Male Nipples and Clitoral Ripples

The Marquis de Condorcet, enthusiast of the French Revolution but not radical enough for the Jacobins—and therefore forced into hiding from a government that had decreed, and would eventually precipitate, his death—wrote in 1793 that “the perfectibility of man is really boundless... It has no other limit than the duration of the globe where nature has set us.” As Dickens so aptly remarked, “It was the best of times, it was the worst of times.”

The very next year, as Condorcet lay dying in prison, a famous voice from across the channel published another paean to progress in a world that many judged on the brink of ruin. This treatise, called Zoonomia, or the Laws of Organic Life was written by Erasmus Darwin, grandfather of Charles.

Zoonomia is primarily a dissertation on the mechanisms of human physiology. Yet, in the anachronistic tradition that judges biological works by their attitude to the great watershed of evolution, established by grandson Charles in 1859, Zoonomia owes its modern reputation to a few fleeting passages that look upon organic transmutation with favor.

The evolutionary passages of Zoonomia occur in Item 8, Part 4, of Section 39, entitled, “Of Generation,” Erasmus Darwin’s thoughts on reproduction and embryology. He viewed embryology as a tale of continuous progress to greater size and complexity. Since his evolutionary speculations are strictly analogous to his concept of embryology, organic transformation also follows a single pathway to more and better:

Would it be too bold to imagine that in the great length of time, since the earth began to exist...all warm-
blooded animals have arisen from one living filament... possessing the faculty of continuing to improve by its own inherent activity, and of delivering down those improvements by generation to its posterity, world without end?

As the last sentence states, Erasmus Darwin’s proposed mechanism of evolution lay in the inheritance of useful characters acquired by organisms during their lifetimes. This false theory of heredity has passed through later history under the label of Lamarckism, but the citation by Erasmus (a contemporary of Lamarck) illustrates the extent of this misnomer. Inheritance of acquired characters was the standard folk wisdom of the time, used by Lamarck to be sure, but by no means original or distinctive with him. For Erasmus, this mechanism of evolution required a concept of pervasive utility. New structures arose only when needed and by direct organic striving for an evident purpose. Erasmus discusses adaptations in three great categories: reproduction, protection and defense, and food. Of the last, he writes:

All... seem to have been gradually produced during many generations by the perpetual endeavor of the creatures to supply the want of food, and to have been delivered to their posterity with constant improvement of them for the purposes required.

In this long section, Erasmus considers only one potential exception to the principle of pervasive utility: “the breasts and teats of all male quadrupeds, to which no use can now be assigned.” He also suggests two exits from this potential dilemma: first, that male nipples are vestiges of a previous utility if, as Plato had suggested, “mankind with all other animals were originally hermaphrodites during the infancy of the world, and were in process of time separated into male and female;” and second, that some males may lactate and therefore help to feed their babies (in the absence of any direct evidence,
Erasmus cites the milky-colored feeding fluids, produced in the crops of both male and female pigeons, as a possible analogue.

The tenacity of anomalies through centuries of changing beliefs can be truly astounding. As a consequence of writing these essays for so many years, I receive hundreds of letters from readers puzzled about one or another apparent oddity of nature. With so large a sample, I have obtained a pretty good feel for the issues and particulars of evolution that pose conundrums for well-informed nonscientific readers. I have been fascinated (and, I confess, surprised) over the years to discover that no single item has evoked more puzzlement than the very issue that Erasmus Darwin chose as a primary challenge to his concept of pervasive utility—male nipples. I have received more than a dozen requests to explain how evolution could possibly produce such a useless structure.

Consider my latest example from a troubled librarian. “I have a question that no one can answer for me, and I don’t know where or how to look up the answer. Why do men have nipples? . . . This question nags at me whenever I see a man’s bare chest!”

I was fascinated to note that her two suggestions paralleled exactly the explanations floated by Erasmus Darwin. First, she reports, she asked a doctor. “He told me that men in primitive societies used to nurse babies.” Finding this incredible, she tried Darwin’s first proposal for nipples as a vestige of previous utility: “Can you tell me—was there once only one sex?”

