



BOOKS: PSYCHOLOGY

Snails and Tails or Sugar and Spice

Kira Hall

These days, few social scientists make grand claims about gender, but in *The Two Sexes: Growing Up Apart, Coming Together* Eleanor Maccoby provides a notable exception. Maccoby, who could be called the mother of contemporary gender theory in developmental psychology, draws on a wealth of evidence to argue that the gender segregation many of us experienced on our preschool playground is a cross-cultural universal. She holds that the biological, social, and cognitive factors that create this segregation also foster different interactive styles for the two sexes—with boys being more competitive and hierarchical in all-male groups and girls more collaborative and egalitarian in all-female groups. In short, she claims, gender is created through same-sex group play in childhood.

Maccoby, now professor emerita of psychology at Stanford University, is well-known for her argument that gender should be analyzed not as an attribute of one's individual personality but as an

emergent property of social groups. Her book is an important contribution to what some social scientists call a "two cultures approach" to gender. She views boys and girls as members of two distinct subcultures, each of which is characterized by radically different kinds of behavior. This behavioral differential is so extreme that when we outgrow our childhood jungle gyms and enter adulthood, men are indeed from Mars and women from Venus (to borrow the phrase made famous by pop-psychologist John Gray). As Maccoby argues in the section of the book that fulfills the title's promise of the sexes "coming to-

gether," the two sexes have a difficult time finding common interactive ground in their daily lives, whether in romance, the workplace, or parenting. But the similarity of Maccoby's arguments to those of pop psychology ends here, as she offers a comprehensive—if, at times, overwhelming—review of the social science literature on same-sex childhood playgroups and the behaviors they encourage. In the opening chapter, for instance, we are introduced to a psychological study that places preschoolers on a long strip of carpet and has them alternatively approach children of the same and opposite sexes. The preschoolers systematically stopped farther away from an opposite-sex child and approached same-sex children with more direct, face-to-face body language. What can a study on "how children walk on carpets" possibly have to do with Maccoby's thesis? This

guing that biological, social, and cognitive forces together constitute what she calls gender's "explanatory web."

So how do the components of this web work to explain behavioral differences between boys' and girls' playgroups? The biological component points to prenatal priming, which predisposes boys and girls to different rates of maturation for particular kinds of behavior. Girls, for instance, self-regulate their behavior much earlier than boys do; this self-regulation leads to all kinds of activities that please parents, including earlier success at potty-training and faster progress in language development. Here the socialization component kicks in, when parents begin to treat little Johnny and little Jane differently. Johnny's lack of self-control wins him more rough-and-tumble play and more hierarchical, disciplinary commands; Jane's more advanced language capacity in-

vites more relational and nurturant talk about feelings. When Johnny and Jane go off to school, they will self-select the playmates who behave as they do (that is, same-sex playmates), accentuating the behavior encouraged by their parents. As boys and girls mature, they will inevitably associate certain behaviors with masculinity and others with femininity, leading to what Maccoby identifies as the web's cognitive component. The metaphor of the "web" is fitting here, as we are in some sense caught up in these associations, passing them on in our own adulthood to the next generation.

But there is a reason why today's theorists avoid making universal claims about gender. While Maccoby is careful to say that biology need not determine our social destiny, she simultaneously suggests that the claims she makes about the behavior of boys and girls in the United States are also valid cross-culturally. This just is not the case. Although it may be true that some degree of sex-segregation in childhood is universal (and I do not have evidence to contradict this claim), the behavior emerging from this segregation is not. A quick look at the ethnographic research conducted by cultural anthropologists in the last few decades reveals that there is very little about gender that is consistent from culture to culture. Maccoby's claim invites a critique that echoes those of Sherry Ortner's and Michelle Rosaldo's biologically and socially based explanations (from the early 1970s) for the "universal subordination of women." These critiques demonstrated that the alignment of the sexes in the world's

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and other studies like it work to support the author's claim that same-sex attraction is an intense feature of early childhood, so much so that children show a preference for same-sex playgroups by the end of their third year. And, Maccoby claims, the rough-and-tumble play of boys' groups and the more relational play of girls' groups are the foundation of gender identity.

What makes Maccoby's analysis stand out in today's intellectual climate is her attempt to explain this early attraction with reference to biology as well as socialization. Most social scientists in the 1990s emphasize one or the other of these components, analyzing gender either as a result of biological predispositions or as a product of social conditioning. But Maccoby straddles this theoretical divide, ar-

guing that biological, social, and cognitive forces together constitute what she calls gender's "explanatory web."

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cultures, and the behavior stemming from this alignment, is too varied to be understood in terms of a universal explanation. Part of the problem for Maccoby is that she relies almost exclusively on the collaborative work of anthropologists Whiting and Edwards for her evidence on same-sex behavior in non-Western societies (this reliance stands in marked contrast to the thoroughness with which she addresses psychological research). But a host of other studies demonstrates that we cannot not predict how any given culture will interpret biology. Even the mother-child unit is by no means as "natural" as it might seem, a point demonstrated by cross-cultural research on variable household formation as well as the "nanny" phenomenon (in which a child's primary bond is not to the biological mother but to the caretaker). In some societies, we even find men imitating menstruation and observing seclusion during their wife's delivery and postpartum period—behavior we could not predict from any of the evidence on male hormones.

