political supremacy in the North China plain; as political entities they, along with many other states, were coeval. Thus, one of Chang's "laws of ancient civilizational development" states that "early civilizations came about only with a political situation in which more than a single state is involved" (p. 366). Such a situation existed in the plains of North and Central China, as it did in Mesopotamia, Mesoamerica, and Andean South America.

In numerous publications spread over two decades, Chang has emphasized the autonomous development of Shang civilization out of its local Neolithic antecedents. His earlier papers tended to characterize the distinction between the Shang civilization and the Neolithic Lung-shan cultures in terms of differences in the degree of cultural intensification. More recently Chang has leaned toward stressing societal transformation that may have been brought about by a breakthrough in military technology, such as horse-drawn chariots. This of course raises further questions: why did the Shang find it necessary to invest in military machines, and what were the causes for the hostile condition? Readers who look for Chang's latest thoughts on the process of this transformation in *Shang Civilization* will be disappointed. Nor will they find detailed discussion of individual elements that were integrated into Shang and other civilizations of early China. Wheat, which was used, but apparently not cultivated, by Shang people, is certainly of West Asian origin, and so possibly is the chariot. Though Shang bronzes are unquestionably distinctive in style and manufacturing technique, bronze metallurgy itself could very well be one of those items that the emerging civilizations incorporated from other sources. Chang has broadened the concept of local origin from that of in situ evolution out of local Neolithic in Honan to autonomous development within the North China plain, where several cultures interacted. Future examinations of the relationship between the North China "nuclear area" and the surrounding regions to the north, west, and south may indicate that early civilizations of North China arose as the results of still wider interactions, making it even more difficult to make clear distinctions between "pristine" and "secondary" states and between "primary urban generation" and "secondary urban generation."

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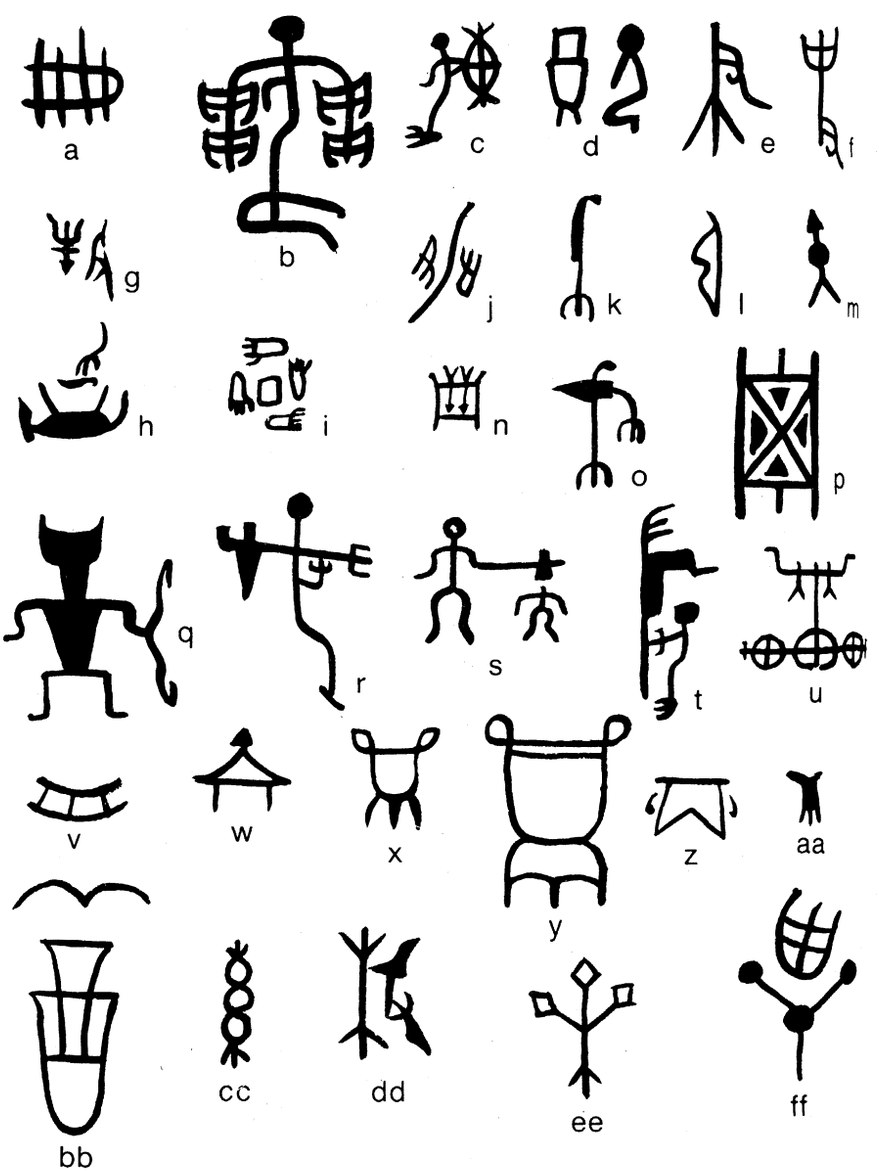