If you are committed—as Erasmus was, and as a distressingly common version of “pop,” or “cardboard,” Darwinism still is—to a principle of pervasive utility for all parts of all creatures, then male nipples do raise an insoluble dilemma, hence (I assume) my voluminous correspondence. But as with so many persistent puzzles, the resolution does not lie in more research within an established framework but rather in identifying the framework itself as a flawed view of life.
Suppose we begin from a different point of view, focusing on rules of growth and development. The external differences between male and female develop gradually from an early embryo so generalized that its sex cannot be easily determined. The clitoris and penis are one and the same organ, identical in early form, but later enlarged in male fetuses through the action of testosterone. Similarly, the labia majora of women and the scrotal sacs of men are the same structure, indistinguishable in young embryos, but later enlarged, folded over, and fused along the midline in male fetuses.

I do not doubt that the large size and sensitivity of the female breast should count as an adaptation in mammals, but the smaller male version needs no adaptive explanation at all. Males and females are not separate entities, shaped independently by natural selection. Both sexes are variants upon a single ground plan, elaborated in later embryology. Male mammals have nipples because females need them—and the embryonic pathway to their development builds precursors in all mammalian fetuses, enlarging the breasts later in females but leaving them small (and without evident function) in males.

In a similar case that illuminates the general principle, the panda develops a highly functional false “thumb” from the radial sesamoid bone of its wrist. Interestingly, the corresponding bone of the foot, the tibial sesamoid, is also enlarged in the same manner (but not nearly so much), although increase of the tibial sesamoid has no apparent function.

As D. Dwight Davis argued in his great monograph on the giant panda (1964), evolution works on growth fields. Radial and tibial sesamoid are homologous structures, probably affected in concert by the same genetic factors. If natural selection operates for an enlarged radial sesamoid, a bigger tibial sesamoid will probably “come along for the ride.” Davis drew a profound message from this case: Organisms are integral and constrained structures, “pushing back” against the force of selection to channel changes along permitted paths; com-
plex animals are not a dissociable collection of independent, optimal parts. Davis wrote that "the effect seen in the sympathetic enlargement of the tibial sesamoid...strongly suggests that a very simple mechanism, perhaps involving a single factor, lies behind the hypertrophy of the radial sesamoid."

In my view of life, akin to Davis's concept of constraint and integration, male nipples are an expectation based on pathways of sexual differentiation in mammalian embryology.

At this point, readers might demur with the most crushing of all rejoinders: "Who cares?" Why worry about little items that ride piggyback on primary adaptations? Let's concentrate on the important thing—the adaptive value of the female breast—and leave aside the insignificant male ornament that arises as its consequence. Adaptations are preeminent; their side effects are nooks and crannies of organic design, meaningless bits and pieces. This argument is, I think, the standard position of strict Darwinian adaptationists.

I could defend the importance of structural nonadaptation with a long and abstruse general argument (I have done so in several technical papers). Let me proceed instead by the most compelling route I know by presenting a second example based on human sexuality, a case entirely comparable in concept with the origin of male nipples but differing in importance for human culture—a case, moreover, where the bias of utility has brought needless pain and anxiety into the lives of millions (where, indeed, one might argue that Freudian traditions have provided a manifestly false but potent weapon, however unintentional, for the subjugation of women). Consider the anatomical site of orgasm in human females.

As women have known since the dawn of our time, the primary site for stimulation to orgasm centers upon the clitoris. The revolution unleashed by the Kinsey report of 1953 has, by now, made this information available to men who, for whatever reason, had not figured it out for themselves by the more obvious routes of experience and sensitivity.

The data are unambiguous. Consider only the three most
widely read of extensive surveys—the Kinsey report of 1953, Masters and Johnson’s book of 1966, and The Hite Report of 1976. In his study of genital anatomy, Kinsey reports that the female clitoris is as richly supplied with sensory nerves as the male penis—and therefore as capable of excitation. The walls of the vagina, on the other hand, “are devoid of end organs of touch and are quite insensitive when they are gently stroked or lightly pressed. For most individuals the insensitivity extends to every part of the vagina.”

The data on masturbation are particularly convincing. Kinsey reports from his sample of 8,000 women that 84 percent of individuals who have ever masturbated depend “primarily on labial and/or clitoral techniques.” The Hite Report on 3,000 individuals found that 79 percent of women who masturbate do so by directly stimulating the clitoris and surrounding vulva, while only 1.5 percent use vaginal entry.