An aside about language is called for here, because Maccoby's evidence relies in part on linguistic studies of male and female speakers in conversation. Language is, of

course, one of the most important elements of human interaction, so it is no wonder that Maccoby weaves a discussion of language use into her analysis. But again, her argument that "males" relate hierarchically (with more direct confrontation and a greater use of imperatives, for example) and "females" cooperatively (with more indirect confrontation and a greater use of conversational softeners) just is not true the world over. In fact, the exact reverse of this behavior is found among Malagasy speakers in Madagascar, to quote a classic example in linguistic anthropology, where male speakers are praised for their use of a nuanced, indirect speaking style that contrasts with the brash directness of female speakers. This contrast is taken to the extreme in a community in Papua New Guinea, where women are infamous for a kind of conflict-talk known as *kros*; their loud, obscene, and highly public displays of anger would make even the toughest of adolescent American boys shudder. These examples remain the exception in language and gender research, but only because the overwhelming majority of studies supporting the two-cultures approach have been done on white, middle-class, heterosexual

communities in Europe and the United States. And it is this research that constitutes the bulk of the book's evidence. If we can point to the existence of communities where women issue more directives and men more mitigators, then we cannot safely say that biology predisposes us to the verbal behaviors identified by Maccoby.

The Two Sexes is in many ways a tour de force, as it offers us a cohesive and intelligent argument about gender that brings together diverse disciplinary concerns. My primary criticism of Maccoby, then, does not lie with her inclusion of biology as a piece of the explanatory puzzle, but with her claim that there might be something universal about how it materializes in culture. In current anthropological thinking gender is a very slippery concept, because we cannot discuss it independently of the ever-shifting social, political, and cultural dimensions that govern its realization. Maccoby's book, as an insightful review of the literature supporting a two-cultures approach to gender, will undoubtedly win an important place on the millennial bookshelf. It is just that for an anthropologist like myself, culture—and even gender—is much more than two.

SCIENCE'S COMPASS



• PERSPECTIVES

PERSPECTIVES: SIGNAL TRANSDUCTION

Proteins in Motion

Mark Gerstein and Cyrus Chothia

The aspartate receptor is a protein that spans the inner membrane of some bacteria. It is known that the portion of the receptor on the outside face of the membrane (the periplasmic domain) binds a small molecule, aspartate, that promotes bacterial movement (chemotaxis). Binding of aspartate to its receptor results in a conformational change in the receptor that is transmitted to the cytoplasmic domain. This domain interacts with proteins in a phosphorylation cascade that further transduces the signal, eventually resulting in a change in the swimming behavior of bacteria. Exactly how conformational changes in the aspartate receptor (and in other transmembrane proteins) result in signal transduction is not known, although several models have been proposed. Now on page 1751 of this issue, Ottemann *et al.* (1) describe a sliding motion of two trans-

membrane helices in the aspartate receptor that suggests a piston-like model of transmembrane signaling.

The structure of the aspartate receptor's periplasmic domain is known, and the location of its two transmembrane helices can be predicted confidently (see the figure) (2). Kim *et al.* recently reported a structure of the cytoplasmic domain of the serine receptor (3), another member of the highly conserved bacterial chemotaxis receptor family. Thus, we now have a fairly complete picture of the whole molecule, which consists entirely of helices (see the figure). The periplasmic domain is a four-helix bundle. The newly solved cytoplasmic domain is composed of two long helices that are coiled together. Pairs of these coiled-coils dimerize to form an extended four-helix bundle. Overall, the receptor is highly elongated: only ~25 Å wide but stretching about 380 Å from the periplasmic domain to the cytoplasmic domain. In the crystal structure, the receptor is a dimer, and there is some disagreement about whether transmembrane signaling involves a monomer or dimer unit. Never-

theless, it is clear that conformational changes in the receptor must somehow be transmitted by the relative motions of the two transmembrane helices. Ottemann *et al.* use electron paramagnetic resonance spectroscopy to estimate changes in distance between selectively labeled residues in the receptor's transmembrane helices, in the absence and presence of aspartate. The distance changes are consistent with the two transmembrane helices sliding relative to each other by 1 Å, in a piston-like motion. This motion presumably affects the geometry at secondary binding sites in the cytoplasmic domain for downstream proteins that are far away from the initial site of aspartate binding.

The investigators compare the motion in the aspartate receptor to that observed between sets of packed α helices in soluble proteins. The fundamental constraint underlying motion in soluble proteins is that internal interfaces, such as those between helices, are tightly packed in low-energy conformations. This tight packing has been observed in numerous studies (4). Combined with the interdigitated nature of side chains at protein interfaces, tight packing suggests that if the interface structure is to be preserved throughout a motion, only very small motions are possible.

This constraint on possible motions at interfaces allows many individual movements within proteins to be described in

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