fied by Erwin Bauer, Hans Stubbe, and other members of Bauer's circle, saw genetics more as Americans did, as a specialized field. They prided themselves on their specialized expertise and their ability to use that expertise to solve practical problems in agriculture, industry, and social engineering. Similarly, they did not put a high value on possessing and displaying artistic or literary culture, preferring outdoor activities like gardening or mountaineering to visiting museums and art galleries. They also were more likely than the comprehensives to get involved in the eugenics and race hygiene movements.

Comprehensives and pragmatics also differed in their attitudes to politics, in surprising ways. They did not divide along the traditional line between right and left, as Harwood expected. Rather, pragmatics tended to participate in formal party political organization of either right or left, whereas comprehensives tended to shun party and parliamentary politics of all sorts—a nice historical insight.

"Karl Henke in 1937, newly appointed to the chair of zoology and Göttingen and delighted that a butterfly has just settled upon his hat." [From *Styles of Scientific Thought*; courtesy Frau Maria Henke]

But do the geneticists' artistic and political activities have anything really to do with their science? Harwood argues boldly that in fact their cultural interests are the key to understanding scientific styles. The comprehensives' delight in visual arts was one, in Harwood's view, with their fascination, as biologists, with form and with their intuitive, holistic approach to living creatures. In science as in art, comprehensives like Goldschmidt and Kühn were first and foremost *Augenmenschen*, in love with form. Science and culture together constituted coherent and stable configurations of values and habits—real cultural styles.

What caused and sustained these different styles through wars and cultural revolutions, generation after generation? Institutions are part of Harwood's explanation. Comprehensives and pragmatics had quite different locations in the institutional geography of German science. Kühn's circle took shape in the University of Göttingen, then migrated to the Kaiser Wilhelm Institute for Biology in Berlin; Bauer's group formed in the Berlin Agricultural College and moved to the Kaiser Wilhelm Institute for Breeding Research at Münchberg. As a university professor, Kühn was expected to teach and to represent all of zoology, whereas Bauer, as a professor in a technical college, was expected to be an expert and to solve practical problems. The particular structure and values of German scientific institutions sustained different professional roles and ideals.

Yet institutions alone cannot explain the cultural sides of the comprehensive and pragmatic styles. Harwood also connects science to the wrenching social, political, and cultural changes of the Wilhelmian and Weimer years. Drawing on work by the historian Fritz Ringer and others on modernization and academic culture, Harwood explains that German geneticists, like other segments of the educated middle class, were trying to cope with economic and political changes that were fast eroding the traditional authority of professional and bureaucratic elites. Scientific and cultural styles were strategies for maintaining social position in a revolutionary world. Harwood builds on the insight of Karl Mannheim (who lived through it) that "styles of thought are fashioned by groups in action."

Many factors—class and family, training, employment—caused comprehensives and pragmatics to choose different social strategies. Those, like Kühn, who came from professional families and were trained in classical gymnasia and universities for cultural leadership preserved the comprehensive, mandarin style. Those, like Erwin Bauer, who came from lower-middle-class families and were trained for practical careers in Realgymnasia and technical schools tended to embrace the new order and the new role of expert problem-solver—the pragmatic style. Harwood's rich and subtle social analysis fits his principals—Bauer, Kühn, Goldschmidt—very well, but is harder to test for the lesser known members of their groups, because so little is known about their lives and values. The evidence that Harwood has managed to glean suggests, however, that his account will survive the discovery of further empirical data.

Harwood's book has some faults: for example, it relies too uncritically on conventional views of American genetics and neglects the Russian-German school of N. W. Timofeef-Ressovsky (which complicates the picture). It also deals too exclusively with thought and misses the role of practice and material culture. But it pursues big ideas and is chock-full of insights into the meaning of actions and events. Historians and sociologists of science may learn from Harwood's example how to do cultural history without throwing intellectual and institutional history overboard. Biologists who are interested in the history of their science but have been repelled by the obscurity and mean spirit of recent science studies will rejoice in this sign of a return to sanity. They will find this book fun to read and illuminating of their own professional experience.

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Mergings and Divergings

Gender Play. Girls and Boys in School. BARRIE THORNE. Rutgers University Press, New Brunswick, NJ, 1993. xiv, 237 pp. $35; paper, $12.95.

In the combined fourth and fifth grade of a California classroom, the teacher lets the children choose their seats. The girls sit on the left side, the boys on the right. In a second-grade Michigan lunchroom, a popular boy walks up to a table with a scattering of boys and girls, saying "ooh, too many girls" as he heads for a seat at an empty table. The other boys move to join him. On the playgrounds of both schools, where adults exert minimal control, boys play football, soccer, or baseball on the large fixed spaces; girls play foursquare, jump rope, or hopscotch closer to the school building.

Observing these scenes in two mostly white working-class schools, Barrie Thorne is traveling familiar ground: in nearly every school situation, from age three to junior high, girls often show a preference to be with girls and boys with boys. However, such scenes are far from invariant, and Thorne's *Gender Play* is far from a simple replication.