The data on intercourse affirm this pattern. Shere Hite reports a frequency of orgasm with intercourse at 30 percent and often attained only with simultaneous stimulation of the clitoris by hand. She concludes: “not to have orgasm from intercourse is the experience of the majority of women.” Masters and Johnson only included women who experienced orgasm with intercourse in their study. But they concluded that all orgasms are identical in physiology and clitoral in origin. These findings led Hite to comment that human copulation “sounds more like a Rube Goldberg scheme than a reliable way to orgasm. . . . Intercourse was never meant to stimulate women to orgasm.” As Kinsey had said earlier with his characteristic economy and candor: “The techniques of masturbation and of petting are more specifically calculated to effect orgasm than the techniques of coitus itself.”

This conclusion should be utterly unsurprising—once we grasp the proper role and limitation of adaptationist argument in evolutionary biology. I don’t believe in the mystery style of writing essays: build up suspense but save the resolution until the end—for then readers miss the significance of details along
the way for want of proper context. The reason for a clitoral site of orgasm is simple—and exactly comparable with the nonpuzzle of male nipples. The clitoris is the homologue of the penis—it is the same organ, endowed with the same anatomical organization and capacity of response.

Anatomy, physiology, and observed responses all agree. Why then do we identify an issue at all? Why, in particular, does the existence of clitoral orgasm seem so problematic? Why, for example, did Freud label clitoral orgasm as infantile and define feminine maturity as the shifting to an unattainable vaginal site?

Part of the reason, of course, must reside in simple male vanity. We (and I mean those of my sex, not the vague editorial pronoun) simply cannot abide the idea—though it flows from obvious biology—that a woman’s sexual pleasure might not arise most reliably as a direct result of our own coital efforts. But the issue extends further. Clitoral orgasm is a paradox not only for the traditions of Darwinian biology but also for the bias of utility that underlies all functionally based theories of evolution (including Lamarck’s and Darwin’s) and, in addition, the much older tradition of natural theology that saw God’s handiwork in the exquisite fit of organic form to function.

Consider the paradox of clitoral orgasm in any world of strict functionalism (I present a Darwinian version, but parallel arguments can be made for the entire range of functionalist thinking, from Paley’s natural theology to Cuvier’s creationism): Evolution arises from a struggle among organisms for differential reproductive success. Sexual pleasure, in short, must evolve as a stimulus for reproduction.

This formulation works for men since the peak of sexual excitement occurs during ejaculation—a primary and direct adjunct of intercourse. For men, maximal pleasure is linked with the greatest possibility of fathering offspring. In this perspective, the sexual pleasure of women should also be centered upon the act that causes impregnation—on intercourse itself.
But how can our world be functional and Darwinian if the site of orgasm is divorced from the place of intercourse? How can sexual pleasure be so separated from its functional significance in the Darwinian game of life? (For the most divergent, but equally functionalist, view of some conservative Christians, sex was made by God to foster procreation; any use in any other context is blasphemy.)

Elisabeth Lloyd, a philosopher of science at Berkeley, has just completed a critical study of explanations recently proposed by evolutionary biologists for the origin and significance of female orgasm. Nearly all these proposals follow the lamentable tradition of speculative storytelling in the a priori adaptationist mode. In all the recent Darwinian literature, I believe that Donald Symons is the only scientist who presented what I consider the proper answer—that female orgasm is not an adaptation at all. (See his book, *The Evolution of Human Sexuality*, 1979.)

Many of these scientists don't even know the simple facts of the matter; they assume that female orgasms are triggered by intercourse and draw the obvious Darwinian conclusion. A second group recognizes the supposed paradox of nonassociation between orgasm and intercourse and then proposes another sort of adaptive explanation, usually based on maintenance of their pair bond by fostering close relationships through sexual pleasure. Desmond Morris (*The Naked Ape*, 1969), the most widely read promoter of this view, writes that female orgasm evolved for its role in promoting the pair bond by “the immense behavioral reward it brings to the act of sexual cooperation with the mated partner.” Perhaps no popular speculation has been more androcentric than George Pugh’s (*Biological Origin of Human Values*, 1977), who speaks about “the development of the female orgasm, which makes it easier for a female to be satisfied by one male, and which also operates psychologically to produce a stronger emotional bond in the female.” Or Eibl-Eibesfeldt, who argues (1975) that the evolution of female orgasm “increases her readiness to sub-
mit and, in addition, strengthens her emotional bond to the partner."

