particularly inappropriate. What is it doing there? From where does it come? And how does it influence our conceptions of science, of objectivity, or, for that matter, of gender?

These are the questions I wish to address, but before doing so it is necessary to clarify and elaborate the system of beliefs in which science acquires a gender—a system that amounts to a “genderization” of science. Let me make clear at the outset that the issue that requires discussion is *not*, or at least not simply, the relative absence of women in science. Although it is true that most scientists have been, and continue to be, men, the makeup of the scientific population hardly accounts, by itself, for the attribution of masculinity to science as an intellectual domain. Most culturally validated intellectual and creative endeavors have, after all, historically been the domain of men. Few of these endeavors, however, bear so unmistakably the connotation of masculine in the very nature of the activity. To both scientists and their public, scientific thought is male thought, in ways that painting and writing—also performed largely by men—have never been. As Simmel observed, objectivity itself is an ideal that has a long history of identification with masculinity. The fact that the scientific population is, even now, a population that is overwhelmingly male, is itself a consequence rather than a cause of the attribution of masculinity to scientific thought.¹ What requires

1. For a further elaboration of this theme, see “Women in Science: A Social Analysis” (Keller 1974).

discussion is a *belief* rather than a reality, although the ways in which reality is shaped by our beliefs are manifold and also need articulating.

How does this belief manifest itself? It used to be commonplace to hear scientists, teachers, and parents assert quite baldly that women cannot, should not, be scientists, that they lack the strength, rigor, and clarity of mind for an occupation that properly belongs to men. Now that the women’s movement has made such naked assertions offensive, open acknowledgment of the continuing belief in the intrinsic masculinity of scientific thought has become less fashionable. It continues, however, to find daily expression in the language and metaphors we use to describe science. When we dub the objective sciences “hard” as opposed to the softer (that is, more subjective) branches of knowledge, we implicitly invoke a sexual metaphor, in which “hard” is of course masculine and “soft” feminine. Quite generally, facts are “hard,” feelings “soft.” “Feminization” has become synonymous with sentimentalization. A woman thinking scientifically or objectively is thinking “like a man”; conversely, a man pursuing a nonrational, nonscientific argument is arguing “like a woman.”

The linguistic rooting of this stereotype is not lost among children, who remain perhaps the most outspoken and least self-conscious about its expression. From strikingly early ages, even in the presence of astereotypic role models, children learn to identify mathematics and science as male. “Science,” my five-year-old son declared, confidently bypassing the fact that his mother was a scientist, “is for men!” The identification between scientific thought and masculinity is so deeply embedded in the culture at large that children have little difficulty internalizing it. They grow up not only expecting scientists to be men but also perceiving scientists as more “masculine” than other male professionals—for example, those in the arts. Numerous studies of masculinity and femininity in the professions confirm this observation, with the “harder” sciences as well as the “harder” branches of any profession consistently characterized as more masculine.

In one particularly interesting study of attitudes prevalent among English schoolboys, a somewhat different but critically related dimension of the cultural stereotype emerges. Hudson (1972)

observes that scientists are perceived as not only more masculine than artists but simultaneously as less sexual. He writes:

The arts are associated with sexual pleasure, the sciences with sexual restraint. The arts man is seen as having a good-looking, well-dressed wife with whom he enjoys a warm sexual relation; the scientist as having a wife who is dowdy and dull, and in whom he has no physical interest. Yet the scientist is seen as masculine, the arts specialist as slightly feminine. (p. 83)

In this passage we see the genderization of science linked with another, also widely perceived, image of science as antithetical to Eros. These images are not unrelated, and it is important to bear their juxtaposition in mind as we attempt to understand their sources and functions. What is at issue here is the kind of images and metaphors with which science is surrounded. If we can take the use of metaphor seriously, while managing to keep clearly in mind that it is metaphor and language which are being discussed, then we can attempt to understand the influences they might exert—how the use of language and metaphor can become hardened into a kind of reality.

Much attention has been given recently to the technological abuses of modern science, and in many of these discussions blame is directed toward the distortions of the scientific program intrinsic in its ambition to dominate nature without, however, offering an adequate explanation of how that ambition comes to be intrinsic to science. Generally such distortions are attributed to technology, or applied science, which is presumed to be clearly distinguishable from pure science. In the latter the ambition is supposed to be pure knowledge, uncontaminated by fantasies of control. Although it is probably true that the domination of nature is a more central feature of technology, it is impossible to draw a clear line between pure and applied science. History reveals a most complex relation between the two, as complex perhaps as the interrelation between the dual constitutive motives for knowledge: transcendence and power. It would be naive to suppose that the connotations of masculinity and conquest affect only the uses to which science is put and leave its structure untouched.

