

Geographical Record

Source: *Geographical Review*, Vol. 57, No. 2 (Apr., 1967), pp. 259-272

Published by: American Geographical Society

Stable URL: <http://www.jstor.org/stable/213165>

Accessed: 17-07-2017 21:31 UTC

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GEOGRAPHICAL RECORD

NORTH AMERICA

COLLECTING LAND-USE INFORMATION IN THE UNITED STATES. The need for reliable and detailed land-use data is urgent in the United States today if the country is to cope successfully with many of its domestic problems. Such important economic and social issues as rapid increase of population, explosion of cities and the consequent encroachment of urban activities in rural and agricultural areas, urban renewal and slum clearance, demand for extensive recreational land, and disposal of agricultural surpluses are related to land utilization. If a segment of land is to have optimum use detailed data and sound analysis are necessary. City and regional planners, agriculturists, foresters, transportation and recreation specialists, local, state, and federal government agencies, and private business are directly concerned, and there is a recent widespread upsurge of interest among laymen.

A well-documented and critical survey of present land-use information has recently been published (Marion Clawson, with Charles L. Stewart: *Land Use Information: A Critical Survey of U.S. Statistics, Including Possibilities for Greater Uniformity* [Baltimore, 1965]). This is not an official document of any federal agency but represents the thinking and discussions over more than three years of an informal committee composed of land-use experts from local, state, and federal agencies, university professors, and representatives from private industries and foundations. The second half of the monograph is devoted to appendixes describing the land-use data collected by a variety of federal government agencies, among them the Department of Agriculture, the Bureau of the Census, the Housing and Home Finance Agency, and the Bureau of Public Roads.

A developed nation requires statistical data on all aspects of its economic and social life. These data must be adequate in detail, accuracy, volume, and relevance. The availability of such information is one characteristic of an economically and socially advanced nation. In the United States a great variety of land-use information has been accumulated for specific purposes by various federal agencies, local governmental agencies, and private organizations, but no comprehensive system for the acquisition, classification, analysis, and publication of such information has been put into operation. The problem is highly complex: the major concepts underlying the broad term "land use" are scale of areas to be inventoried, precise location of a specific segment of land, type of activity on the land (agricultural, commercial, industrial, recreational, and so on), physical qualities of the land (topography, natural vegetation, surface and subsurface characteristics), improvements (drainage, leveling, terracing, construction of buildings), intensity of use, amount of activity per unit of area, land tenure or ownership, land prices and land marketing activity, interrelationship in use between different tracts of land, and interrelationships between specific activities on the land and other economic and social activities.

Although no immediate crisis concerning land-use statistics exists, there are several major reasons why a comprehensive and standard system of compiling land-use data is necessary for the near future. It is recommended that such a system should be structured on logical concepts. During the inventory state—data acquisition and tabulation—information on the different concepts about the land should not be mixed indiscriminately but collected on a "pure line" basis. Data should relate to a specific area, be precisely defined, and provide maximum

detail. Summaries for larger areas and correlations can be made at the analysis stage, and data can be made available in different forms as required by different groups of planners.

Significant progress toward an improved, uniform system of compilation of basic land-use data requires the establishment of a continuing organization to develop a coding system, parcel identification, field-survey techniques, and a classification system, and perhaps to serve as a consulting bureau for the benefit of various agencies and organizations. Classification and data-collection procedures must be updated from time to time; and modern data-processing techniques and machinery must be fully exploited.—JOHN F. LOUNSBURY

SOUTH AMERICA

CIUDAD GUAYANA: VENEZUELA'S PLANNED INDUSTRIAL FRONTIER METROPOLIS. Proposals for entirely new planned cities have taken center stage among urban developments in several countries in recent years. Few, however, have combined a true metropolitan scale, an economy rooted in basic industry, and a role as regional-growth pole in a frontier area. In combining these several distinctive facets Venezuela's Ciudad Guayana, now under construction on the Orinoco River 450 miles southeast of Caracas, represents a unique entry into the ranks of new cities being planned and constructed in the postwar era. This city, which is expected to achieve a population of 250,000 by 1970 and 600,000 by 1980, constitutes a key element of both regional and sectorial dimensions in the Venezuelan economic development strategy. Several recent studies have provided new insights into the plan for the city, the progress in its construction, and the general developmental milieu within which this monumental project is being realized. These works, all by individuals who have been deeply involved, include John Friedmann's book "Venezuela: From Doctrine to Dialogue" (Syracuse, 1965) and articles by Lloyd Rodwin, "Ciudad Guayana: A New City" (*Scientific American*, Vol. 213, No. 3, 1965, pp. 122-132), and Anthony H. Penfold, "Ciudad Guayana: Planning a New City in Venezuela" (*Town Planning Rev.*, Vol. 36, 1965-1966, pp. 225-248).