This popular speculation about pair bonding usually rests upon an additional biological assumption—almost surely false—that capacity for female orgasm is an especially human trait. Yet Symons shows, in his admirable review of the literature, that whereas most female mammals do not experience orgasm during ordinary copulation, prolonged clitoral stimulation—either artificially in the laboratory (however unpleasant a context from the human point of view) or in nature by rubbing against another animal (often a female)—does produce orgasm in a wide range of mammals, including many primates. Symons concludes that "orgasm is most parsimoniously interpreted as a potential all female mammals possess."

Adaptive stories for female orgasm run the full gamut—leaving only the assumption of adaptation itself unquestioned. Sarah Hrdy (1981), for example, has taken up the cudgels against androcentrism in evolutionary speculation, not by branding the entire enterprise as bankrupt, but by showing that she can tell just as good an adaptive story from a female-centered point of view. She argues—turning the old pair-bond theory on its head—that the dissociation between orgasm and intercourse is an adaptation for promiscuous behavior, permitting females to enlist the support of several males to prevent any one from harming her babies. (In many species, a male that displaces a female's previous partner may kill her offspring, presumably to foster his own reproductive success by immediate remating.)

Indeed, no one surpasses Hrdy in commitment to the adaptationist assumption that orgasm must have evolved for Darwinian utility in promoting reproductive success. Chosen language so often gives away an underlying bias; note Hrdy's equation of nonadaptation both with despair in general and with the denigration of women's sexuality in particular.

Are we to assume, then, that [the clitoris] is irrelevant? . . . It would be safer to suspect that, like most organs . . .
it serves a purpose, or once did. . . . The lack of obvious purpose has left the way open for both orgasm, and female sexuality in general, to be dismissed as "nonadaptive."

But why are adaptationist arguments "safer," and why is nonadaptation a "dismissal"? I do not feel degraded because my nipples are concomitants of a general pattern in human development and not a sign that ancestors of my sex once lactated. In fact, I find this nonadaptationist explanation particularly fascinating, both because it teaches me something important about structural rules of development and because it counters a pervasive and constraining bias that has harmed evolutionary biology by restricting the range of permitted hypotheses. Why should the dissociation of orgasm from intercourse degrade women when it merely records a basic (if unappreciated) fact of human anatomy that happens to unite both sexes as variations of a common pattern in development? (Such an argument would only hold if adaptations were "good" and all other aspects of anatomy "irrelevant." I, for one, am quite attached to all my body parts and do not make such invidious rankings and distinctions among them.)

I could go on but will stop here for the obvious reason that this discussion, however amusing, might be deemed devoid of social importance. After all, these biologists may be enjoying themselves and promoting their view of life, but isn't all this strictly entre nous? I mean, after all, who cares about speculative ideas if they impose no palpable harm upon people's lives? But unfortunately, the history of psychology shows that one of the most influential theories of our century—a notion that had a direct and deeply negative effect upon millions of women—rested upon the false assumption that clitoral orgasm cannot be the natural way of a mature female. I speak, of course, about Sigmund Freud's theory of transfer from clitoral to vaginal orgasm.

In Freud's landmark and most influential book *Three Essays on the Theory of Sexuality* (1905, but first published in
complete form in 1915), the third essay on “transformations of puberty” argues that “the leading erotogenic zone in female children is located at the clitoris.” He also, as a scientist originally trained in anatomy, knows the reason—that the clitoris “is homologous to the masculine genital zone of the glans penis.”

Freud continues: “All my experience concerning masturbation in little girls has related to the clitoris and not the regions of the external genitalia that are important in later sexual functioning.” So far so good; Freud recognizes the phenomenon, knows its anatomical basis, and should therefore identify clitoral orgasm as a proper biological expression of female sexuality. Not at all, for Freud then describes a supposed transformation in puberty that defines the sexuality of mature women.

Puberty enhances the libido of boys but produces an opposite effect in girls—“a fresh wave of repression.” Later, sexuality resumes in a new way. Freud writes:

When at last the sexual act is permitted and the clitoris itself becomes excited, it still retains a function: the task, namely, of transmitting the excitation to the adjacent female sexual parts, just as—to use a simile—pine shavings can be kindled in order to set a log of harder wood on fire.

