Journal of California and Great Basin Anthropology | Vol. 36, No. 1 (2016) | pp. 160–171

The Berkeley Geographers and Baja California's Prehistory

DON LAYLANDER
ASM Affiliates
2034 Corte del Nogal, Carlsbad, CA 92011

Members of what has been termed the Berkeley School of Geographers made important contributions to our understanding of Baja California's prehistoric past through investigations that began in the 1920s and continued through the middle of twentieth century. Under the direction and stimulus of Carl O. Sauer, one of the twentieth century's leading U.S. academic geographers, four University of California graduate students, Fred Kniffen, Peveril Meigs, Brigham Arnold, and Homer Aschmann, carried out field studies and research on the peninsula that addressed ethnographic and archaeological themes from a geographical perspective.

CARL SAUER AND THE BERKELEY SCHOOL

Carl Ortwin Sauer (1889–1975) was a professor of geography at the University of California, Berkeley from 1923 to 1957. He was recognized as one of the leaders of his profession, albeit often in idiosyncratic, iconoclastic roles. Viewing geography as culture history, Sauer was noted as standing apart from many of his colleagues within academic geography in advocating a nondeterministic, particularistic, diachronic, and cultural view of the morphology of landscapes. He was sometimes strongly critical of prevailing approaches to geography, and he received strong criticism in return. Numerous retrospective studies have examined the contributions of Sauer and his students to geography (e.g., Blouet 1981; Kenzer 1987a; Mathewson 2011; Mathewson and Kenzer 2003; Williams 2014).

Sauer was born in a German-American community in Missouri and was educated in part in Germany. German writings and ideas about geography, including the anthropogeography of Friedrick Ratzel, the diachronic emphasis of Otto Schlüter, and others, did much to shape Sauer's cultural approach to the subject. He shifted his graduate studies from geology to geography, receiving his doctorate at the University of Chicago. In 1923, he was invited to come west from the University of Michigan to head the Geography Department at the University of California in Berkeley. He refashioned and maintained the department very much in his own intellectual image for more than three decades. After retiring in 1957, he continued to teach and write.

Sauer was no respecter of academic disciplinary boundaries. He forged close intellectual bonds at Berkeley with Herbert E. Bolton's investigations of Spanish colonial history, but above all with Boasian anthropology as represented at the university by Alfred L. Kroeber and Robert H. Lowie (Speth 2003:98). Sauer's graduate students frequently participated in anthropology seminars and sometimes undertook field studies under anthropological auspices, while Sauer himself frequently sat on anthropology dissertation committees. Sauer's focus was on cultural or historical geography, but his studies and those of his students recognized a developmental continuum as extending from pre-human geological landscapes through prehistory and ethnohistory up to modern conditions and lifeways.

The influence of the Boasian anthropologists on the work of Sauer and the Berkeley School is evident and has been widely discussed. Sauer's conception of geography may have exerted some reciprocal influence on the Berkeley-trained anthropologists and archaeologists and their intellectual descendants, including individuals who would work in Baja California during the ensuing decades. However, influences in this direction are at best tenuous and difficult to trace, and they will not be explored further here, where the main focus is on the empirical contributions rather than the theoretical influences of the Berkeley geographers.

Sauer favored Latin America as a field of research. He led field trips to Baja California beginning in 1926, but his own research and publication on the peninsula were quite limited. He co-authored a study of the 1769 Franciscan mission of San Fernando Velicatá (Fig. 1) with one of his graduate students, Peveril Meigs (Sauer and Meigs 1927). He also played an important role in sponsoring the research of the peninsula's pioneering archaeologist William C. Massey. Work in Baja California helped to shape the development of Sauer's thinking about the diachronic dimension in human geography; according to Aschmann (1987:140), "First in Baja

