pect." I find him unconvincing on this point. For example, he argues that those who produced the merger between Mendelism and Darwinism "were not very familiar with some of the theories they were merging." This seems an odd remark to make about Haldane and Fisher. To give other examples, my own best-known contribution to biology has been to merge ideas from economics (game theory) and evolutionary theory. On a larger and more important scale, molecular biology arose from the merging of genetics, microbiology, and several threads from the physical sciences. On a still larger scale, a fundamental feature of science is the requirement of consistency between disciplines: we could not tolerate a situation in which biologists supposed that the laws of chemistry were different from those accepted by chemists. It is for this kind of reason that, at best, there may be an analogy between scientific change and evolution, but not an isomorphism.

Hull places much emphasis on the infighting and political maneuvering that go on in science. On several occasions, he refers to scientists as having such motives as a desire to "get that son of a bitch." I cannot help wondering how far this emphasis arises from the accident that he took as his study material the behavior of taxonomists, but doubtless people in all branches of science, and in all walks of life, are sometimes motivated by personal animus. Where I disagree most strongly is with his suggestion that such animus may help the process of discovery, by providing the necessary motivation and creating the competition needed if selection is to be effective. I think this is nonsense, and perhaps dangerous nonsense. I accept that disagreements are inevitable and that, when they arise, it is valuable that the different views be expressed as clearly as possible. If, as I think is the case, the phenetic and the cladistic approaches to taxonomy are incompatible, it is important that this should be stated openly, and not fudged. But I see no reason for personal ill feeling. Much of my own work was stimulated by disagreement with Wynne-Edwards, but I have always admired and respected him and have found rational discussion with him a possibility.

Why should personal feelings matter? Essentially, because once a scientist's ego gets over-involved in an argument, he or she is unlikely to admit to being wrong, and unlikely to see any merit in an opponent's case. Since, in most serious debates, there is some sense in what both sides are saying, too aggressive a personal involvement may delay a correct resolution, and may condemn some individuals to a lifelong commitment to an erroneous position. The opinions of the biometricians and the Mendelians were incompatible, but the resolution contained elements of both views: the participants were prevented from seeing this by personal animosity. Thus I agree that personal animus plays a role in science, as elsewhere, but I think it is almost always counterproductive. It is valuable that scientists should discuss their disagreements, because this is the best way of identifying where the difference lies and how it might be settled. But my experience suggests that this is best done in very small groups, when egos are less likely to be involved, or in print, because in print one has time to think of a dirty crack, and then suppress it in the interests of understanding, whereas in debate it is likely to slip out. Large confrontational meetings are usually a waste of time. Hull refers to the macroevolution meeting in Chicago as having become a watershed in evolutionary biology as a result of the opportunity it gave Roger Lewin to write a tendentious account in *Science*. I cannot imagine why he thinks so. Those of us who like a row enjoyed it, but no issues were clarified and none of the participants changed their minds, or even learned very much. Kuhn's *Structure of Scientific Revolutions* had the unhappy effect of convincing some young scientists that the best way of persuading people that one was the inventor of a new paradigm was to misrepresent one's opponents and to be incomprehensible: then one would be seen to be involved in a paradigm debate. It would be sad if Hull's book were to convince the next generation that they should aim to be obnoxious.

No one could read this book without learning many interesting facts and meeting many persuasive arguments. More often than not, I found myself agreeing with Hull's judgments. But although I enjoyed a lot of the details, I am not persuaded by the picture as a whole. Much the most interesting thing that happened in taxonomy in the period since 1950 was the work of Hennig, carried out largely in isolation in East Germany. To the extent that the cladists defeated the pheneticists, they did so because they had the sounder argument, and Hennig had provided it for them. Hull would no doubt reply that Hennig would have had no effect on science if it had not been for the enthusiasm and political skill of his supporters at the American Museum. I am not convinced. Indeed, Hennig's ideas might have spread more rapidly if they had been propagated less abrasively. In any case, they would not have spread at all if they had been wrong.

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Farm Problems

The Law of the Land. Two Hundred Years of American Farmland Policy. JOHN OPIE. University of Nebraska Press, Lincoln, 1987. xxii, 231 pp., illus. $25.95.

John Opie's survey of American land policies provides the context for his provocative, learned, and polemical contribution to the debate on the nature of the farm problem and the means to solve it. Throughout our history, Opie, a historian, convincingly argues, contradictory goals have produced contradictory policies that are the sources of our current problems.