Ciudad Guayana is a lineal descendant and logical extrapolation of two sizable projects, a 600,000-ton-a-year steel mill and a 350,000-kilowatt hydroelectric installation, begun by separate government authorities in the mid-1950's. These projects are on the south bank of the Orinoco near the confluence with its northward-flowing tributary the Caroní, in the same general area as the iron-ore developments begun by Bethlehem Steel and United States Steel in the late 1940's and early 1950's. In 1960 an autonomous government authority, the Corporación Venezolana de Guayana (CVG), was established, charged with the study and development of the region's resources; it was also given control of the steel mill and the hydroelectric installation. In its more than five years of activity the CVG has vigorously stimulated and managed regional development. Particularly noteworthy has been the effort expended in planning a new city of massive proportions to incorporate existing features of the physical and cultural landscapes efficiently, and at the same time providing for rational, harmonious future growth.

Although all new planned cities have certain elements in common, in Ciudad Guayana the differences perhaps deserve greater stress than the similarities. The motive for the creation of such cities as Canberra, New Delhi, Islamabad, and Brasília was plainly political administrative—the construction of a political capital with symbolic idealism and accommodation of the administrative bureaucracy. The "new towns" in the United Kingdom and Sweden

represent, for the most part, rational attempts to overcome the friction and chaos of super-metropolitan agglomeration. There the planner's motive was to achieve optimal balance between the self-containment of the city and the essential, inevitable intercity linkages that characterize the socioeconomic existences of cities in the industrialized free world. Clearly Ciudad Guayana is not in either of these categories. The Venezuelan purpose is the creation of a new "mother city," not the structuring of overflow from an existing one. The new city is considered an instrument for achieving the level of industrial development specified in the national plan. Given the juxtaposition of a great volume and variety of natural resources, the city becomes the focus for their integration into the national economy. Toward this end the CVG is acting as the composer orchestrating a work in which various government agencies and participants from the private sector are contributing to an investment program that is giving rise to the new city. In 1965 the CVG itself provided directly only 21 percent of the capital of 42 million dollars poured into Ciudad Guayana.

Outside the city, activity has been limited principally to transportation improvements, hydroelectric projects, mineral extraction, agronomic studies, and the beginnings of reclamation of swampy and flooded land in the Orinoco Delta. Eventually the new city will have an enormous impact on the economy of the entire eastern llanos area, but at present greatest emphasis is being placed on development of the national economy. The output goals assigned to the city indicate the key role of this new industrial complex within the Venezuelan economy. The 1975 targets include an installed hydroelectric capacity of 2,100,000 kilowatts; 3,860,000 metric tons of finished steel products derived from the reduction of 10 million tons of iron ore; 200,000 tons of aluminum bars; 130,000 tons of paper and pulp products; and significant amounts of magnesium, manganese, phosphorus, nitric acid, ammonium nitrate, caustic soda, and chlorine. Volumes of derived consumer and intermediate goods are less easily projected, though estimates have been made for outputs of heavy machinery, construction materials, and certain light manufactures ("Guayana: Clave en el desarrollo de Venezuela" [Corporación Venezolana de Guayana, Caracas, 1963]).

The master plan for Ciudad Guayana was completed in 1964. The structure of the new city is keyed to a major vehicular artery, Avenida Guayana, as a principal axis connecting several key functional centers. The overall planning strategy included three principal decisions as determinants of city structure and subsequent decisions. First, the urban entity will be a "single city." At the outset there was some temptation to think of a complex of cities or at least of twin cities. These early ideas arose from concern over the multiple nuclei that constituted local settlement before 1960, the relatively long distances separating them, and the barrier effect of the Caroní River. Second, development of the land area available west of the Caroní will be encouraged. This policy will lead to the development of a new concentration of population closer to the steel mill and the heavy industrial area. The bulk of the existing population lives east of the Caroní where the general cargo port, the warehousing area, and the zone for light industry are located and where the major medical center will be constructed. Third, a strong "city center" will be established as the major focus of intracity commerce. The site selected was a topographic high that offered a commanding physical position. As thinking concerning the CBD has evolved, the site has migrated westward to its present location. In 1962, at the time of the decision to construct the bridge over the Caroní, the consensus favored a site on the Punta Vista peninsula at the west end of the bridge, rather nearer the populated areas on the east side of the river (David E. Snyder: *Ciudad Guayana: A Planned Metrop-*

olis on the Orinoco, *Journ. of Inter-American Studies*, Vol. 5, 1963, pp. 405–412). Subsequently it has become apparent that the area available would not be sufficient for the volume of commercial and civic activity necessary for a single large city of the size envisioned. However, the Punta Vista peninsula has been designated as the major focus for cultural and recreational activity, including the university. In developing the relatively open, higher Alta Vista site three miles west of Punta Vista as the CBD, precautions are being taken to ensure its focal position and, hopefully, to avoid the difficulties of the excentric commercial aberrations experienced in Brasília. The first of three stages in the development of Ciudad Guayana's 540-acre commercial and administrative center emphasizes regional functions. A large department store, a supermarket, and bowling alleys will be combined with a *plaza de comercio* and an office complex designed principally for use by the CVG. Simultaneous development of the highway axis and a sizable residential area easily accessible to the CBD will maximize the reciprocity of linkages arising from these specialized land uses.—DAVID E. SNYDER