Emblems from Shang and early Chou bronzes that may be related to professions. *a*, animal herder; *b*, trader; *c*, carrier; *d*, food service; *e*, painter; *f*, archivist; *g*, herder; *h*, butcher; *i*, guardsmen; *j*, messenger; *k*, knife-maker; *l*, bowmaker; *m*, arrowmaker; *n*, quiver-maker; *o*, halberd-maker; *p*, shield-maker; *q*, bowman; *r*, halberder; *s*, executioner; *t*, flag-maker; *u*, chariot-maker; *v*, boat-maker; *w*, house-builder; *x*, *ting*-tripod-maker; *y*, *yen*-steamer-maker; *z*, *li*-tripod-maker; *aa*, chüeh-cup-maker; *bb*, wine-maker; *cc*, silk-maker; *dd*, woodsman; *ee*, orchard grower; *ff*, net-hunter. [From *Shang Civilization*]

River Fisheries

Fisheries Ecology of Floodplain Rivers. ROBIN L. WELCOMME. Longman, New York, 1979. x, 318 pp., illus. $45.

Large rivers with extensive floodplains such as the Ganges, Mekong, Nile, Zaire, and Amazon are the dominant aquatic features of tropical landscapes. This is not apparent from the perspective of the temperate zone, where lakes and ponds are conspicuously numerous. In lowland Asia, Africa, and South America, however, river systems provide the focus for human activities, from the search for foodstuffs to the devising of heroes and demons to populate society's myths. Welcomme's book concerns these large rivers and their fisheries, with emphasis on tropical systems, the author's forte.

Three factors give river fisheries their distinctness: spatial diffuseness, high species diversity, and marked seasonality. The author examines these attributes of rivers in a concise and absorbing introductory chapter, covering topics

ranging from river morphology to zooplankton secondary production. The chapter on fishes includes an interesting section on species adaptations to low concentrations of dissolved oxygen, a common characteristic of tropical waters. The author reminds us in the section on fisheries that a successful fish husbandry technology is less an indication of a developed nation than of one where native fisheries have already been heavily exploited. River fisheries models, for which Welcomme and his colleagues are well known, are treated only briefly in the book, which is definitely oriented toward a general audience.

The book documents in some detail humanity's greatest engineering folly—dams. Attempts at flood control have traditionally followed closely the first appearance of humans on the river floodplains. Welcomme can state that, in spite of past decades' extensive investment of time and money, the costs of damage from flooding are increasing at a greater rate in countries adopting flood-control measures than in those where the natural regime is left unmodified. Equally discouraging, fish diversity and production (as estimated by catch) are proportional to the intensity of flooding, which flood-control measures attempt to reduce. The results of flood control, therefore, include declining native fisheries as well as increasing economic costs.

If there is one major disappointment, it is the book's narrow focus. It is unfortunate that a scientist with Welcomme's expertise has not made better use of related disciplines to provide insights on a more general level. For instance, there is no reference to the extensive lessons derived from marine fisheries, such as are to be found in works by Cushing or Gulland. A lone reference to evolutionary ecology is conspicuous by its misspelling of the author's name.