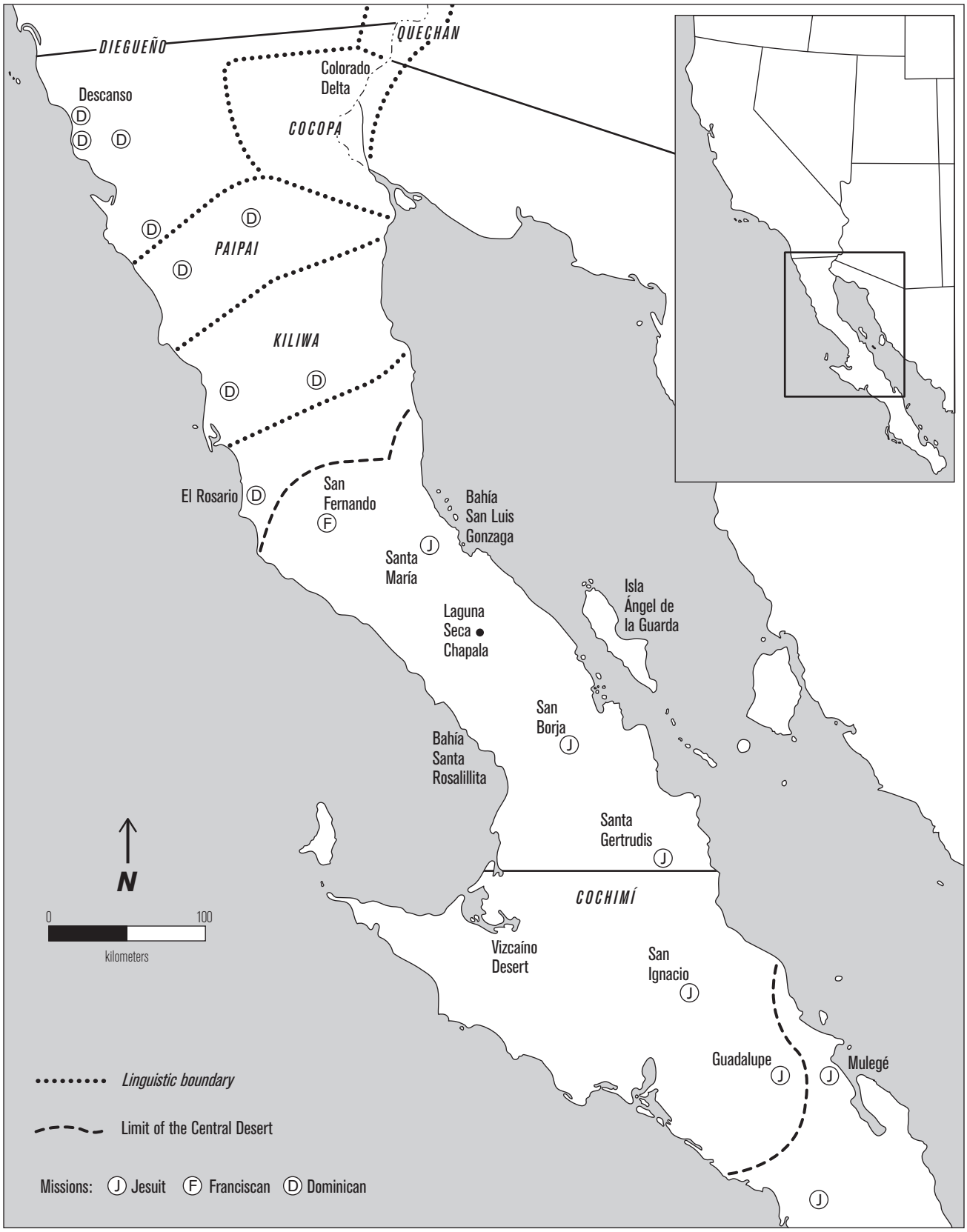

Figure 1. Map of Baja California locations investigated by the Berkeley geographers.

California at San Fernando Velicatá (Sauer and Meigs 1927) and then more strongly in Arizona, Sonora, and northwestern Mexico in general, Sauer's attention and curiosity were pulled further back into time."

Over the course of his career at Berkeley, Sauer supervised 37 doctoral dissertations in geography (Kenzer 1987b:4). Four of those dissertations represented important contributions to Baja California anthropology. They came from two separate generations of Sauer's graduate students. The first generation was represented by Fred Kniffen and Peveril Meigs, who completed their dissertations in 1929 and 1932 respectively. The second generation included Brigham Arnold and Homer Aschmann, who both completed their dissertations in 1954.

FRED KNIFFEN IN THE COLORADO DELTA

Fred Bowerman Kniffen (1900–1993) was born in Michigan and initially studied geology at the University of Michigan. He followed Sauer to Berkeley in 1925, where he found Sauer and Kroeber to be "the two figures who were to me bigger than the field they represented, who provided concepts and license to deal with the things I found of interest and deemed significant" (Kniffen 2003:9). In choosing between anthropology and geography as fields to pursue, he would later comment, "the main thing that finally turned me to geography was the fact that in anthropology there was too little consideration of the physical landscape" (Dow 1998:33).

Kniffen's later professional career was spent at Louisiana State University, where he taught both geography and anthropology. He specialized in folk geography and vernacular architecture, but his publications also included archaeological, ethnographic, and historical studies of Louisiana's Native Americans. In the western U.S., he authored anthropological/geographical studies of the Achomawi, the Pomo, and the Walapai in addition to his dissertation work.

Kniffen's dissertation addressed *The Delta Country of the Colorado* (Kniffen 1929). Most of the study was subsequently published in the *University of California Publications in Geography* series (Kniffen 1931, 1932). It drew upon fieldwork that had extended over several months in 1927–1930 in the part of the delta that lay south of the international border. More than half of the dissertation was devoted to the delta's natural environment, dissecting its geology, geomorphology, hydrology, climate, flora, and fauna. The delta's cultural landscapes were addressed in the remainder. Kniffen divided the region's human history into three chronologically overlapping stages: a primitive stage, an exploratory stage, and a stage of exploitation (Table 1).

One way in which Kniffen addressed the region's "primitive" stage was through undertaking explorations that looked for archaeological evidence. In addition to finding remains that could be attributed to the delta's ethnographically-known Yuman groups, he sought physical evidence for earlier, pre-Yuman cultures (Table 2). However, he concluded, "the evidence for postulating a prehistoric culture apparently not ancestral to the later primitive culture is uncertain. It rests principally on rumors of adobe ruins, and reported finds of polychrome pottery" (Kniffen 1931:46). In his dissertation, he wrote, "About the existence of adobe ruins there can be little question" (Kniffen 1929:140), but this claim was later weakened in the published version: "There is some reason for believing that there exist, or existed in the area adobe ruins of some antiquity" (Kniffen 1931:46). His efforts to locate the rumored adobe ruins, which the early explorers Anza and Hardy had suggested might represent links to central Mexico's Aztec Empire, were unavailing, and Kniffen did not himself see the reported polychrome pottery. The availability of a framework for distinguishing and interpreting a long sequence of prehistoric cultures on the lower Colorado River still lay a decade in the future, in the pioneering publications of the archaeologist Malcolm J. Rogers (1939, 1945).