EUROPE

PARIS AND REGIONAL DEVELOPMENT IN FRANCE. The urgency of problems in the great cities, the emergence of regional thinking, and the need to fuse physical with economic and social objectives have been the hallmarks of planning in the past decade. In few other countries has this wide-ranging environmental planning taken such firm root as in France since 1955. Here is a society apt for experimentation, with rapid economic growth providing the means and the burgeoning of population dictating the ends. As primate city Paris has long been exceptionally prominent, both in size and as the keystone of national economic growth. It lies between an underprivileged agrarian west and south and an industrialized north and east that abuts directly on the heart of the Common Market. Within the centralized French State administration has traditionally been close and detailed, in some contrast with the notable freedom of industrialists and merchants to make locational decisions.

Two recent publications, "France: Town and Country Environment Planning" (Ambassade de France, Service de Presse et d'Information, New York, 1965) and "Schéma directeur d'aménagement et d'urbanisme de la région de Paris" (Paris, 1965), touch on the core problems of France—environmental planning and the future of the Paris region. Although both are national, they must be viewed within the increasingly important context of the Common Market, the only valid framework for West European planning today. Yet the French regional problem is a distinctive variant on a European development theme: the need for regional balance within the economy, with the program of metropolitan nodes and associated relay centers, must be set against a strongly inherited doctrine, until recently that of the precedence of the capital city. If Paris no longer contrasts with the French "desert," it is impossible to ignore the city's size, distinctiveness, and distance from major metropolitan centers, many of which are near the outer limits of the state.

The acid test for regional policy is that the regions should be valid entities and that there should be effective authority to plan and act at the regional level. The twenty "districts for regional action" are serviceable but do not always escape the uneasy compromise between ancient traditions and modern needs. Decision making in France lays sophisticated emphasis on central initiative and the representation of central government at the regional level but relies more heavily on consultation for rapport with the diverse committees representing regional interests.

To correct the imbalance in living standards and growth between the northeast and the southwest, a comprehensive decentralization program has been set in motion, founded on an improved national infrastructure—of transport, housing, and utilities—as the precursor to economic growth. Not only material resources but also cultural and intellectual aspects of the living environment are being disseminated through the regions. In the less privileged areas of rural France regional policy meets thorny problems of agrarian reform, a reform that when implemented will add to the urbanward tide of migrants during the remainder of this century. Rural development programs are as diverse as the French countryside. Some of the more dramatic plans and achievements are in the Midi: the pioneer multipurpose Rhône Valley project; the Lower Rhône–Languedoc–Roussillon scheme for water control, irrigation, and tourist development; and the new industrial metropolis on the Gulf of Fos, near Marseilles.

Crucial to French regional planning is the massive program for balanced urbanization, to accommodate in towns 64 million of the 72 million persons estimated as the French population by the year 2000 (14 million in an enlarged Paris). This vast prospective growth, from a present national figure of little more than 46 million (17.5 million of whom are still on the land), can be met only by planning on the heroic scale. All cities must grow fast, Paris and metropolitan centers alike; it is to be hoped that the quality and character of the French city will not be engulfed in the process.

The “Schéma directeur” for the Paris region changes the concepts and the course for growth over the next few decades. As recently as 1960 the P.A.D.O.G. scheme (Plan d’aménagement et d’organisation générale de la région parisienne) proposed to restrict the territorial spread of the Paris agglomeration, while introducing growth areas into the existing city fabric. The “Schéma directeur” rejects the hypothesis of limiting growth, and aims at no less than rectifying the monocentric form of the built-up area by creating seven “new towns,” each capable of serving 300,000 to one million inhabitants, aligned almost as extensions of the built-up area along parallel growth axes tangential to the present city. These axes extend along the plateaus overlooking the Seine, in the direction of the dynamic growth zone of the Seine estuary.

There is no program for planned overspill from Paris to surrounding towns, and the solution of “new towns” on the British pattern is repudiated in a vindication of the concentrated, restructured city-region, a concept rejected by many European planners in favor of the multinucleate city-region as exemplified today by the *randstad* of the Netherlands. It must be admitted, however, that Paris is peculiarly a giant among the minnows of its basin, that it is already one of the most concentrated, congested cities of the Western world, and that its role and its needs as an industrial and service center are both exceptional.