Thus, we encounter Freud’s famous theory of female sexual maturity as a transfer from clitoral to vaginal orgasm:

When erotogenic susceptibility to stimulation has been successfully transferred by a woman from the clitoris to the vaginal orifice, it implies that she has adopted a new leading zone for the purposes of her later sexual activity.

This dogma of transfer from clitoral to vaginal orgasm became a shibboleth of pop culture during the heady days of pervasive
Freudianism. It shaped the expectations (and therefore the frustration and often misery) of millions of educated and “enlightened” women told by a brigade of psychoanalysts and by hundreds of articles in magazines and “marriage manuals” that they must make this biologically impossible transition as a definition of maturity.

Freud’s unbiological theory did further harm in two additional ways. First, Freud did not define frigidity only as an inability to perform sexually or as inefficacy in performance, but proposed as his primary definition a failure to produce this key transfer from clitoris to vagina. Thus, a woman who greatly enjoys sex, but only by clitoral stimulation, is frigid by Freud’s terminology. “This anaesthesia,” Freud writes, “may become permanent if the clitoridal zone refuses to abandon its excitability.”

Second, Freud attributed a supposedly greater incidence of neurosis and hysteria in women to the difficulty of this transfer—for men simply retain their sexual zone intact from childhood, while women must undergo the hazardous switch from clitoris to vagina. Freud continues:

The fact that women change their leading erotogenic zone in this way, together with the wave of repression at puberty...are the chief determinants of the greater proneness of women to neurosis and especially to hysteria. These determinants, therefore, are intimately related to the essence of femininity.

In short, Freud’s error may be encapsulated by stating that he defined the ordinary biology of female sexuality as an aberration based on failure to abandon an infantile tendency.

The sources of Freud’s peculiar theory are complex and involve many issues not treated in this essay (in particular his androcentric biases in interpreting the act of intercourse from a man’s point of view and in defining both clitoral and penile stimulation in childhood as a fundamentally masculine form
of sexuality that must be shunned by a mature woman). But another important source resides in the perspective underlying all the fanciful theories that I have discussed throughout this essay, from male nipples as sources of milk to clitoral orgasm as a clever invention to cement pair bonds—the bias of utility, or the exclusive commitment to functionalist explanations.

The more I read Kinsey, the more he wins my respect for his humane sensibility, and for his simple courage. (His 1953 report on Sexual Behavior in the Human Female appeared during the height of McCarthyism in America and led to a withdrawal of funding for his research and the effective end, during his lifetime, of his programs—see the essay “Of Wasps and WASPs” in my previous book, The Flamingo’s Smile.) Kinsey was a measured man. He wrote in a dry and clinical fashion (probably more for reasons of necessity than inclinations of temperament). Yet, every once in a while, his passion spills forth and his rage erupts in a single, well-controlled phrase. Nowhere does Kinsey express more agitation than in his commentary on Freud’s theory of the shift from clitoral to vaginal orgasm.

Kinsey locates his discussion of Freud in the proper context—in his section on sexual anatomy (Chapter 14, “Anatomy of Sexual Response and Orgasm”). He reports the hard data on adult masturbation and on the continuing clitoral site of orgasm in mature women. He locates the reason for clitoral orgasm not in any speculative theory about function but in the basic structure of sexual anatomy.

In any consideration of the functions of the adult genitalia, and especially in their liability to sensory stimulation, it is important and imperative that one take into account the homologous origins of the structures in the two sexes.

Kinsey then provides a long and beautifully clear discussion of anatomical homologies, particularly the key unity of
penis and clitoris. He concludes that "the vaginal walls are quite insensitive in the great majority of females. . . . There is no evidence that the vagina is ever the sole source of arousal, or even the primary source of erotic arousal in any female." Kinsey has now laid the foundation for a swift demolition of Freud's hurtful theory. He cites (in a long footnote, for his text is not contentious) a compendium of psychoanalytical proclamations from the Freudian heyday of the 1920s to 1940s. Consider just three items on his list:

1. (from 1936): "If this transition [from clitoris to vagina] is not successful, then the woman cannot experience satisfaction in the sexual act. . . . The first and decisive requisite of a normal orgasm is vaginal sensitivity."