The ethnography of the Cocopa was a more productive research area for Kniffen. He was able to offer at least brief observations on a wide range of topics, but with a strong emphasis on material culture (Table 2). Following the early explorers' accounts, professional ethnographic studies in the delta had begun with the work of Edward W. Gifford, Kroeber's Berkeley anthropology colleague. Gifford conducted fieldwork among the Cocopa during four winters between 1916 and 1930, prior to and concurrently with Kniffen's fieldwork. Gifford's account only appeared in print after Kniffen's own work had been published, and Gifford cited Kniffen's authority for several points (Gifford 1933). Kniffen's Cocopa

Table 1

HISTORICAL STAGES IN THE COLORADO DELTA, ACCORDING TO KNIFFEN

Stage	Representatives
Primitive	Possible pre-Yuman cultures; Yuman groups, including the Cocopa, Quechan, and Kamia
Exploratory	Ulloa, 1539; Alarcón, 1540; Díaz, 1540; Oñate, 1604-1605; Kino, 1699-1706; Ugarte, 1721; Consag, 1746; Sedelmair, 1748-1750; Garcés and Anza, 1771-1776; abortive mission settlement, 1780-1781; Hardy, 1826; Pattie, 1827; Kearney and Cooke, 1847; surveys, military installation, river steamers, Butterfield stage, railroad, and roads in the second half of the nineteenth century
Exploitation	Trapping, 1820s-1830s; ranching, 1870s and after; irrigation agriculture, 1890s and after; and urbanization, 1900s and after

Table 2

ARCHAEOLOGICAL AND ETHNOGRAPHIC EVIDENCE OF THE COLORADO DELTA'S NATIVE CULTURES REPORTED BY KNIFFEN

Archaeological	Ethnographic
Adobe ruins (rumored)	Agricultural crops, including corn, beans, pumpkins, squashes, and gourds, as well as crops introduced by the Spanish but not specifically identified as such by Kniffen
Polychrome pottery (rumored)	
Numerous and extensive shell middens	Native food plants, including water grass, wild rice, quelite, mesquite, screwbean, palo fierro, palo verde, pinyon nuts, acorns, and agave
Extensive pottery scatters	Containers, including pottery, basketry, and granaries
Bedrock mortars	Cooking practices
Sites around water holes	Weaponry and hunting gear, including willow bows, arrows (cane, arrowweed, mesquite; feathered), clubs, shields, deer corrals, and use of fires
Roof-smoked caves	Fishing gear, including dip nets, woven willow traps, and tule balsas
Well-worn trails	Dwellings, including semi-subterranean houses and brush shelters
	Clothing, including willow bark skirts and thongs
	Communal ownership of property
	Seasonal migrations and trail systems
	Cremation

ethnography would be largely superseded by the much more detailed work subsequently produced by Gifford, Philip Drucker (1941), Edward F. Castetter and Willis H. Bell (1951), and William H. Kelly (1977).

Kniffen helped to initiate an emerging theme among the Berkeley geographers: the upward revision of estimates for prehistoric populations in the Americas (Denevan 1996). Such revisions challenged the relatively conservative estimates that were offered by Kroeber and others. Sauer himself would be quoted as estimating the native population density of Baja California as high as one person per square mile (Kroeber 1939:159).

Specifically discussing Yuman groups in the Colorado delta, Kroeber (1925:796) noted concerning the Halyikwamai, a delta group that later moved to the middle Gila River, that "Garcés [in the 1770s] estimated them to number 2,000, but his figures on the population of this region are high, especially for the smaller groups." Kroeber also noted Garcés's estimates of 3,000 for the Kohuana, 2,500 for the Halchidhoma, and 3,000 for the Yuma (Quechan). Kroeber cited without comment the estimates from the report of Oñate's 1604–1605 expedition that included 4,000–5,000 Halchidhoma, 5,000 Kohuana, and 4,000–5,000 Agalle and Halliquamalla (possibly Halyikwamai), as well as an unspecified number of Cocopa. The Cocopa population was put at 5,000–6,000 in a first-hand report from a member of the Oñate expedition that was not used by Kroeber or Kniffen (Hammond and Rey 1953:1022). Kroeber (1925:782) estimated 2,500 individuals for the pre-contact Quechan.

Kniffen (1931:51) observed that, despite some confusion over ethnic designations,

> what to the geographer is significant in the old accounts is the general idea that he gets of the wealth of agricultural products raised by primitive methods, and of the enormous number of people dwelling in villages along the river. Oñate's estimate of the number of people living along the left bank of the river, from the mouth of the Gila to the gulf, is around 22,000.

Kniffen noted that the Oñate expedition had travelled along the east bank of the Colorado River. While the Oñate estimate might be valid for the whole delta, it was also possible that it only applied to the east bank. "If the region west of the river was equally densely populated, the first estimate must be at least doubled" to 44,000 (Kniffen 1931:51).

Subsequent estimates for pre-contact delta populations have included 4,000 for the Quechan and 5,000 for the Cocopa (Alvarez de Williams 1983:104; Forbes 1965:343). Kelly (1977:10) remarked that the high population estimates from the Oñate expedition seemed to be "out of line" with the other evidence. In this instance, later opinion has tended to favor the lower

estimates of the anthropologist Kroeber over those of the geographer Kniffen.

PEVERIL MEIGS ON THE DOMINICAN FRONTIER

Peveril Meigs, III (1903–1979) was born in New York State, but he received his undergraduate and graduate education at Berkeley. He held academic positions between 1929 and 1942, mostly in California at the state colleges in San Francisco and Chico. During World War II, he worked in Washington, D.C. as an analyst for the Office of Strategic Services (OSS, predecessor of the CIA). Most of his subsequent career up to his retirement in 1965 was spent in government service. In the early 1950s, he was prominent among those accused by Senator Joseph McCarthy of being security risks (Selcer 2011). Meigs's professional research in geography focused on arid lands throughout various parts of the world.

Meigs travelled to Baja California in 1925, a year before Sauer himself ventured into that region. An initial publication on Baja California, written in collaboration with Sauer, discussed San Fernando Velicatá in the northern Central Desert, the only mission on the peninsula that had been founded by the Franciscans (Sauer and Meigs 1927). This study focused on the mission's setting and its history; prehistory was represented by no more than a few brief notes concerning aboriginal subsistence.

The Dominican Missions of Lower California: A Chapter in Historical Geography was the subject of Meigs's 1932 dissertation, which was subsequently published (Meigs 1932, 1935). As in the case of the monograph on San Fernando Velicatá, this study was based primarily on an examination of historical documentation and on field observations of the missions' natural settings and their architectural remains. Nine missions and an *asistencia* (satellite mission station) in the Dominican Frontier region were individually and collectively discussed in detail in relationship to the resources of their natural landscapes. A few comments on pre-contact native settlement patterns were also provided.