Like most scholars studying gender, Thorne (a sociologist) began her research noticing the separation of boys and girls. But she gradually came to observe that groups of boys and girls sometimes ignore or relax the gender divide. Jessie, the only African-American girl in the fourth–fifth grade class, is one of the most talented and practiced players of soccer and football, basketball and kickball. Referring to the boys as her "buddies," she acts out the boys' culture even more dramatically than most of the

boys—taking her part of their shared oranges and Twinkies, sometimes sitting as an accepted member on the boys' side of the class or cafeteria. But Jessie also claims Kathryn, the most popular girl in the class, as her best friend and joins in whispering with three other girls, "Just us four will play jump rope." Jessie's behavior, like that of some other boys and girls, neutralizes the gender divide though it does not earn her the label of "tomboy"—a term these children rarely use (although many still use the word "sissy" to insult boys and devalue girls).

Thorne also finds that in some groups, whether working on class projects or playing handball, girls and boys intermingle. Sometimes interaction emphasizes opposition: Groups of boys and girls chase each other, squealing "help save me from the girls" and "let's get that boy," or they ritually express antagonism and power (usually boys') when their touch transfers cooties (which girls can give to boys and to girls but boys can only give to girls). But interaction also sometimes dissolves difference, as boys become less aware that they are boys and girls less aware that they are girls.

Finding so much variation, Thorne rejects the commonly cited "ultimate" explanations for gender segregation. She disclaims the psychoanalytic version (most prominent in Nancy Chodorow's or Myrna Dinnerstein's theories that boys separate from and devalue things feminine in order to gain separation from their mothers) and the cognitive version (in which a number of acclaimed scholars have argued that the growing awareness that one is a boy or a girl consolidates around age two, setting in place identification with, and desire to be with, others of "one's own kind"). Thorne suggests, instead, that we need to understand the fluctuating significance of gender. In what social situations are boys and girls likely to choose to be together or apart?

By raising and answering this question, Thorne rejects the standard conception of childhood in which children are viewed in terms of development or as recipients of socialization. Even recent writers who insist that children participate in their own socialization wind up treating children as incomplete, on the way to becoming something, "acted upon more than acting" (p. 3). In *Gender Play*, children are not just the next generation's adults. They are not simply preparing for life. They are living. Groups of kids—in forming lines and choosing seats, teasing and gossiping—are creative, sometimes confirming and sometimes rejecting, sometimes even mocking, adults' insistence that boys and girls are "just different."

Moreover, Thorne offers an explanation of why most research and social commentary on boys and girls report only gender difference. It is, she argues, a result of a scientific model that emphasizes statistical difference. It is, in part, because difference is what researchers, with a vision and language of the "opposite sex," are willing or able to perceive. And it is also in part, Thorne argues, a result of the key informants often used in ethnographic research. For example, studying boys' play, ethnographers tend to rely on those popular athletes who are assertive, in both talk and action. These boys' flamboyant masculinity is then falsely generalized to all boys.

Thorne shows that the organization and meaning of gender shift from circumstance to circumstance and age to age. She argues (although she has few data to support it) that schools—because of their formal age grading, their crowded and public character, and the presence of adult evaluation and power—are likely to have more gender segregation than other settings, such as neighborhoods or families. But even within schools, there are occasions when gender matters less. Sometimes a resource (like popularity) allows girls to join boys or, less frequently, boys to join girls—in earnest, without taunts or disruption. Sometimes ethnicity or race becomes the source of group alliance or individual exception, making gender less important. In small instructional groups, gender also tends to recede in importance as particular skills—such as reading—become the focus. As Thorne details, teachers can use her findings about the fluctuation of gender in children's play to encourage cooperation between girls and boys—by organizing students into small, heterogenous groups, relying on skill rather than gender to organize activities, or using terms of address like "students" or "class" rather than "boys and girls."

Entering the fifth and sixth grades, some children, with the fully developed bodies of teens, continue to play with jump ropes and toy cars. For others, still looking like children, "goin' with" becomes the central activity, as they divide up into shifting girl-boy pairs. Entering the romantic (hetero)sexuality on which girls' (but not boys') social position increasingly depends, they learn to put on makeup, try new modes of dress, and move their bodies in sexualized ways. Childhood ends. But in taking kids and their play seriously, Thorne's penetrating and subtle analysis makes it much harder to see gender or age grades as ubiquitous or natural divides.

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Vignettes: Chaos

The term "chaos" entered science in an unlikely way. The first recorded observation of an amoeba was by Rîsel von Rosenhof in 1755. In the 10th edition of *Systema Naturae*, Linnaeus named this protozoan *Volvox chaos*. In a later edition, he changed the name to *Chaos protheus*. To anyone who has ever watched an amoeba under a microscope, the concept of chaos seems an appropriate basis for a genus or species name. In one of those endless disputes among taxonomists, there is some debate as to whether the original amoeba should be called *Volvox chaos* or *Chaos chaos*. Systematics aside, poetry would seem to dictate the latter name.

—*Harold J. Morowitz*, in *Entropy and the Magic Flute* (Oxford University Press)

Chaos theory is not as interesting as it sounds. How could it be?

—*Stephen H. Kellert*, in *In the Wake of Chaos: Unpredictable Order in Dynamical Systems* (University of Chicago Press)

Materials Physics

The Metal-Hydrogen System. Basic Bulk Properties. YUH FUKAI. Springer-Verlag, New York, 1993. x, 355 pp., illus. $98 or DM 138. Springer Series in Materials Science, 21.

Although materials have been under investigation for centuries, the discipline of materials science as we know it today was not born until the 1950s, following the invention of the transistor and other electronic devices through the application of the principles of solid state physics. Within a decade, researchers were attracted to challenging problems in metal-hydrogen systems—that is, materials consisting primarily of atoms of transition or rare-earth elemental