In the earliest years, when available land seemed limitless, the goal of using the public domain to create a nation of working farmers required making it available in small parcels at low prices on easy credit terms. But the goal of using it to provide government revenues and to finance public improvements required selling land in large parcels at high cash prices and granting large tracts to companies that would build canals and railroads. The contradiction was never resolved; instead both policies were carried out simultaneously. The government gradually reduced land prices and the minimum size of tracts to be sold until, under the 1862 Homestead Act, a settler could get a small parcel by paying only a small registration fee. But at the same time buyers could continue to purchase land in lots as large as they could afford, which, together with huge land grants to railroads, resulted in a vast acreage becoming unavailable to homesteaders.

As public lands rapidly fell into private hands—in five rather than the hundred generations that Jefferson had envisaged—new conditions and new problems required policy changes, but once again contradictory goals produced contradictory policies. Industrialization and urbanization created a growing non-agricultural population that demanded abundant and cheap food, a demand that farmers supplied but often at great personal and social cost. Smaller farmers who found it impossible to compete lost their lands to larger producers who often mined the soil seeking the largest output at the lowest cost even when the long-term effect was deteriorating farm land; and when farmers moved into the high plains beyond the 100th meridian they began cultivation on lands with insufficient rainfall. Public irrigation policies designed to promote settlement and to continue production of cheap and abundant food contradicted policies that allowed water to be diverted to meet the growing urban demand. Nonagricultural users could afford to pay high

prices for their water, which diminished its availability to farmers or raised their production costs.

Mounting concerns over the use (and abuse) of land, water, and timber and the conflicting goals of farmers, ranchers, miners, road builders, and urban developers led conservationists such as Gifford Pinchot to propose restrictions to guarantee the "best possible use" of land, a proposal that some charged was an abridgement of the rights of private property. Dust storms, declining fertility, and environmental pollution strengthened the arguments of those who advocated government regulation but did not still the voices of those who feared government intrusion on private property rights. The creation of the Soil Conservation Service in 1935 and the 1970 Clean Air Act, the latter described by Opie as "aggressive government action to protect prime farmland as a strategic national resource, at theoretical levels of no significant deterioration," were significant new policies. By placing costly restrictions on farmers they contradicted the policy of making more food available at declining prices and subordinated the saving of the small farmers to the presumably larger social goals of saving the soil and the environment. Yet the production of cheap and abundant food and the sanctity of the family farm remained stated policy goals.

Opie is more successful in outlining the historical roots of current farm problems than he is in suggesting viable solutions. Saving the small family farmer and protecting the soil need not be contradictory, he notes, if we are willing to accept the higher food prices that would come from using fewer chemicals and less capital in production. But he notes also that powerful lobbies, demands for cheap and abundant food, and foreign policy imperatives make such goals difficult to achieve. The history that Opie outlines provides scant hope for easy solutions, but his essay does provide a clear view of the sources of many of the pressing problems we face and the difficult choices we must make rather than continue to avoid if we are to solve the problems.