The dissertation's main contribution to prehistory was an extended analysis of pre-contact demography. Meigs discussed his methodology in some detail, basing his estimates on early historic counts of Indian rancherias and the average number of inhabitants per rancheria, as well as on calculations derived from the numbers of the missions' baptisms and burials, and such mission censuses as were available. For the Dominican Frontier area extending from El Rosario to Descanso, he arrived at an estimate of 6,745 natives, or 1.15 persons per square mile. Aschmann would later note that Meigs's estimate was "nearly twice the population density that Kroeber (1939:154, 178–179) allows for an area of comparable environment and almost identical cultural background just north of the border;" i.e., for Diegueño (Kumeyaay) territory in San Diego and Imperial counties (Aschmann 1959:145). Meigs himself, comparing his results with Kroeber's estimates for pre-contact populations in Alta California as a whole, noted

> the surprising result that he [Kroeber] assigns to Upper California, the promised land of the Franciscans, less than one person to the square mile, or less than was assigned to the poor desert-and-steppe land of the Dominicans….
>
> The present writer is inclined to think that Kroeber's estimate is about right…. [T]he difference in density of population between Upper and Lower California can easily be accounted for when it is remembered that in neither of the Californias did the Indians depend upon agriculture, and that in a gathering economy the suitability of land for crops is of little importance. Grassy land provides for more game, but desert land is conducive to the growth of directly edible vegetation in the form of succulent stems (mescal), roots, and seeds. Even more important in the present consideration is sea food, which favored the greatest densities in Lower California and probably in Upper California. Lower California, being narrow, has more seacoast in proportion to its area than Upper California, a fact which would be enough to account for a slightly greater density in the former even without any additional factor [Meigs 1935:140–141].

However, Kroeber rejected the argument that Meigs's population estimates were compatible with his own, asserting that "the peninsula could not have fed more than a fraction of the people per areal unit which American California sustained. If Meigs's figures are right, mine are too low" (Kroeber 1939:179).

Meigs's 1939 ethnographic study of the Kiliwa and other native groups on the Dominican Frontier had a more substantial bearing on the region's prehistory. This monograph was supplemented in the 1970s, after Meigs had retired, by a series of ethnographic and

archaeological articles published in the *Pacific Coast Archaeological Society Quarterly*, based primarily on his field experiences during the 1920s and 1930s (Meigs 1970, 1971, 1972, 1974a, 1974b, 1976, 1977). While the 1939 study included a fairly systematic description of Kiliwa culture, the 1970s articles were more anecdotal. Together, Meigs's publications presented a valuable picture of aboriginal culture in northwestern Baja California (Table 3) that was more detailed than the limited work done in that region by Berkeley anthropologists Gifford and Lowie (1928), and later by Drucker (1941). Comparably detailed ethnographic monographs would subsequently come from anthropologists William D. Hohenthal, Jr. (2001) and Jesús Ángel Ochoa Zacueta (1978), along with more narrowly focused studies by Roger C. Owen, Ralph C. Michelsen, Frederic Noble Hicks, Thomas B. Hinton, and others. However, Meigs's work has not been superseded.

Table 3

ARCHAEOLOGICAL AND ETHNOGRAPHIC EVIDENCE OF BAJA CALIFORNIA NATIVE CULTURES REPORTED BY MEIGS

Archaeology	Rock art, pottery, and shamans' hair capes
Settlement	Territorial limits (K, P, D), mobility (K), population (K, P, D), and place names (K, P, D)
Subsistence	Food plants (K), hunting practices (K, D), fishing (K), and salt (K)
Material culture	Tools (K, D), containers (K), shelter (K, P, D), and clothing and adornment (K, D)
Social organization	Kinship terms (K, P), lineages (K, P), property (K), leaders (K, P, D), and inter-ethnic relations (K, P, D)
Ideational culture	Languages (K, P, D), ceremonies (birth, adolescence, marriage, death) (K, P), shamans (K, P, D), curing (K, D), the supernatural (K, D), oral traditions (K, P, D), taboos (K), games (K), music (K), calendar (K), stars (K), and directions (K, P)

K = Kiliwa (including Ñakipa); P = Paipai (Akwa'ala, Yakakwal); D = Diegueño (Kumeyaay, Tipai, Kwatl)

BRIGHAM ARNOLD AT LAGUNA SECA CHAPALA

Brigham Alicen Arnold (1917-2010) grew up in Wisconsin and Arizona. He took his undergraduate degree in anthropology at the University of Arizona before serving in the Army in North Africa and Italy during World War II. After receiving his Ph.D. in geography at Berkeley, he founded the Geography Department at Sacramento State College in 1954, where he continued to teach until his retirement in 1988. Among Arnold's professional productions were several archaeological studies in Alta California.

Kniffen, Meigs, and Aschmann all addressed archaeological subjects in Baja California, but Arnold's contributions to the region's human prehistory were based entirely on archaeology. His fieldwork took place in 1949-1950, in part in the company of Sauer and Aschmann. His main focus was the Laguna Seca Chapala basin in the peninsula's Central Desert, but he also documented sites as far north as Bahía San Luis Gonzaga, as far south as Bahía Santa Rosalillita, and as far east as Isla Ángel de la Guarda in the Gulf of California. About two-thirds of his study consisted of a geological examination of the evolution of the region's landforms through tectonism and climatic change, while the remaining third addressed its prehistoric archaeological landscape (Arnold 1954, 1957).

Only shortly before Arnold's investigations, Massey (1947) had identified Laguna Seca Chapala as a location that was particularly promising for discovering traces of early human occupations. In his archaeological reconnaissance of the Baja California peninsula, Massey had proposed recognition of a "Chapala Culture" or a "Chapala Industry" and found evidence in the basin that he believed could be assigned to, or was at least similar to, Alta California's "Pinto-Gypsum Culture" and the "Lake Mohave and Playa Complexes."