Within the existing city an ambitious restructuring of the suburbs is proposed, with greater fluidity of zoning, and projects for new growth areas or urban renewal schemes. Overshadowing all, however, is the prospect of absorbing six million new inhabitants by the year 2000, a population as large as that of Switzerland today. Can this be accomplished without undesirable modifications in central Paris or a traffic problem of insuperable dimensions?

In Paris, as in other great cities of the Western world, it must remain an open question whether the immense capital investment to be committed might not be more effectively deployed within a less centralized urban network. With uncertainties about the longer-term flows of migrants and the socioeconomic structure of France in the future, it is right to look

on the "Schéma directeur" as a farsighted blueprint, not a plan, advancing and justifying the "concentration" solution for the manifold problems of what M. Georges Pompidou has referred to as "the brain and the heart of France."—JOHN W. HOUSE

LAST GLACIAL TUNDRA VEGETATION IN CENTRAL EUROPE. At the height of the Pleistocene glacials an open vegetation prevailed over most of the unglaciated terrain of mid-latitude Europe. This conclusion was originally based on the mammalian fauna, with species such as musk ox, reindeer, woolly rhino, and mammoth, as well as on the prevalence of loess deposition and a variety of periglacial phenomena. The scanty paleobotanical evidence suggested a treeless vegetation in southern Britain, the Low Countries, and central Europe, and some scattered groves of trees in eastern Europe, but even there limited to riverine lowlands or other sheltered valleys. It was widely assumed that a typical tundra vegetation with herbs, shrubs, grasses, and sedges prevailed west of 20°E.

However, the great biomass of gregarious herbivores of Glacial Age Europe seemed incongruent with that of contemporary high-Arctic tundras in North America and Eurasia. European paleontologists have already emphasized that most of the characteristic mammals of the Last Glacial were open-country grazers, many of them better adapted to the cold, dry environment of present-day Central Asia than to the Eurasian tundra (see, for example, E. Thenius: *Die Grossäugetiere des Pleistozäns von Mitteleuropa*, *Zeitschr. für Säugetierkunde*, Vol. 27, 1962, pp. 65–83). The abundance of steppe rodents has supported this view. More recently the present writer has pointed out that the resource base and ecology of the Pleistocene mid-latitude tundras should have been decidedly more favorable than those of the modern high Arctic (Karl W. Butzer: *Environment and Archeology* [Chicago, 1964], pp. 138 and 374). For one thing, the intensity of midsummer radiation is greater in France and Germany than in Lapland, favoring more rapid plant photosynthesis under otherwise equal climatic conditions. Similarly, the annual cycle of insolation, of some relevance for animal grazing activity, varies appreciably between 50°N and 65°N.

Two recent articles by Burkhard Frenzel (*Zur Pollenanalyse von Lössen, Eiszeitalter und Gegenwart*, Vol. 15, 1964, pp. 5–39; *Über die offene Vegetation der letzten Eiszeit am Ostrande der Alpen, Verhandl. Zool.-Botan. Gesell. in Wien*, Vol. 103/104, 1964, pp. 110–143) provide wholly new perspectives on the Last Glacial vegetation of mid-latitude Europe. Since pollen studies of Pleistocene loesses have been stymied by a scarcity of recoverable pollen, Frenzel has developed a new method of sample processing, by which loesses or interdigitated soil profiles will provide almost unlimited pollen (several thousand grains from a hundred grams of sediment). After removal of carbonates and humus, the sample is repeatedly subjected to flotation in a mixture of potassium iodide and cadmium iodide. The pollen is caught on fine filter paper after centrifuging, and subsequently is cleansed of attached mineral matter by the application of hydrofluoric acid. In his discussion of sources of error Frenzel points out that percolation of modern pollen is insignificant below a depth of 50–60 centimeters, as shown by stratigraphic consistency and duplicated sample spectra. Only 7.9 percent of the sixteen thousand pollen grains examined were corroded or deformed beyond identification, and Tertiary pollen from nearby bedrock exposures was absent. This implies that derivation from older sources is fairly unimportant. Differential preservation is no more of a problem than in conventional pollen studies, to judge by consistent representation of particular morphological types in stratigraphically equivalent beds. Since herbaceous pollen is either insect-pollinating or otherwise not prone to significant wind transport, long-distance

derivation appears to be limited to the arboreal pollen of paleosol horizons. Finally, the basic reliability of the tree pollen record is demonstrated by frequent macrobotanical remains.