As an example of how research in related areas could contribute to an understanding of the floodplains fisheries, consider that most tantalizing of topics, fish migration, a subject treated in some detail in this book. In Asia, Africa, and South America, numerous fish species undertake long and spectacular migrations. In Africa characins, mormyrids, silurid catfishes, and cyprinids such as *Labeo altivelis* leave lake habitats during the floods to ascend rivers and spawn in the upstream swamps. A similar upstream migration has been described for a tributary of the Mekong in Asia. In the La Plata and Paraná systems in South America, the characins *Salminus maxillosus* and *Prochilodus scrofa* migrate up to 1000 kilometers upstream to spawn in swamps. In the Central Amazon Basin, however, the spawning migrations are the reverse (what Welcomme describes as the "piracemas" are actually nonspawning migrations). Characins of the genera *Prochilodus*, *Semaprochilodus*, *Colossoma*, *Brycon*, and others migrate long distances down the tributaries to spawn in white waters such as the Amazon River. Having spawned, the schools immediately ascend the same tributaries. The observations of fish migrations, therefore, make up a rather complicated picture in which some species migrate upstream and others downstream to spawn and the different behaviors occur for fishes within the same or closely related families, sometimes within several hundred miles of each other.

A reasonable explanation for this otherwise confusing situation can be deduced from evolutionary considerations of fish life history patterns. As Cushing and Lasker first noted for marine systems, postlarval stages of many fish species have a "critical period" during the first several weeks of life in which mortality can reach 99 percent unless the young encounter zooplankton as food resources. My own data indicate that postlarval and juvenile fishes of the Central Amazon Basin are similarly initially dependent on zooplankton. This suggests a single explanation for the different spawning patterns; namely that adult fish enhance their larvae's chances of surviving the critical period by spawning in habitats favorable for zooplankton production such as newly flooded areas. In Asia, Africa, and southern South America these nursery grounds are located in upstream swampy regions; in central Brazil zooplankton develop in the floodplains and small lakes associated with the white-water systems. The generalization that adults feed in one habitat, young begin life in a different habitat, and the distance between the two is spanned in the spawning migration appears to be a general principle for many river fishes throughout the world, with interesting management implications.

In this book Welcomme has provided us with the first in-depth analysis of the fisheries of floodplains rivers, especially in the tropics. If the book does not answer all our questions, that is less a reflection on the author's knowledge than an indication of what is still to come.

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Life and Work of Wegener

Alfred Wegener und die Drift der Kontinente. MARTIN SCHWARZBACH. Wissenschaftlich Verlagsgesellschaft, Stuttgart, 1980. 160 pp., illus. DM 29. Grosse Naturforscher, vol. 42.

With the acceptance of plate tectonics Alfred Wegener's name has become something of a household word as belated tribute has been paid to the "father" of continental drift. Wegener was not the first to embrace the idea, but with *Die Entstehung der Kontinente und Ozeane* he succeeded beyond any of the others in focusing attention (and also ridicule and hostility) on this revolutionary concept. Yet it is doubtful that many adherents of the current conventional wisdom can cite the title of this book from memory, let alone have actually read it. Wegener's remains a one-dimensional image, not adequately reflecting the breadth and depth of his scholarly interests and contributions.

Several English-language histories of the recent geological revolution have attempted to remedy this with brief biographies. It is the merit of this concise book, written in clear and economic German by a distinguished German geologist and paleoclimatologist, that it views history from the European and Continental rather than from the Anglo-American point of view so much more familiar to us. I was surprised to find how fairly and completely modern plate tectonics can be sketched while most of the names that recur over and over again in accounts written on this side of the Atlantic Ocean are omitted.

The book succeeds well in showing how much more Wegener was than the single-minded protagonist of continental drift we usually visualize. He saw himself first and foremost as a polar explorer, but his biographer points out, somewhat mercilessly, that his achievements do not match his investment of time and, ultimately, of his life. Less well remembered but far more important was his collaboration with his father-in-law, Wladimir Köppen, on *Die Klimate der Vorzeit*, an influential work that, because of the meteorological background of the authors, proceeded far beyond the then usually very intuitive approach to this subject. On returning to this book I found it surprisingly fresh and, although dated by modern advances in paleontology, geochemistry, and paleoceanography, full of stimulating insights.

The biography is full of old acquaintances, the European heroes of geology of the first decades of this century. Many