Arnold identified three discrete assemblages at Laguna Seca Chapala on the basis of his surface observations and collections. These he termed the elongate-biface assemblage, the scraper-plane assemblage, and the flake-core-chopper assemblage. They were said to be "distinct in distribution, in content, and in antiquity" (Arnold 1957:250). In addition to the artifact types that were named in their designations, diagnostic traits for the assemblages variously included the presence of ground stone tools, the presence and types of hearths, and the presence and species of marine shells.

A relative chronological sequence for the three assemblages, from older (elongate-biface) to younger (flake-core-chopper), was discerned on the basis of two criteria: their positions with respect to the basin's landforms (including lacustrine deposits, lake shorelines, and desert pavements), and the degree of weathering on the surfaces of the flaked lithic artifacts. A vague

absolute chronology was deduced from the proposed tectonic and lacustrine history of the basin, which indicated to Arnold that the human occupations had extended well back into the Pleistocene, at least as far as the early part of the Wisconsin glaciation (now dated to about 75,000 years ago).

In subsequent years, Arnold continued to defend his interpretation of the Laguna Seca Chapala assemblages and their early dating (Arnold 1971, 1978, 1984). However, amplifications, revisions, or general challenges to that scheme would come from investigations by archaeologists Emma Lou Davis (1968), Eric W. Ritter (1976, 1991; Ritter and Aceves Calderón 2013; Ritter et al. 1984), Loren G. Davis (2003, 2013), and Ruth Gruhn and Alan Bryan (2009). Arnold's definitions for artifact types and for assemblage types have not generally been adopted by subsequent investigators, and the radiocarbon dates that are now available from Laguna Seca Chapala archaeological sites fall within the Holocene rather than the Pleistocene.

HOMER ASCHMANN IN THE CENTRAL DESERT

Harold Homer Aschmann (1920–1992), a native Californian, received his B.A. and M.A. degrees in geography at the University of California, Los Angeles in 1940 and 1942. During World War II, he served as an Army bomber pilot until he was shot down and made a prisoner of war in Germany. After teaching at San Diego State College, he earned his doctorate at Berkeley in 1954, becoming in his own words "a full-dressed disciple of Sauer's" (Dow 1998:21). He served as a founding member of the faculty at the University of California, Riverside, where he continued to teach geography until his retirement in 1990.

Aschmann was introduced to Baja California in 1949 on a field trip with Sauer and Arnold. He focused his dissertation study on the Central Desert, a region that he defined as encompassing the territories of six eighteenth-century Jesuit and Franciscan missions: Guadalupe, San Ignacio, Santa Gertrudis, San Borja, Santa María, and San Fernando Velicatá (Aschmann 1954, 1959). Extending from west of Mulegé in the south to east of El Rosario in the north and including the desolate Vizcaíno Desert as well as the central sierras, many parts of the Central Desert represented some of the peninsula's driest and most forbidding landscapes.

In contrast to Kniffen and Meigs, Aschmann could not base his contributions to Baja California prehistory on ethnographic fieldwork, because the Central Desert groups had been culturally extinct for more than a century. He did use archaeological observations, but only to a subordinate degree. He noted that "artifacts and flakes are to be found within a few hundred yards of almost any point within the region" and that extensive shell middens existed at all accessible beaches along both coasts (Aschmann 1959:43). Features included hearths, agave roasting pits, and pictographs. Ceramic artifacts were rare, but plano-convex ("hump-backed") flaked stone scrapers were particularly abundant, and manos and metates were common. An important archaeological contribution was the first report of a fluted ("Clovis") projectile point from Baja California (Aschmann 1952). The point presumably dated from the terminal Pleistocene, although it was not found in context. The presence of this technology in the central portion of the peninsula would be confirmed by subsequent finds of additional fluted points, also undated (e.g., Des Lauriers 2008; Hyland and Gutiérrez 1995).

The heart of Aschmann's contribution to prehistory was his detailed description of aboriginal culture based on an analysis of historical documentation. This was checked against his on-the-ground familiarity with the terrain and with the opportunities and limitations that had been created for prehistoric inhabitants by the region's geological and ecological features. The documentation he considered was not limited to the well-known, published eighteenth-century Jesuit accounts but also included many unpublished manuscripts and mission records. The result was an exceptionally detailed picture of long-past native lifeways (Table 4). Aschmann concluded that "these Indians possessed a remarkably effective set of devices to gain subsistence from a meager environment" (Aschmann 1959:6). Ashmann's picture gave relatively little consideration to the nonmaterial aspects of culture such as social organization and oral traditions, even when those were attested in his sources.

A key topic in Aschmann's Baja California studies, as in those of Kniffen and Meigs, was the region's demographic history. He addressed this issue in detail in an article that its publisher entitled "Desert