Science bears the imprint of its genderization not only in the

ways it is used but in the description of reality it offers—even in the relation of the scientist to that description. To see this, it is necessary to examine more fully the implications of attributing masculinity to the very nature of scientific thought.

Having divided the world into two parts—the knower (mind) and the knowable (nature)—scientific ideology goes on to prescribe a very specific relation between the two. It prescribes the interactions which can consummate this union, that is, which can lead to knowledge. Not only are mind and nature assigned gender, but in characterizing scientific and objective thought as masculine, the very activity by which the knower can acquire knowledge is also genderized. The relation specified between knower and known is one of distance and separation. It is that between a subject and an object radically divided, which is to say, no worldly relation. Simply put, nature is objectified. Bacon's "chaste and lawful marriage" is consummated through reason rather than feeling, through "observation" rather than "immediate" sensory experience. The modes of intercourse are defined so as to ensure emotional and physical inviolability for the subject. Concurrent with the division of the world into subject and object is, accordingly, a division of the forms of knowledge into "subjective" and "objective." The scientific mind is set apart from what is to be known, that is, from nature, and its autonomy—and hence the reciprocal autonomy of the object—is guaranteed (or so it had traditionally been assumed) by setting apart its modes of knowing from those in which that dichotomy is threatened. In this process, the characterization of both the scientific mind and its modes of access to knowledge as masculine is indeed significant. Masculine here connotes, as it so often does, autonomy, separation, and distance. It connotes a radical rejection of any commingling of subject and object, which are, it now appears, quite consistently identified as male and female.

What is the real significance of this system of beliefs, whose structure now reveals an intricate admixture of metaphysics, cognitive style, and sexual metaphor? If we reject the position, as I believe we must, that the associations between scientific and masculine are simply "true"—that they reflect a biological difference between male and female brains—then how are we to account for our adherence

to them? Whatever intellectual or personality characteristics may be affected by sexual hormones, it has become abundantly clear that our ideas about the differences between the sexes far exceed what can be traced to mere biology; that, once formed, these ideas take on a life of their own—a life sustained by powerful cultural and psychological forces. Even the brief discussion offered above makes it evident that, in attributing gender to an intellectual posture, in sexualizing a thought process, we inevitably invoke the large world of affect. The task of explaining the associations between masculine and scientific thus becomes, short of reverting to an untenable biological reductionism, the task of understanding the emotional substructure that links our experience of gender with our cognitive experience.

The nature of the problem suggests that, in seeking an explanation of the origins and endurance of this mythology, we look to the processes by which the capacity for scientific thought develops, and the ways in which those processes are intertwined with emotional and sexual development. Doing this makes it possible to acquire deeper insight into the structure and perhaps even the functions of the mythology we seek to elucidate. The route I wish to take proceeds along ground laid by psychoanalysts and cognitive psychologists, along a course shaped by the particular questions I have posed. What emerges is a scenario supported by the insights these workers have attained, and held together, it is to be hoped, by its own logical and intuitive coherence.

The Development of Objectivity

The crucial insight that underlies much of this discussion—an insight for which we are indebted to both Freud and Piaget—is that the capacity for objectivity, for delineating subject from object, is *not* inborn, although the potential for it no doubt is. Rather, the ability to perceive reality “objectively” is acquired as an inextricable part of the long and painful process by which the child’s sense of self is formed. In the deepest sense, it is a function of the child’s capacity for distinguishing self from not-self, “me” from “not-me.” The consolidation of this capacity is perhaps the major achievement of childhood development.

After half a century’s clinical observations of children and adults

the developmental picture that has emerged is as follows. In the early world of the infant, experiences of thoughts, feelings, events, images, and perceptions are continuous. Boundaries have not yet been drawn to distinguish the child’s internal from external environment; nor has order or structure been imposed on either.² The external environment, for most children consisting primarily of the mother during this early period, is experienced as an extension of the child. It is only through the assimilation of cumulative experiences of pleasure and pain, of gratification and disappointment, that the child slowly learns to distinguish between self and other, between image and percept, between subject and object. The growing ability to distinguish his or her self from the environment allows for the recognition of an external reality to which the child can relate—at first magically, and ultimately objectively. In the course of time, the inanimate becomes released from the animate, objects from their perspective, and events from wishes; the child becomes capable of objective thought and perception. The process by which this development occurs proceeds through sequential and characteristic stages of cognitive growth, stages that have been extensively documented and described by Piaget and his co-workers.