2. (again from 1936): "The sole criterion of frigidity is the absence of the vaginal orgasm."

3. (from 1927): "In frigidity the pleasurable sensation is as a rule situated in the clitoris and the vaginal zone has none."

Kinsey's sole paragraph of evaluation ranks as the finest dismissal by understatement (and by incisive phrase at the end) that I have ever read.

This question is one of considerable importance because much of the literature and many of the clinicians, including psychoanalysts and some of the clinical psychologists and marriage counselors, have expended considerable effort trying to teach their patients to transfer "clitoral responses" into "vaginal responses." Some hundreds of women in our own study and many thousands of the patients of certain clinicians have consequently been much disturbed by their failure to accomplish this biological impossibility.

I then must ask myself, why could Kinsey be so direct and sensible in 1953, while virtually all evolutionary discussion of female orgasm during the past twenty years has been not only biologically erroneous but also obtuse and purely speculative? I'm sorry to convert this essay into something of a broken re-
cord in contentious repetition, but the same point pervades the discussion all the way from Erasmus Darwin on male nipples to Sarah Hrdy on clitoral orgasm. The fault lies in a severely restrictive (and often false) functionalist view of life. Most functionalists have not misinterpreted male nipples, for their unobtrusive existence poses no challenge. But clitoral orgasm is too central to the essence of life for any explanation that does not focus upon the role of sexuality in reproductive success. And yet the obvious, nonadaptive structural alternative stares us in the face as the most elementary fact of sexual anatomy—the homology of penis and clitoris.

Kinsey's ability to cut through this morass right to the core of the strong developmental argument has interesting roots. Kinsey began his career by devoting twenty years to the taxonomy of gall-forming wasps. He pursued this work in the 1920s and 1930s before American evolutionary biology coalesced around Darwinian functionalism. In Kinsey's day, many (probably most) taxonomists accepted the nonadaptive nature of much small-scale geographic variability within species. Kinsey followed this structuralist tradition and never absorbed the bias of utility. He was therefore able to grasp the meaning of this elemental fact of homology between penis and clitoris—a fact that stares everyone in the face, but becomes invisible if the bias of utility be strong enough.

I well remember something that Francis Crick said to me many years ago, when my own functionalist biases were strong. He remarked, in response to an adaptive story I had invented with alacrity and agility to explain the meaning of repetitive DNA: "Why do you evolutionists always try to identify the value of something before you know how it is made?" At the time, I dismissed this comment as the unthinking response of a hidebound molecular reductionist who did not understand that evolutionists must always seek the "why" as well as the "how"—the final as well as the efficient causes of structures.

Now, having wrestled with the question of adaptation for
many years, I understand the wisdom of Crick’s remark. If all structures had a “why” framed in terms of adaptation, then my original dismissal would be justified for we would know that “whys” exist whether or not we had elucidated the “how.” But I am now convinced that many structures (including male nipples and clitoral orgasm) have no direct adaptational “why.” And we discover this by studying pathways of genetics and development—or, as Crick so rightly said to me, by first understanding how a structure is built. In other words, we must first establish “how” in order to know whether or not we should be asking “why” at all.

I began with Charles Darwin’s grandpa Erasmus and end with his namesake, Desiderius Erasmus, the greatest of all Renaissance scholars. Of more than 3,000 proverbs from antiquity collected in his *Adagia* of 1508, perhaps two are best known and wonderfully apt for the point of this essay (which is not a diatribe against adaptation but a plea for expansion by alternative hypotheses and for fruitful competition and synthesis between functional and structural perspectives). First a comment on limitations of outlook: “No one is injured save by himself.” Second, probably the most famous of zoological metaphors about human temperament: “The fox has many tricks, and the hedgehog only one, but that is the best of all.” Some have taken the hedgehog’s part in this dichotomy, but I will cast my lot for a diversity of options—for our complex world may offer many paths to salvation, and the hounds of hell press continually upon us.
Acknowledgements

"The Bird of Paradise" was reprinted by permission of the publishers from *Biophilia* by Edward O. Wilson, Cambridge, Mass.: Harvard University Press, Copyright 1984 by the President and Fellows of Harvard College.

"Physiographic California..." was selected from *Assembling California* by John McPhee, published in February by Farrar, Straus & Giroux. Copyright 1993 by John McPhee. All rights reserved.