Table 4

ASPECTS OF NATIVE CENTRAL DESERT CULTURES ADDRESSED BY ASCHMANN'S DOCUMENT-BASED ETHNOGRAPHY

Drinking water	Springs, *tinajas* (natural tanks), *batequis* (excavated wells on beaches), containers (baskets, turtle bladders, and mammal intestines), plant moisture (agave leaves, pitahaya fruit, and other cacti)	
Food resources	Plants	More than two dozen species identified and discussed, including agave, cacti, leguminous trees, palms, herbaceous plants, and others; grass and sedge seeds, edible roots; suggested as composing 57% of the native diet
	Land animals	Mammals, birds, reptiles, insects, and spiders; food taboos; 18% of the native diet
	Marine animals	Shellfish, fish, marine mammals, and turtles; 25% of the native diet
Subsistence technology	Plant gathering	Digging sticks, nets, hooked poles, basket trays, and turtle shells
	Hunting	Bows and arrows, throwing sticks, nets, snares, antler and deer-head disguises, and fire driving
	Fishing	Sticks or stones to dislodge shellfish, diving for shellfish, tule balsas, log canoes, double-bladed paddle, hooks and lines, harpoons, nets, and poisoning
	Transporting and storing	Nets, agave fiber or palm leaf knotted bags, and skin bags
	Processing	Winnowing trays, toasting trays, fire-making drills, open fires, grinding of seeds and bones, drying, and agave roasting pits
Other	Clothing	Skirts, mantles, capes, blankets, belts, and sandals
	Shelter	Brush or rock windbreaks, pits, caves and rock shelters, brush huts, and sweathouses
	Ornamentation and ceremonial objects	Headbands, collars, shell ornaments, headdresses of grass or feathers, snoods, removal of face and body hair, piercing (ears, noses, lips), tattoos, mutilations, and body painting; stone and clay pipes, human hair capes, *tablas* (wooden tablets), fans, rattles, amulets, *chacuacos* (sucking tubes), figurines, and funerary offerings
	Warfare	Bows and arrows, clubs, and staves
Social organization	Family	Marriage, post-marital residence, gender roles, and child care
	Rancheria	Basis in lineages, leaders, communal activities (deer hunts, fishing, agave roasting), and age grades
	Inter-rancheria relations	Intermarriage, ceremonial assemblies, feuding, and territorial ownership

Genocide" (contrary to Aschmann's wishes) and in his Ph.D. dissertation, which was subsequently published (Aschmann 1953, 1954, 1959). To analyze the evidence on population, he drew heavily upon the methodologies that had previously been developed by Meigs for the Dominican Frontier and by the Berkeley professor of physiology Sherburne Friend Cook for central and southern Baja California (Cook 1937). Aschmann's initial 1953 estimate for the aboriginal population of the Central Desert's six mission territories was 17,350 individuals, or a density of 0.81 persons per square mile. In his published dissertation, he revised this estimate upward to 21,100 individuals, or 0.97 persons per square mile. As he himself acknowledged, "in comparison with other comparably dry parts of the world which had an aboriginal population which did not practice agriculture, these population figures are phenomenally high" (Aschmann 1997:52).

In later years, Aschmann wrote several articles of a synthetic character that described and evaluated the ethnohistoric, archaeological, and ethnographic evidence concerning the native cultures not just of the Central Desert but of Baja California as a whole (Aschmann 1965, 1968, 1986). He also published English translations of two important eighteenth-century Jesuit accounts (Aschmann 1966).

CONCLUSIONS

While the Berkeley School of Geographers made some influential contributions to the prehistory of Alta California, their influence in shaping the emerging understanding of Baja California's prehistory was substantially greater. This was the case if only because the peninsula received comparatively little attention from Berkeley's anthropologists.

The work of the Berkeley geographers can be seen as somewhat distinctive from that of their anthropological, archaeological, and historical colleagues, despite the Berkeley School's extremely close interdisciplinary links,

particularly with anthropology. Two of these distinctions may be worth highlighting: the geographers' use of a more integrated, multidisciplinary, landscape-oriented perspective, and their favoring of dissenting viewpoints on some topics.

The Berkeley geographers tended to integrate the information and insights that could be derived from biogeography and, above all, from geomorphology more strongly into their analyses than did most other investigators of peninsular prehistory. The geographer Conrad J. Bahre has claimed that

> Reconstruction of the type Aschmann demonstrated in his Baja work requires integrating history, ethnography, archaeology, climatology, botany, and linguistics in a way that only cultural geographers seem to be able to do; specialists in any one of these disciplines rarely see or understand the total landscape [Bahre 1997:44].

The multidisciplinary perspective has evident advantages, both in general and as seen in its application to Baja California. However, it also includes some costs. Individual researchers can be expected to acquire only so much information and expertise, and trade-offs therefore exist. For instance, in reviewing Meigs's Kiliwa ethnography, the anthropologist George Devereux noted large gaps in the author's incorporation of the results from previous Yuman ethnographies and limitations in his topical coverage (Devereux 1940). The archaeologist Clement W. Meighan, in reviewing Arnold's Laguna Seca Chapala study, observed, "Judging by this and similar reports by other geographers, the 'comparative method' so dear to the archaeologist is not a very important part of the geographer's methodology" (Meighan 1958:1236–1237).

A second characteristic of the Berkeley geographers was a certain fondness for views that dissented from the "conventional wisdom" of the anthropologists. One manifestation of this was an interest in hyper-diffusionist interpretations of the origins and intercontinental transmission of agricultural crops, although this particular theme was not applied to Baja California.

A dissenting position that was relevant to the peninsula's prehistory concerned aboriginal demography. The higher estimates of prehistoric Native American populations that were championed by the geographers have subsequently morphed into a new conventional wisdom, although in Baja California this view has not gone entirely unchallenged (e.g., Mathes 2005).

A second subject of dissent concerned the antiquity of humans in the New World. On the peninsula, ages extending back at least several tens of thousands of years into the Pleistocene were proposed by Arnold and supported by Aschmann (1965:101). Most but not all archaeologists have continued to regard such claims with profound skepticism.

The Berkeley School geographers succeeded in using archaeological surface observations, ethnographic interviews, and the scrutiny of Spanish historical documents to flesh out pictures of prehistoric and aboriginal lifeways in greater detail than had been achieved by previous observers. Those pictures were also more firmly rooted within their ecological contexts than the work done by many of their successors. These contributions have been fundamental to the subsequent development of understanding of Baja California's prehistory during the late twentieth and early twenty-first centuries. Despite their inevitable limitations, they continue to offer stimulating models for research.

ACKNOWLEDGEMENTS

Eric W. Ritter, one anonymous reviewer, and the *Journal* editors are thanked for their help in refining this article and bringing it to completion.

REFERENCES

Alvarez de Williams, Anita
1983 Cocopa. In *Handbook of North American Indians, Vol. 10, Southwest*, Alfonso Ortiz, ed., pp. 99–112. Washington, D.C.: Smithsonian Institution.