The background of this development is fraught with intense emotional conflict. The primary object that the infant carves out of the matrix of his/her experiences is an emotional “object,” namely, the mother. And along with the emergence of the mother as a separate being comes the child’s painful recognition of his/her own separate existence. Anxiety is unleashed, and longing is born. The child (infant) discovers dependency and need—and a primitive form of love. Out of the demarcation between self and mother arises a longing to undo that differentiation, an urge to reestablish the original unity. At the same time, there is also growing pleasure in autonomy, which itself comes to feel threatened by the lure of an earlier state. The process of emotional delineation proceeds in fits and starts, propelled and inhibited by conflicting impulses, desires, and fears. The parallel process of cognitive delineation must be negoti-

2. Since this article was first published, new research in infant studies has produced increasing evidence challenging the sweep of these assumptions (see Stern 1983). Although this evidence does not alter the essential structure of my own argument, it will undoubtedly give rise to future modifications in our understanding of developmental dynamics beyond the modifications discussed in chaps. 4 and 5.

ated against the background of these conflicts. As objects acquire a separate identity, they remain for a long time tied to the self by a network of magical ties. The disentanglement of self from world, and of thoughts from things, requires relinquishing the magical bonds that have kept them connected. It requires giving up the belief in the omnipotence—now of the child, now of the mother—that perpetuates those bonds and learning to tolerate the limits and separateness of both. It requires enduring the loss of a wish-dominated existence in exchange for the rewards of living “in reality.” In doing so, the child moves from the egocentricity of a self-dominated contiguous world to the recognition of a world outside and independent of him/herself: a world in which objects can take on a “life” of their own.

Thus far my description has followed the standard developmental account. The recognition of the independent reality of both self and other is a necessary precondition both for science and for love. It may not, however, be sufficient—for either. Certainly the capacity for love, for empathy, for artistic creativity requires more than a simple dichotomy between subject and object. Autonomy too sharply defined, reality too rigidly defined, cannot encompass the emotional and creative experiences that give life its fullest and richest depth. Autonomy must be conceived of more dynamically and reality more flexibly if they are to allow for the ebb and flow of love and play. Emotional growth does not end with the mere acceptance of one's own separateness; perhaps it is fair to say that it begins there. Out of a condition of emotional and cognitive union with the mother, the child gradually gains enough confidence in the enduring reality of both him/herself and the environment to tolerate their separateness and mutual independence. A sense of self becomes delineated, in opposition, as it were, to the mother. Ultimately, however, both sense of self and of other become sufficiently secure to permit momentary relaxation of the boundary between—without, that is, threatening the loss of either. One has acquired confidence in the enduring survival of both self and other as vitally autonomous. Out of this recognition and acceptance of one's aloneness in the world, it becomes possible to transcend one's isolation, to truly love another.³ The final step—of reintroducing ambiguity into one's re-

3. See, e.g., Kernberg (1977) for a psychoanalytic discussion of love.

lation to the world—is a difficult one. It evokes deep anxieties and fears stemming from old conflicts and older desire. The ground of one's selfhood was not easily won, and experiences that appear to threaten the loss of that ground can be seen as acutely dangerous. Milner (1957), in seeking to understand the essence of what makes a drawing “alive,” and conversely, the inhibitions that impede artistic expression, has written with rare perspicacity and eloquence about the dangers and anxieties attendant upon opening ourselves to the creative perception so critical for a successful drawing. But unless we can, the world of art is foreclosed to us. Neither love nor art can survive the exclusion of a dialogue between dream and reality, between inside and outside, between subject and object.