Applying his technique to Pleistocene loess deposits and paleosols of eastern Austria, Frenzel presents fascinating patterns of spatial and temporal variation, both in the proportion of arboreal pollen and in the composition of the nonarboreal components. During the periods of maximum cold, coinciding with loess deposition, tree pollen in the moister foothill country ranged from 20 to 70 percent, as compared with less than 5 percent in the drier lowland plains. Consequently, scattered trees or parklands of pine, spruce, alder, and birch are postulated for the foothill zone. The open vegetation of the foothills was dominated by *Artemisia* (related to the sagebrush of the intermontane basins of Utah and Nevada) and by herbaceous plants. The plains were dominated by a grassy steppe, rich in herbaceous plants, with a component of semidesert or salt-tolerant *Chenopodiaceae*. Although tundra and alpine elements are present in all spectra, this was not a true tundra vegetation. For example, there is a great abundance of plants favoring dry but eutrophic environments. This corroborates the geomorphic and pedologic evidence whereby the Pleistocene loesses bear little analogy to the highly acidic and generally waterlogged soils and surficial sediments of modern Arctic tundras. Certain floristic analogies of Last Glacial Austria with the steppes and semideserts of Central Asia are apparent, but Frenzel stresses that this late-Pleistocene vegetation cannot be adequately described in terms of modern plant associations.

Considerable temporal change of vegetation is apparent within the Last Glacial itself. The earlier cold maxima appear to have experienced a relatively moister climate, and *Artemisia* is a significant component of most spectra. However, the final glacial maximum was drier, a conclusion borne out by the molluscan faunas, and the *Chenopodiaceae* attain their greatest prominence. This basic loess-steppe pattern was interrupted by several, more temperate, interstadials. These were characterized by soil formation and a vegetation of subalpine-coniferous and riverine-deciduous woodlands along the major valleys, with steppe formations retaining their dominance on the drier loess plains.

The prospect of further regional studies of Pleistocene mid-latitude loess-steppes in Europe and North America is of interest not only to plant geographers but also to those concerned with man-land relationships in prehistory.—KARL W. BUTZER

AFRICA

LAND AND PEOPLE IN THE KANO CLOSE-SETTLED ZONE. More than most other African cities, Kano exerts a strong pull on the imagination—an allure that a visit to the city usually dispels. “Please God, you shall go and visit Kano,” said a Hausa slave in Tunisia to Heinrich Barth in the late 1840’s, and these words (plus the promise of a professorship in geography at the University of Berlin) drew him across the Sahara a few years later. For Barth “the wonders of this African London, Birmingham, and Manchester” never really lost their luster, though he thought it a rather unhealthy place. The nonchalant Kanawa, then as now, never reciprocated the wonder, and one is amused to read Hugh Clapperton’s description of his entry into Kano in 1824: “Arrayed in naval uniform, I made myself as smart as circumstances would permit . . . [but] I might have spared all the pains I had taken with my toilet; for not an individual turned his head round to gaze at me” (Narrative of Travels and Discoveries in Northern and Central Africa, in the Years 1822, 1823, and 1824 [London, 1826]: Captain Clapperton’s Narrative, pp. 39–40).

As the premier city of Hausaland, at least since the Fulani wars of 1805–1812, Kano has

undergone several fundamental changes in the last century, including an almost complete commercial reorientation after the demise of the caravan trade and the construction of the railroad linking Kano with Southern Nigeria. At first appearance, Kano seems to be an inviting testing ground for the central-place theory: the annular design of the surrounding "close-settled zone" (uniformly low relief, "fertility rings," continued importance of firewood and nonmechanized transport) suggests relevance to the Von Thünen model, but the potential investigator would have to make due allowance for some of the basic African and Muslim elements.

To know what Kano consists of and to plan for its orderly development, the Greater Kano Planning Authority has commissioned several studies of its contemporary geography. The first to appear were three mimeographed reports, which had only a small distribution: "Traffic Studies 1963," by V. C. Johnston (1963); "Metropolitan Kano and Its Environs: Planning and Economic Geography," by Gavan McDonell (1963; see also McDonell's paper, "The Dynamics of Geographic Change: The Case of Kano," *Annals Assn. of Amer. Geogrs.*, Vol. 54, 1964, pp. 355-371); and "Social Studies with Special Reference to Housing," by Jennifer Wilson (n.d. [1964]). More recently, the Department of Geography in Ahmadu Bello University, in Zaria (110 miles south of Kano), has issued three *Occasional Papers* by Michael J. Mortimore, lecturer in geography: "Land and People in the Kano Close-Settled Zone: A Survey of Some Aspects of Rural Economy in the Ungogo District, Kano Province" (*Occasional Paper No. 1*, 1965); "Distribution of Population in Kano Province, 1962" (map at the scale of 1:500,000, *ibid.*, No. 2, 1965); and "Land Use in Kano City and Township" (map at the scale of 1:12,500 and "Report," *ibid.*, No. 3, 1966). Mr. Mortimore was assisted in the first study by Jennifer Wilson, who was able to penetrate and describe the life of women in this Muslim society. Although the studies by McDonell and Mortimore are similar in many respects, it is of interest to point out some differences. McDonell includes a brief historical survey and attempts to place Kano in its wider setting. Mortimore offers a close dissection of the present scene and usually allows his data to speak for themselves. The Mortimore-Wilson work is essentially a microgeographic study of several villages in Ungogo District, just to the north of the Kano urban area. These villages are typical of the immediate environs of Kano, and perhaps of a wider area as well. This intensive study has led Mortimore to controvert, or at least to question, several of McDonell's generalizations. For example, Mortimore queries the general usefulness of McDonell's figures for yields and population density. He could find no evidence to support McDonell's assertions of net emigration and large-scale seasonal migration in Ungogo District. McDonell also fails to recognize the importance of secondary, nonagricultural, occupations in the village economy.