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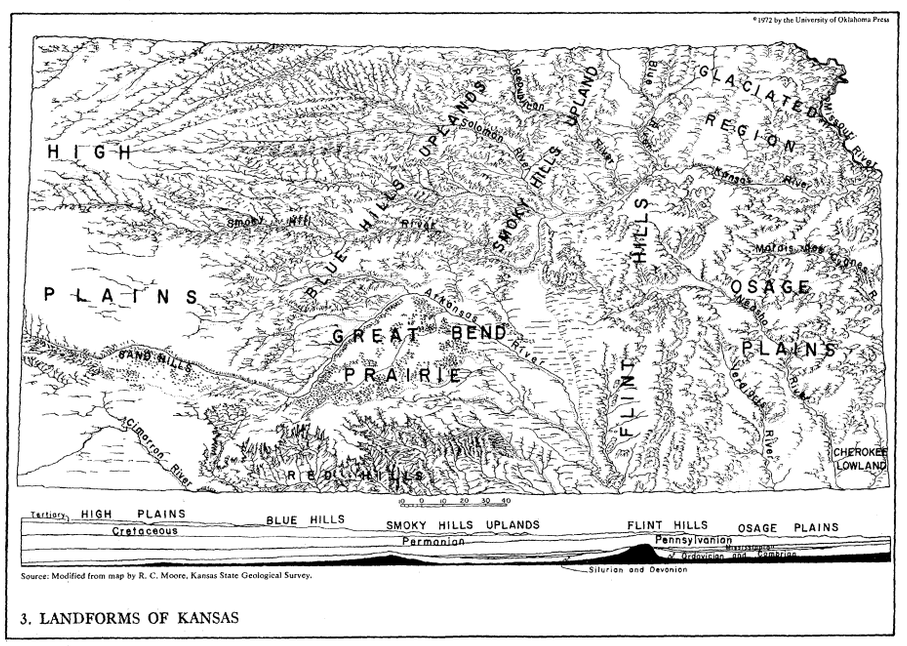
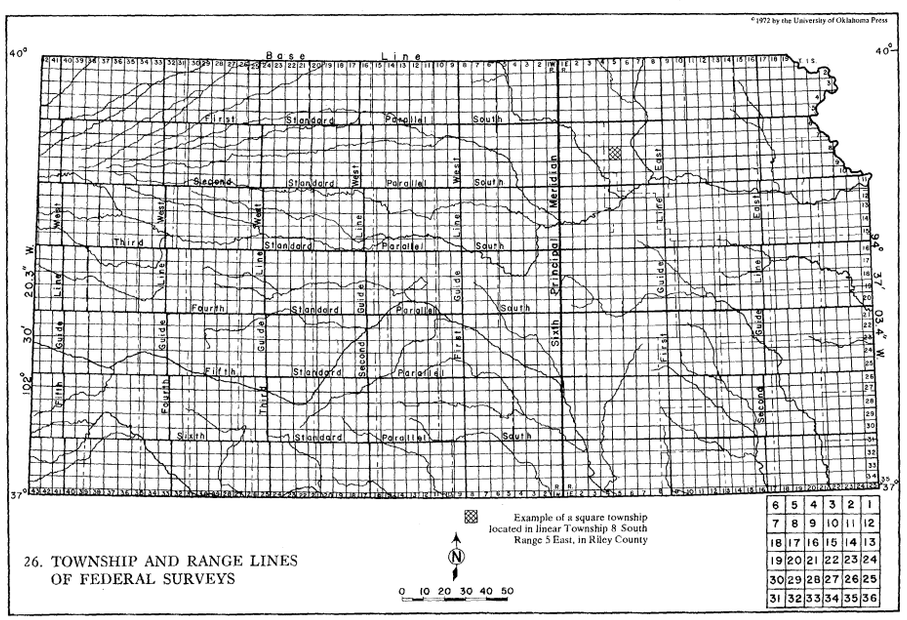


3. LANDFORMS OF KANSAS



26. TOWNSHIP AND RANGE LINES OF FEDERAL SURVEYS

Landforms of Kansas and township and range lines as set by land survey. "The extreme contrast between physiography and geometric survey was typical of land surveys in all the public domain states." The federal land survey "began the transfer of 1.3 billion acres . . . from public trust into private ownership" and had a "psychological impact [that] cannot be overstated." In the minds of the hoped-for settlers, especially immigrant farmers from Europe, where "human orderliness, not wilderness, dominated the . . . landscape," the patterns laid out by the survey "transformed the strange wilderness into a familiar geometry." [From *The Law of the Land*; H. E. Socolofsky and H. Self, *Historical Atlas of Kansas,* University of Oklahoma Press, 1972]

Some Other Books of Interest

Surveying Social Life. Papers in Honor of Herbert H. Hyman. HUBERT J. O'GORMAN, Ed. Wesleyan University Press, Middletown, CT, 1988. xx, 533 pp. $45.

"Modern survey research has increased our knowledge of social life more than any other tool in the social sciences," writes O'Gorman in the introduction to this volume memorializing a "man who made a difference" in the history of this enterprise. In his introduction O'Gorman delineates Hyman's career and contributions, which include two "classic" works in the field, *Interviewing in Social Research* (1954) and *Survey Design and Analysis: Principles, Cases and Procedures* (1955), studies of the role of "reference groups" (a term Hyman introduced in his 1942 doctoral dissertation) in perceptions of status, studies of the long-term effects of education, and systematization of methods for "secondary analysis" of survey data. The volume proper consists of 22 papers, many but not all of which make reference to Hyman's work, on broad themes or particular subjects of empirical