Our understanding of psychic autonomy and, along with it, of emotional maturity, owes a great deal to the work of the English psychoanalyst Winnicott. Of particular importance here is Winnicott's concept of the transitional object: an object intermediate between self and other (as, for example, the baby's blanket). It is called a transitional object insofar as it facilitates the transition from the state of magical union with the mother to autonomy, the transition from belief in omnipotence to acceptance of the limitations of everyday reality. Gradually, it is given up,

not so much forgotten as relegated to limbo. By this I mean that in health the transitional object does not “go inside” nor does the feeling about it necessarily undergo repression. . . . It loses meaning, and this is because the transitional phenomena have become diffused, have become spread out over the whole intermediate territory between “inner psychic reality” and “the external world as perceived by two persons in common,” that is to say, over the whole cultural field. (Winnicott 1971, p. 5)

To the diffuse survival of the “creative apperception” he attributes what, “more than anything else, makes the individual feel that life is worth living” (p. 65). Creativity, love, and play are located by Winnicott in the “potential space” between the inner psychic space of “me” and the outer social space of “not-me”—“the neutral area of experience which will not be challenged”—about which “we will never ask the question: Did you conceive of this or was it presented to you from without?” (p. 12).

The inability to tolerate such a potential space leads to psychic distress as surely as the complementary failure to delineate adequately between self and other. "These two groups of people come to us for psychotherapy because in the one case they do not want to spend their lives irrevocably out of touch with the facts of life and in the other because they feel estranged from dream" (p. 67). Both inadequate and excessive delineation between self and other can be seen as defenses, albeit opposite ones, against ongoing anxiety about autonomy.

Emotional maturity, then, implies a sense of reality that is neither cut off from, nor at the mercy of, fantasy; it requires a sufficiently secure sense of autonomy to allow for that vital element of ambiguity at the interface between subject and object. In the words of Loewald (1959), "Perhaps the so-called fully developed, the mature ego is not one that has become fixated at the presumably highest or latest stage of development, having left the others behind it, but is an ego that integrates its reality in such a way that the earlier and deeper levels of ego-reality integration remain alive as dynamic sources of higher organization" (p. 18).

Although most of us will recognize the inadequacy of a static conception of autonomy as an emotional ideal, it is easy to fall into the trap of regarding it as an appropriate ideal for cognitive development. That is, cognitive maturity is frequently identified with a posture in which objective reality is perceived and defined as radically divided from the subjective. Our inclination to accept this posture as a model for cognitive maturity is undoubtedly influenced by the definition of objectivity we have inherited from classical science—a definition rooted in the premise that the subject can and should be totally removed from our description of the object. Though that definition has proven unquestionably efficacious in the past, contemporary developments in both philosophy and physics have demonstrated its epistemological inadequacy. They have made it necessary for us to look beyond the classical dichotomy to a more dynamic conception of reality, and a more sophisticated epistemology to support it.

If scientists have exhibited a reluctance to do so, as I think they have, that reluctance should be examined in the light of what we know about the relation between cognitive and emotional development. Elsewhere (see chap. 8) I have attempted to show the per-

sistence of demonstrably inappropriate classical ideas even in contemporary physics, from where the most dramatic evidence for the failure of classical ideas has come. There I try to establish some of the consequences of this persistence, and to account for the tenacity of such ideas. In brief, I argue that the adherence to an outmoded, dichotomous conception of objectivity might be viewed as a defense against anxiety about autonomy of exactly the same kind that we find interfering with the capacity for love and creativity. When even physics reveals "transitional phenomena"—phenomena, that is, about which it cannot be determined whether they belong to the observer or the observed—then it becomes essential to question the adequacy of traditional "realist" modes for cognitive maturity as well as for reality. Our very definition of reality requires constant refinement as we continue in the effort to wean our perceptions from our wishes, our fears, and our anxieties; insofar as our conception of cognitive maturity is dictated by our definition of reality, that conception requires corresponding refinement.

The Development of Gender

What, the reader may ask, has all this to do with gender? Although the discussion has led us on a sizable detour, the implicit argument that relates it to the genderization of science should already be clear. Before articulating the argument more explicitly, however, we need an account of the development of gender identity and gender identifications in the context of the developmental picture I have presented thus far.

Perhaps the single most important determinant of our conceptions of male and female is provided by our perceptions of and experiences with our parents. Although the developmental processes described above are equally relevant for children of both sexes, their implications for the two sexes are bound to differ. The basic and fundamental fact that it is, for most of us, our mothers who provide the emotional context out of which we forge the discrimination between self and other, inevitably leads to a skewing of our perceptions of gender. As long as our earliest and most compelling experiences of merging have their origin in the mother-child relation, it appears to be inevitable that that experience will tend to be identified with "mother," while delineation and separation are experienced as a ne-

gation of "mother," as "not-mother." In the extrication of self from other, the mother, beginning as the first and most primitive subject, emerges, by a process of effective and affective negation, as the first object.⁴ The very processes (both cognitive and emotional) that remind us of that first bond become colored by their association with the woman who is, and forever remains, the archetypal female. Correspondingly, the processes of delineation and objectification are colored by their origins in the process of separation from the mother; they become marked, as it were, as "not-mother." The mother becomes an object, and the child a subject, by a process that itself becomes an expression of opposition to and negation of "mother."