As the largest Sudanese city between Dakar and Khartoum-Omdurman, Kano stands out strikingly on the African population map. The 1962 census showed a population of a quarter of a million in Kano City (the area within the old wall) and Township (extramural), and the disputed 1963 census gave 295,000. The City is almost 100 percent Muslim and Hausa, whereas the Township includes immigrants from other parts of Nigeria (the Ibo, however, left in 1966), Levantines, and Europeans. Although the residential quarters of the City are congested, all the intramural space has not been filled in; there is still considerable farmland in the western part. Visitors since the days of Clapperton and Barth have wondered about this arrangement, not only in Kano but in Zaria and Katsina, the other large walled cities of Hausaland. Empty land (or farmland) within the wall does not indicate depopulation,

as was sometimes thought; for the walls have always enclosed considerable farmland, perhaps in anticipation of long sieges. It is now much easier to acquire land, and to build, outside the wall than inside it.

Kano and its region are important not only in themselves but also as offering a picture of what other Sudanese urban centers will be like in the future. The increasing density of population has forced certain changes in land tenure and land use—changes that on the whole have been beneficial. The large population of the Kano close-settled zone calls for permanent cultivation and a more efficient use of the land than obtains, say, around Sokoto. In a study of Sokoto, R. Mansell Prothero (Some Observations on Desiccation in North-Western Nigeria, *Erdkunde*, Vol. 16, 1962, pp. 111–119; reference on p. 118) argues that the “real dangers of land deterioration seem to be greatest where the population densities are between . . . c.200 and 250 per square mile [as around Sokoto] . . . These figures indicate a critical transition stage between lower densities which allow cultivation under a system of land rotation and higher densities which demand the permanent cultivation of a large proportion of the cultivable land.” As the bellwether, Kano provides lessons for the other rapidly growing Sudanese cities to follow—or to avoid.—GARY S. DUNBAR

MEDICAL GEOGRAPHY

HUMAN AND ECOLOGICAL FACTORS IN MALARIA. The status of malaria as one of the most widely distributed and most serious causes of morbidity and mortality in tropical countries is steadily declining in the face of a massive international control effort. Since its inception in 1955, the World Health Organization’s Malaria Eradication Program had succeeded, by the end of 1965, in achieving control of the disease among 57 percent of the 1576 million people living in the areas of the world designated by WHO as malarious, and programs were in progress for the benefit of an additional 20 percent. The remaining 23 percent is made up of 86 million people in countries (mainly in Africa) that have yet to begin a program leading to malaria control (*WHO Chronicle*, Vol. 20, 1966, p. 287). It is critical for the success of the general program that it should eventually include all malarious areas, and that where control has been achieved it should be carefully maintained to prevent any resurgence.

Human malaria has a complex host-parasite relationship involving the parasite *Plasmodium*, the mosquito vector *Anopheles*, the human host, and the environment, physical, biological, and cultural. The life history of the disease and, especially, the roles of the parasite and the vector are comparatively well understood, as is the clinical nature of the disease in man. Less attention has been paid to the behavior of man as a susceptible host and how his activities may increase or decrease his probability of infection, either by influencing the parasite and vector or by altering his exposure to them. Likewise, the influence of the environment in modifying the probability of infection at several points in the host-parasite relationship is not fully clear. These shortcomings are especially apparent in many areas where control programs are planned or in progress but where the specifics of the culture and economy, and the peculiar nature of the local environment, have yet to be adequately investigated.

One human activity critically related to malaria is population migration, and this forms the topic of a recent work by R. Mansell Prothero, “Migrants and Malaria” (London, 1965). The author is a geographer who served as a consultant to WHO in Africa. With reference to five major regions that include most of the continent except the Sahara Desert and South

Africa, Prothero illustrates the significance of various types of migration for malaria distribution and incidence, and especially as complicating factors in the implementation of a control program. Over much of North Africa pastoral nomads wander with their stock in search of pasture and water. This highly mobile population forms an excellent agency for malaria transmission, either by infected carriers or by the unintentional transport of infected mosquitoes or both. Basic knowledge of the numbers and patterns of movement of nomadic populations is scanty and difficult to obtain, yet such information must be enlarged if anti-malarial measures are to succeed. Pastoral groups that practice transhumance, in which time and path of movement and destinations are more clearly defined, pose fewer problems. Annual pilgrimages, especially the convergence on Mecca and Medina of more than a quarter of a million Muslims from all parts of the world, constitute major challenges in the control of communicable diseases, including malaria. No less important are seasonal and daily movements over shorter distances by traders, farmers, and fishermen, and by laborers in agriculture, mining, and manufacturing. Political changes have led to sporadic but often significant migrations of African communities, both refugees from persecution and converts to new regimes.