Arnold, Brigham A.
1954 *Landforms and Early Human Occupance of the Laguna Seca Chapala Region, Baja California, Mexico*. Ph.D. dissertation, University of California, Berkeley.
1957 Late Pleistocene and Recent Changes in Land Forms, Climate, and Archaeology in Central Baja California. *University of California Publications in Geography* 10(4).
1971 The Earlier Traces of Man in the Two Californias. Paper presented at the Baja California Symposium 9.
1978 Surface Evidence of Early Man in Arid Lands. In *Early Man in America from a Circum-Pacific Perspective*, Alan Lyle Bryan, ed., pp. 181–182. *University of Alberta Department of Anthropology Occasional Papers* 1. Edmonton.

1984 Early Man in Baja California—Evidence and Interpretation. *Pacific Coast Archaeological Society Quarterly* 20(1):27–36.

Aschmann, Homer
1952 A Fluted Point from Central Baja California. *American Antiquity* 17:262–263.
1953 Desert Genocide. *El Museo* 1(4):3–15. San Diego Museum of Man.
1954 *The Ecology, Demography, and Fate of the Indians of the Central Desert of Baja California*. Ph.D. dissertation, University of California, Berkeley.
1959 The Central Desert of Baja California: Demography and Ecology. *Ibero-Americana* 42. Berkeley: University of California Press.
1965 Historical Sources for a Contact Ethnography of Baja California. *California Historical Society Quarterly* 44:99–121.
1966 *The Natural and Human History of Baja California.* Los Angeles: Dawson's Book Shop.
1968 Historical Accounts and Archaeological Discoveries: Working Together Two Scholarly Disciplines Enlarge Our Understanding of the Extinct Indians of Baja California. *Pacific Coast Archaeological Society Quarterly* 4(1):46–51.
1986 Learning about Baja California: Sources and Problems. J*ournal of California and Great Basin Anthropology* 8:238–245.
1987 Carl Sauer, a Self-Directed Career. In *Carl O. Sauer: A Tribute*, Martin S. Kenzer, ed., pp. 137–143. Corvallis: Oregon State University Press.
1997 Desert Genocide. In *The Evolving Landscape: Homer Aschmann's Geography*, Martin J. Pasqualetti, ed., pp. 47–54. Baltimore, Maryland: Johns Hopkins University Press.

Bahre, Conrad J.
1997 Introduction. In *The Evolving Landscape: Homer Aschmann's Geography*, Martin J. Pasqualetti, ed., pp. 44–46. Baltimore, Maryland: Johns Hopkins University Press.

Blouet, Brian W.
1981 *The Origins of Academic Geography in the United States.* Hamden, Connecticut: Archon Books.

Castetter, Edward F., and Willis H. Bell
1951 *Yuman Indian Agriculture*. Albuquerque: University of New Mexico Press.

Cook, S. F.
1937 The Extent and Significance of Disease among the Indians of Baja California, 1697-1773. *Ibero-Americana* 12. Berkeley: University of California Press.

Davis, Emma Lou
1968 An Archaeological Reconnaissance in the Central Desert of Baja California. *UCLA Archaeological Survey Annual Reports* 10:176–208. Los Angeles.

Davis, Loren G.
2003 Geoarchaeology and Geochronology of Pluvial Lake Chapala, Baja California, Mexico. *Geoarchaeology: An International Journal* 18:205–224.
2013 Evaluating Claims for Early Cultural Occupation in the Laguna Seca Chapala Basin, Baja California. In *Memorias de balances y perspectivas de la antropología e historia de Baja California, 2005–2011*. Centro INAH Baja California, Mexicali. Electronic document, http://www.xaguaro.com/MemoriasCD/page2/styled-10/styled-11/, accessed December 8, 2014.

Denevan, William M.
1996 Carl Sauer and Native American Population Size. *Geographical Review* 86:385–397.

Des Lauriers, Matthew R.
2008 A Paleoindian Fluted Pont from Isla Cedros, Baja California. *Journal of Island and Coastal Archaeology* 3:271–276.

Devereux, George
1940 Review of *The Kiliwa Indians of Lower California*, by Peveril Meigs, III. American Anthropologist 42:501–502.

Dow, Maynard Weston
1998 *Online Geographers on Film Transcriptions*. Electronic document, http://oz.plymouth.edu/~mwd/, accessed December 8, 2014.

Drucker, Philip
1941 Culture Element Distributions: XVII Yuman-Piman. *University of California Anthropological Records* 6(3). Berkeley.

Forbes, Jack D.
1965 *Warriors of the Colorado*. Norman: University of Oklahoma Press.

Gifford, E. W.
1933 The Cocopa. *University of California Publications in American Archaeology and Ethnology* 31(5). Berkeley.

Gifford, E. W., and R. H. Lowie
1928 Notes on the Akwa'ala Indians of Lower California. *University of California Publications in American Archaeology and Ethnology* 23:338–352.

Gruhn, Ruth, and Alan Bryan
2009 An Interim Report on Two Rockshelter Sites with Early Holocene Occupation in the Northern Baja California Peninsula. *Pacific Coast Archaeological Society Quarterly* 42(2&3):1–16.

Hammond, George P., and Agapito Rey (eds.)
1953 *Don Juan de Oñate, Colonizer of New Mexico*. 2 vols. Albuquerque: University of New Mexico Press.

Hohenthal, William D., Jr.
2001 *Tipai Ethnographic Notes: A Baja California Indian Community at Mid Century*. [*Ballena Press Anthropological Papers* 48.] Menlo Park, California: Ballena Press.

Hyland, Justin R., and María de la Luz Gutiérrez
1995 An Obsidian Fluted Point from Central Baja California. *Journal of California and Great Basin Anthropology* 17:126–128.

Kelly, William H.
1977 Cocopa Ethnography. *Anthropological Papers of the University of Arizona* 29. Tucson.