Although there is an entire world that exists beyond the mother, in the family constellation with which we are most familiar it is primarily the father (or the father figure) toward whom the child turns for protection from the fear of reengulfment, from the anxieties and fears of disintegration of a still very fragile ego. It is the father who comes to stand for individuation and differentiation—for objective reality itself; who indeed can represent the "real" world by virtue of being *in* it.

For Freud, reality becomes personified by the father during the oedipal conflict; it is the father who, as the representative of external reality, harshly intrudes on the child's (that is, boy's) early romance with the mother—offering his protection and future fraternity as the reward for the child's acceptance of the "reality principle." Since Freud, however, it has become increasingly well understood that the rudiments of both gender and reality are established long before the oedipal period, and that reality becomes personified by the father as soon as the early maternal bond comes to be experienced as threatening engulfment, or loss of ego boundaries. A particularly pertinent discussion of this process is presented by Loewald (1951), who writes:

Against the threatening possibility of remaining in or sinking back into the structureless unity from which the ego emerged, stands the powerful paternal force. . . . While the primary narcissistic identity with the mother forever con-

4. To the extent that she personifies nature, she remains, for the scientific mind, the final object as well.

stitutes the deepest unconscious origin and structural layer of ego and reality, and the motive force for the ego's "remarkable striving toward unification, synthesis"—this primary identity is also the source of the deepest dread, which promotes, in identification with the father, the ego's progressive differentiation and structuralization of reality. (pp. 15–17)

Thus it is that for all of us—male and female alike—our earliest experiences incline us to associate the affective and cognitive posture of objectification with the masculine, while all processes that involve a blurring of the boundary between subject and object tend to be associated with the feminine.

The crucial question of course is: What happens to these early associations? Although the patterns that give rise to them may be quasi-universal (though strongest, no doubt, in our own form of nuclear family), the conditions that sustain them are not. It is perhaps at this point that specific cultural forces intrude most prominently. In a culture that validates subsequent adult experiences that transcend the subject-object divide, as we find for example in art, love, and religion, these early identifications can be counteracted—provided, that is, that such experiences are validated as essentially human rather than as "feminine" experience. However, in a culture such as ours, where primary validation is accorded to a science that has been premised on a radical dichotomy between subject and object, and where all other experiences are accorded secondary, "feminine" status, the early identifications can hardly fail to persist. The genderization of science—as an enterprise, as an intellectual domain, as a world view—simultaneously reflects and perpetuates associations made in an earlier, prescientific era. If this is true, adherence to an objectivist epistemology, in which truth is measured by its distance from the subjective, has to be reexamined when it emerges that, by this definition, truth itself has become genderized.

It is important to emphasize that what I have been discussing is a system of *beliefs* about the meaning of masculine and feminine rather than any either intrinsic or actual differences between male and female. Children of both sexes learn essentially the same set of ideas about the characteristics of male and female. How they then make use of these ideas in the development of their gender identity

as male or female is another question. The relation between the sexual stereotypes we believe in and our actual experience and even observation of gender is a very complex one. It is crucial, however, to make a vigilant effort to distinguish between belief and reality, even, or especially, when the reality that emerges is so influenced by our beliefs. I have not been claiming, for example, that men are by nature more objective, better suited for scientific work, or that science, even when characterized by an extreme objectivist epistemology, is intrinsically masculine. What I have been discussing are the reasons we might believe such claims to be true: These beliefs may in fact lead to observed differences between the sexes, though the question of actual differences between men and women in a given culture is ultimately an empirical one. The subsequent issue of how those possible differences might be caused by cultural expectations is yet another issue, and requires separate discussion. Without getting into the empirical question of sex differences, about which there is a great deal of debate, it seems reasonable to suggest that our early beliefs about gender are (inevitably) subject to some degree of internalization.