Associated with population migration are a host of additional cultural problems. The conservative and independent spirit of many communities—notably the pastoralists, who have experienced malaria for centuries and accept it as part of normal life—often manifests itself as resentment and resistance against attempts by authority to modify a way of life in order to control disease. Settlement patterns, their permanency and the nature of construction materials, govern the efficacy of residual spraying projects aimed at the mosquito. Political boundaries become problem zones when control measures are in effect on one side and not on the other. Screening the vast numbers of migrants that cross the long and lonely borders has proved an almost impossible task, even for such clearly demarcated units as the islands of Zanzibar and Pemba.

More subtle human and ecological factors underlie these general patterns. For example, the use of medicated salt as a prophylaxis has not been acceptable to many West African communities that prefer unrefined rock salt, which cannot be chloroquinized. Other examples have been noted by L. Schuyler Fonaroff (Biogeographic Aspects of Malaria in Trinidad [Office of Naval Research, ONR Project NR 388 067, 1966]). Fonaroff illustrates the importance of specific cultural habits by reference to the practice of many small cacao farmers who are employed away from home during the day but return to work on their own plots during the early evening hours—the period when the malaria vector *Anopheles bellator* is most active. Another interesting situation is that in which government order requires that the cacao plots be shaded by other trees, a culture which is believed to increase yields, but which also provides a habitat even more favorable for *A. bellator* than the natural forest itself.

The importance of viewing the ecology of malaria as an ecosystem is emphasized by the research in Trinidad, where the close association between microclimate, the particular species *A. bellator*, and the cacao plantation, which affords both an optimal environment for the mosquito and ready access to its human host, has been clearly demonstrated. On the other hand, the other major malaria vector in Trinidad, *A. aquasalis*, prefers a different habitat, namely coastal swamps. It appears to reach maximum breeding densities after the onset of the midsummer rainy season, and higher intensities of rainfall appear to flush out the mosquitoes from the coastal forest into the open. The fact that much of Trinidad's sugar

cultivation is within flight range of the swamps points up the importance of studying the spatial relations of vector habitats and the presence of man and his activities. Last year Trinidad entered the lists of those countries where malaria has been declared eradicated, but constant surveillance will be needed, as in all such areas, to preserve that status.

Clearly, the control of malaria and many other diseases can be achieved and maintained more effectively if the ecological relationships between disease, man, and environment are understood. Dr. A. M.-M. Payne, chairman of the Department of Epidemiology and Public Health at the Yale School of Medicine, in a statement to the WHO Executive Board in January, 1966 (*WHO Chronicle*, Vol. 20, 1966, pp. 284-285), emphasized the value of the concept of a multifactorial etiology that considers the environmental and social factors as well as the biological. He noted that it is vital to study the ecology of an area if dangers inherent in changing conditions are to be foreseen and preventive action taken. In keeping with this concept, Prothero and Fonaroff have performed the dual service of providing new insights into the human and ecological factors related to malaria and adding to the literature two applied specific studies with operational significance in public health.—R. W. ARMSTRONG

MEDICAL GEOGRAPHY IN THE WESTERN PACIFIC. Medical geographers, anthropologists, ethnologists, and scholars in other disciplines who are interested in the cultural environment of the Western Pacific realm will find much of value in the results of a series of epidemiologic, hematologic, and immunologic studies carried on in recent years among native population groups in various parts of Micronesia and Melanesia. The articles, largely the work of Dr. D. Carleton Gajdusek, of the National Institute of Neurological Diseases and Blindness, and his associates, constitute a welcome addition to the literature of the region and should be made known to geographers.

In 1964 the spread of an A2 influenza epidemic to three isolated atolls in the Carolines was investigated (Paul Brown, D. Carleton Gajdusek, and J. Anthony Morris: Epidemic A2 Influenza in Isolated Pacific Island Populations without Pre-Epidemic Antibody to Influenza Virus Types A and B, and the Discovery of Other Still Unexposed Populations, *Amer. Journ. of Epidemiology*, Vol. 83, 1966, pp. 176-188). The epidemic appears to have started in Yap, but morbidity was not high. On reaching the first of the isolated "outer islands," the disease began to change to a rapidly spreading and severe respiratory illness. Morbidity increased as each of the other two atolls was successively infected, until in Ifaluk, the last, only two of the total population were not sick, and these two were psychotic men who had been kept isolated in their huts. The mortality rate also rose, from 1 percent in the first atoll to 3 percent in the second and 6.5 percent in the third. Sera collected in these atolls before the epidemic showed an almost total absence of antibodies against types A and B influenza virus. After the epidemic high titers were obtained against the A2 strain. On several other atolls the inhabitants have been shown to be susceptible to influenza, since their blood is without antibodies against the virus, and the possibility of similar epidemics therefore exists.