Kenzer, Martin S.
1987a *Carl O. Sauer: A Tribute*. Corvallis: Oregon State University Press.
1987b Introduction. In *Carl O. Sauer: A Tribute*, Martin S. Kenzer, ed., pp. 1–8. Corvallis: Oregon State University Press.

Kniffen, Fred B.
1929 *The Delta Country of the Colorado*. Ph.D. dissertation, University of California, Berkeley.
1931 The Primitive Cultural Landscape of the Colorado Delta. *University of California Publications in Geography* 5(2).
1932 The Natural Landscape of the Colorado Delta. *University of California Publications in Geography* 5(4).
2003 Foreword. In *Culture, Land, and Legacy: Perspectives on Carl O. Sauer and Berkeley School Geography*, Kent Mathewson and Martin S. Kenzer, eds., pp. 5–9. Baton Rouge: Louisiana State University.

Kroeber, A. L.
1925 Handbook of the Indians of California. *Bureau of American Ethnology Bulletins* 78. Washington, D.C.
1939 Cultural and Natural Areas of Native North America. *University of California Publications in American Archaeology and Ethnology* 38. Berkeley.

Massey, William C.
1947 Brief Report on Archaeological Investigations in Baja California. S*outhwestern Journal of Anthropology* 3:344–359.

Mathes, W. Michael
2005 Reflections and Considerations Regarding Baja California Demography Before and During the Mission Period. In *Archaeology without Limits: Papers in Honor of Clement W. Meighan*, Brian D. Dillon and Matthew A. Boxt, eds., pp. 205–212. Lancaster, California: Labyrinthos.

Mathewson, Kent
2011 Sauer's Berkeley School Legacy: Foundation for an Emergent Environmental Geography? In *Geografía y ambiente en América Latina*, Gerardo Bocco, Pedro S. Urquijo, and Antonio Vieyra, eds., pp. 51–81. Mexico City: Universidad Nacional Autónoma de México.

Mathewson, Kent, and Martin S. Kenzer, (eds.)
2003 *Culture, Land, and Legacy: Perspectives on Carl O. Sauer and Berkeley School Geography*. Baton Rouge: Louisiana State University.

Meighan, Clement W.
1958 Review of *Late Pleistocene and Recent Changes in Land Forms, Climate, and Archaeology in Central Baja California*, by Brigham A. Arnold. *American Anthropologist* 60:1236–1237.

Meigs, Peveril, III
1932 *The Dominican Missions of Lower California: A Chapter in Historical Geography*. Ph.D. dissertation, University of California, Berkeley.
1935 The Dominican Mission Frontier of Lower California. *University of California Publications in Geography* 7.
1939 The Kiliwa Indians of Lower California. *Ibero-Americana* 15. Berkeley: University of California Press.
1970 Capes of Human Hair from Baja California and Outside. *Pacific Coast Archaeological Society Quarterly* 6(1):21–28.
1971 Creation Myth and Other Reflections of the Nijí Mishkwish. *Pacific Coast Archaeological Society Quarterly* 7(1):9–13.
1972 Notes on the La Huerta Jat'am, Baja California: Place Names, Hunting, and Shamans. *Pacific Coast Archaeological Society Quarterly* 8(1):35–40.
1974a Field Notes on the Sh'un and Jat'am, Manteca, Baja California. *Pacific Coast Archaeological Society Quarterly* 10(1):19–28.
1974b Meigs on Tablas. *Pacific Coast Archaeological Society Quarterly* 10(1):37–38.
1976 Some Pictographs in Northern Baja California. *Pacific Coast Archaeological Society Quarterly* 12(1):2–8.
1977 Notes on the Paipai of San Isidoro, Baja California. *Pacific Coast Archaeological Society Quarterly* 13(1):11–20.

Ochoa Zazueta, Jesús Ángel
1978 *Los kiliwa y el mundo se hizo así*. Mexico City: Instituto Nacional Indigenista.

Ritter, Eric W.
1976 The Antiquity of Man in the Laguna Seca Chapala Basin of Baja California. *Pacific Coast Archaeological Society Quarterly* 12(1):39–46.
1991 Los primeros bajacalifornianos: enigmas cronológicos y socioculturales. *Estudios Fronterizos* 24/25:9–30.

Ritter, Eric W., and Patricia Aceves Calderón
2013 Fragments of Archaeological Landscapes in North-Central Baja California, Mexico. In *Memorias de balances y perspectivas de la antropología e historia de Baja California, 2005–2011*. Centro INAH Baja California, Mexicali. Electronic document, http://www.xaguaro.com/MemoriasCD/page2/styled-10/styled-15/, accessed December 8, 2014.

Ritter, Eric W., Louis A. Payen, and Carol Huber Rector
1984 An Archaeological Survey of Laguna La Guija, Baja California. *Pacific Coast Archaeological Society Quarterly* 20(1):17–26.

Rogers, Malcolm J.
1939 Early Lithic Industries of the Lower Basin of the Colorado River and Adjacent Desert Areas. *San Diego Museum of Man Papers* 3.
1945 An Outline of Yuman Prehistory. *Southwestern Journal of Anthropology* 1:167–198.

Sauer, Carl Ortwin, and Peveril Meigs
1927 Site and Culture at San Fernando Velicatá. *University of California Publications in Geography* 2(9).

Selcer, Perrin
2011 *Patterns of Science: Developing Knowledge for a World Community at Unesco*. Ph.D. dissertation, University of Pennsylvania. Electronic document, http://repository.upenn.edu/cgi/viewcontent.cgi?article=1455&context=edissertations, accessed December 8, 2014.

Speth, William W.
2003 A Sociological View of the Sauer School (1923–44). In *Culture, Land, and Legacy: Perspectives on Carl O. Sauer and Berkeley School Geography*, Kent Mathewson and Martin S. Kenzer, eds., pp. 81–114. Baton Rouge: Louisiana State University.

Williams, Michael
2014 *To Pass on a Good Earth: The Life and Work of Carl O. Sauer*. Charlottesville: University of Virginia Press.