To return to the issue of gender development, it is important to recognize that, although children of both sexes must learn equally to distinguish self from other and have essentially the same need for autonomy, to the extent that boys rest their sexual identity on an opposition to what is both experienced and defined as feminine, the development of their gender identity is likely to accentuate the process of separation. As boys, they must undergo a twofold "disidentification from mother" (Greenson 1968): first for the establishment of a self-identity, and second for the consolidation of a male gender identity. Further impetus is added to this process by the external cultural pressure on the young boy to establish a stereotypic masculinity, now culturally as well as privately connoting independence and autonomy. The traditional cultural definitions of masculine as what can never appear feminine and of autonomy as what can never be relaxed conspire to reinforce the child's earliest associations of female with the pleasures and dangers of merging, and male with both the comfort and the loneliness of separateness. The boy's internal anxiety about both self and gender is here echoed by the cultural anxiety; together they can lead to postures of exaggerated and rigidified autonomy and masculinity that can—indeed that may

be designed to—defend against the anxiety and the longing that generates it. Many psychoanalysts have come to believe that, because of the boy's need to switch his identification from the mother to the father, his sense of gender identity tends always to be more fragile than the girl's. On the other hand, her sense of self-identity may be comparatively more vulnerable. It has been suggested that the girl's development of a sense of separateness may be to some degree hampered by her ongoing identification with her mother. Although she too must disentangle her "self" from the early experience of oneness, she continues to look toward her mother as a model for her gender identity. Whatever vicissitudes her relation to her mother may suffer during subsequent development, a strong identification based on common gender is likely to persist—her need for "disidentification" is not so radical. Cultural forces may further complicate her development of autonomy by stressing dependency and subjectivity as feminine characteristics. To the extent that such traits become internalized, they can be passed on through the generations by leading to an accentuation of the symbiotic bond between mother and daughter (see, for example, Chodorow 1974, 1978).

Thus it seems appropriate to suggest that one possible outcome of these processes is that boys may be more inclined toward excessive and girls toward inadequate delineation: growing into men who have difficulty loving and women who retreat from science. What I am suggesting, and indeed trying to describe, is a network of interactions between gender development, a belief system that equates objectivity with masculinity, and a set of cultural values that simultaneously (and conjointly) elevates what is defined as scientific and what is defined as masculine. The structure of this network is such as to perpetuate and exacerbate distortions in *any* of its parts—including the acquisition of gender identity.

The Development of Scientists

Whatever differences between the sexes such a network might generate (and, as I have said earlier, the existence of such differences remains ultimately an empirical question), they are in any case certain to be overshadowed by the inevitably large variations that exist within both the male and female populations. Not all men become scientists. A science that advertises itself as revealing a reality in

which subject and object are unmistakably distinct may perhaps offer special comfort to those who, as individuals (be they male or female), retain particular anxiety about the loss of autonomy. In short, if we can take the argument presented thus far seriously, then we must follow it through yet another step. Would not a characterization of science which appears to gratify particular emotional needs give rise to a self-selection of scientists—a self-selection that would, in turn, lead to a perpetuation of that same characterization? Without attempting a detailed discussion of either the appropriateness of the imagery with which science is advertised or of the personality characteristics such imagery might select for, it seems reasonable to suggest that such a selection mechanism ought inevitably to operate. The persistence of the characterization of science as masculine, as objectivist, as autonomous of psychological as well as of social and political forces, would then be encouraged, through such selection, by the kinds of emotional satisfaction it provides.

If so, the question that then arises is whether, statistically, scientists do indeed tend to be more anxious about their affective as well as cognitive autonomy than nonscientists. Although it is certainly part of the popular image of scientists that they do, the actual measurement of personality differences between scientists and nonscientists has proven to be extremely difficult; it is as difficult, and subject to as much disagreement, as the measurement of personality differences between the sexes. One obvious difficulty arises out of the term *scientist*, and the enormous heterogeneity of the scientific population. Apart from the vast differences among individuals, characteristics vary across time, nationality, discipline, and, even, with degree of eminence. The Einsteins of history fail, virtually by definition, to conform to more general patterns either of personality or of intellect. Nevertheless, certain themes, however difficult they may be to pin down, continually reemerge with enough prominence to warrant consideration. These are the themes, or stereotypes, on which I have concentrated throughout this essay, and though they can neither exhaustively nor accurately describe science or scientists as a whole—as stereotypes never can—they do acquire a degree of corroboration from the literature on the “scientific personality.” It seems worth noting, therefore, several features that emerge from a number of efforts to describe the personality characteristics which tend to distinguish scientists from nonscientists.

I have already referred to the fact that scientists, particularly physical scientists, score unusually high on “masculinity” tests, meaning only that, on the average, their responses differ greatly from those of women. At the same time, studies (for example, Roe 1953, 1956) report that they tend overwhelmingly to have been loners as children, to be low in social interests and skills, indeed to avoid interpersonal contact. McClelland’s subsequent studies confirm these impressions. He writes: “And it is a fact, as Anne Roe reports, that young scientists are typically not very interested in girls, date for the first time late in college, marry the first girl they date, and thereafter appear to show a rather low level of heterosexual drive” (1962, p. 321). One of McClelland’s especially interesting findings was that 90 percent of a group of eminent scientists see, in the “mother-son” picture routinely given as part of the Thematic Apperception Test, “the mother and son going their separate ways” (p. 323), a relatively infrequent response to this picture in the general population. It conforms, however, with the more general observation (emerging from biographical material) of a distant relation to the mother,⁵ frequently coupled with “open or covert attitudes of derogation” (Roe 1956, p. 215).

Though these remarks are admittedly sketchy and by no means constitute a review of the field, they do suggest a personality profile that seems admirably suited to an occupation seen as simultaneously masculine and asexual. The Baconian image of a “chaste and lawful marriage” becomes remarkably apt insofar as it allows the scientist both autonomy and mastery in his marriage to a bride kept at safe, “objectified” remove.⁶

5. These studies are, as is evident, of male scientists. It is noteworthy, however, that studies of the relatively small number of female scientists reveal a similar, perhaps even more marked, pattern of distance in relations to the mother. For most, the father proved to be the parent of primary emotional and intellectual importance (see, e.g., Plank and Plank 1954).

6. Earlier I pointed out how Bacon’s marital imagery constitutes an invitation to the “domination of nature.” A fuller discussion of this posture would also require consideration of the role of aggression in the development of object relations and symbolic thought processes (an aspect that has been omitted from the present discussion). It has been suggested by Winnicott that the act of severing subject from object is experienced by the child as an act of violence, and that it carries with it forever, on some level, the feeling tone of aggression. Winnicott observes that “it is the destructive drive that creates the quality of externality” (p. 93), that, in the creation and recognition of the object there is always, and inevitably, an implicit act

Conclusion

It is impossible to conclude a discussion of the genderization of science without making some brief comments on its social implications. The linking of scientific and objective with masculine brings in its wake a host of secondary consequences that, however self-evident, may nevertheless need articulating. Not only does our characterization of science thereby become colored by the biases of patriarchy and sexism, but simultaneously our evaluation of masculine and feminine becomes affected by the prestige of science. A circular process of mutual reinforcement is established in which what is called scientific receives extra validation from the cultural preference for what is called masculine, and, conversely, what is called feminine—be it a branch of knowledge, a way of thinking, or woman herself—becomes further devalued by its exclusion from the special social and intellectual value placed on science and the model science provides for all intellectual endeavors. This circularity not only operates on the level of ideology but is assisted by the ways in which the developmental processes, both for science and for the child, internalize ideological influences. For each, pressures from the other operate, in the ways I have attempted to describe, to effect biases and perpetuate caricatures.

Neither in emphasizing the self-sustaining nature of these beliefs, nor in relating them to early childhood experience do I wish to suggest that they are inevitable. On the contrary, by examining their dynamics I mean to emphasize the existence of alternative possibilities. The disengagement of our thinking about science from our notions of what is masculine could lead to a freeing of both from some of the rigidities to which they have been bound, with profound ramifications for both. Not only, for example, might science become more accessible to women, but, far more importantly, our very con-

of destruction. Indeed, he says, "It is the destruction of the object that places the object outside the area of the subject's omnipotent control" (p. 90). Its ultimate survival is, of course, crucial for the child's development. "In other words, because of the survival of the object, the subject may now have started to live in the world of objects, and so the subject stands to gain immeasurably; but the price has to be paid in acceptance of the ongoing destruction in unconscious fantasy relative to object-relating" (p. 90). It seems likely that the aggressive force implicit in this act of objectification must make its subsequent appearance in the relation between the scientist and his object, that is, between science and nature.

ception of "objective" could be freed from inappropriate constraints. As we begin to understand the ways in which science itself has been influenced by its unconscious mythology, we can begin to perceive the possibilities for a science not bound by such mythology.

How might such a disengagement come about? To the extent that my analysis rests on the significance of the gender of the primary parent, changing patterns of parenting could be of critical importance.⁷ But other developments might be of equal importance. Changes in the ethos that sustains our beliefs about science and gender could also come about from the current pressure (in part, politically inspired) to reexamine the traditionally assumed neutrality of science, from philosophical exploration of the boundaries or limitations of scientific inquiry, and even, perhaps especially, from events within science itself. Both within and without science, the need to question old dogma has been pressing. Of particular interest among recent developments *within* science is the growing interest among physicists in a process description of reality—a move inspired by, perhaps even necessitated by, quantum mechanics. In these descriptions, object reality acquires a dynamic character, akin to the more fluid concept of autonomy emerging from psychoanalysis. Bohr himself perspicaciously provided us with a considerably happier image than Bacon's (one more apt even for the future of physics) when he chose for his coat of arms the yin-yang symbol, over which reads the inscription: *Contraria Sunt Complementa*.

Where, finally, has this analysis taken us? In attempting to explore the significance of the sexual metaphor in our thinking about science, I have offered an explanation of its origins, its functions, and some of its consequences. Necessarily, many questions remain, and it is perhaps appropriate, by way of concluding, to articulate some of them. I have not, for example, more than touched on the social and political dynamics of the genderization of science. This is

7. In this I am glad to be joined by Dinnerstein (1976), who contributes an extraordinarily provocative analysis of the consequences of the fact that it is, and has always been, the mother's "hand that rocks the cradle." Her analysis, though it goes much further than the sketch provided here, essentially corroborates my own in the places where they overlap. She concludes that the human malaise resulting from the present sexual arrangements can be cured only by sharing the nurturance and care of the infant equally between the mother and the father. Perhaps that is true. I would, however, argue that, at least for the particular consequences I have discussed here, other changes might be of more immediate bearing.

a crucial dimension that remains in need of further exploration. It has seemed to me, however, that central aspects of this problem belong in the psychological domain, and further, that this is the domain least accounted for in most discussions of scientific thought.

Within the particular model of affective and cognitive development I have invoked, much remains to be understood about the interconnections between cognition and affect. Although I have, throughout, assumed an intimate relation between the two, it is evident that a fuller and more detailed conception is necessary.

Finally, the speculations I offer raise numerous questions of historical and psychological fact. I have already indicated some of the relevant empirical questions on the psychology of personality that bear on my analysis. Other questions of a more historical nature ought also to be mentioned. How, for example, have conceptions of objectivity changed with time, and to what extent have these conceptions been linked with similar sexual metaphors in other, pre-scientific eras (see, for example, part 1), or, for that matter, in other, less technological cultures? Clearly, much remains to be investigated; perhaps the present essay can serve to provoke others to help pursue these questions.

CHAPTER FIVE

Dynamic Autonomy: Objects as Subjects

Plato and Bacon may be the two most cited forebears of modern science, but between them lies a divide more urgent than time: their incommensurability is marked above all by the gulf between love and power. Whereas the Platonic knower seeks to "approach and unite" with the essential nature of things, guided in his search by pure eros, for the Baconian scientist knowledge is equated with power; he seeks dominion over things. Both visions of knowledge are supported by images of chaste sexuality, but the difference between the two images is striking. For Plato, chastity implies a demarcation between body and soul; it serves to safeguard the erotic purity of the like-to-like relationship between the mental faculty and the objects of knowledge. By contrast, Bacon's "chaste and lawful marriage"—now between a male mind and a female nature—seems to be a metaphor for power and domination, designed to safeguard the integrity of the knower.

However, to stop at the suggestion that Bacon's marital metaphor sets modern science in a patriarchal tradition and thus *naturally* implies domination is to miss an opportunity to examine the subtler dynamics of domination in both science and patriarchy. It is, for one, to miss the complex interaction between chastity and conjugality that plays such a crucial role in Bacon's vision. This marriage is chaste because it keeps sexual congress within bounds, lawful, and hence safely under control. Unlike Plato's vision of ultimate union, and unlike the "mystic marriage" of the alchemists, Bacon's vision was of a conjunction that remains forever disjunctive. The question we must ask is this: To what extent does that disjunction carry within it a *necesssary* implication of control and power? Or, in the words