Another study on the Caroline Islands details the clinical responses to measles vaccine in a population proved immunologically to be susceptible to measles (Paul Brown, Mint Basnight, and D. Carleton Gajdusek: Response to Live Attenuated Measles Vaccine in Susceptible Island Populations in Micronesia, *Amer. Journ. of Epidemiology*, Vol. 82, 1965, pp. 115-122). More than 1200 persons in the Yap District were inoculated with measles vaccine.

Severe febrile reactions followed, especially in young children, though these and other reactions were not severe enough to be seriously disabling. One year after immunization, immune (HAI) titers had increased in 99 percent of the vaccinated persons, and the amount of the increase was correlated with the severity of the febrile reactions.

An analysis of ABO, MNS, and Rh blood-group characteristics in the people of the Western (Yap and Palau Districts) and Eastern (Truk District) Carolines has been set against a background of ethnic and geographic information, including ancient origins, migrations, and linguistics (R. T. Simmons, J. J. Graydon, D. C. Gajdusek, and Paul Brown: *Blood Group Genetic Variations in Natives of the Caroline Islands and in Other Parts of Micronesia, Oceania*, Vol. 36, 1965-1966, pp. 132-170). Gene frequencies were studied, "especially in relation to the varying genetic patterns encountered within individual island and atoll populations, and between the islands of a given linguistic group," and some interesting correlations emerged. A similar investigation was carried out in the Sepik District of New Guinea (R. T. Simmons, J. J. Graydon, D. C. Gajdusek, F. D. Schofield, and A. D. Parkinson: *Blood Group Genetic Data from the Maprik Area of the Sepik District, New Guinea, Oceania*, Vol. 35, 1964-1965, pp. 218-232).

Four papers dealing with the hematologic and immunologic characteristics of the peoples of Papua and New Guinea seem to be reports on the same group of sera. Slightly more than 800 blood specimens were collected in New Britain and nearly 1900 in New Guinea (about 600 from the Sepik District, some 350 from Morobe, 600 from the Eastern Highlands, 200 from the Southern Highlands, and 80 from the Western Highlands). Studies were carried out on the presence and levels of serum proteins, on serum pseudocholinesterase levels, on haptoglobins and transferrins, and on cold hemagglutinins ("A Study of the Serum Proteins of the Peoples of Papua and New Guinea," *Amer. Journ. of Tropical Medicine and Hygiene*, Vol. 14, 1965, pp. 678-690, "Serum Pseudocholinesterase Levels and Variants in the Peoples of Papua and New Guinea," *ibid.*, pp. 671-677, and "Haptoglobins and Transferrins in Melanesia," *Amer. Journ. of Physical Anthropol.*, N.S., Vol. 23, 1965, pp. 363-379, by C. C. Curtain, D. C. Gajdusek, C. Kidson, J. Gorman, L. Champness, and R. Rodrigue; and "Cold Haemagglutinins: Unusual Incidence in Melanesian Populations," by C. C. Curtain, A. Baumgarten, J. Gorman, C. Kidson, L. Champness, R. Rodrigue, and D. C. Gajdusek, *British Journ. of Haematol.*, Vol. 11, 1965, pp. 471-479). Results are tabulated by geographic area, cultural and linguistic group, age, and sex; and pertinent ethnic, ecological, and medical data are analyzed in an attempt to explain the patterns observed. Analyses of serum proteins showed increasing levels of gamma globulins with increasing age in all districts studied. Unusually high levels of cold hemagglutinins were found among the Tolai people, as compared with levels in other population groups.

Serological survey techniques were also used to investigate arthropod-borne virus infections in Australasia, with promising results (C. L. Wisseman, Jr., D. C. Gajdusek, F. D. Schofield, and E. C. Rosenzweig: *Arthropod-Borne Virus Infections of Aborigines Indigenous to Australasia, Papua and New Guinea Medical Journ.*, Vol. 7, 1964-1965, pp. 12-18). In many parts of Melanesia and Micronesia both epidemic and sporadic cases of acute viral infections of the central nervous system—for example, encephalitis—have been observed, and much work remains to be done to clarify the epidemiological and environmental factors associated with these diseases.

But perhaps the most valuable, and certainly the most fascinating, of the studies under

consideration deals with kuru, a degenerative disease of the central nervous system that seems to be limited in distribution to circumscribed areas in the Western Pacific. Dr. Gajdusek has apparently been investigating this unusual disease for some years and has published, alone or as coauthor, a dozen or more reports on the work. Among them is a discussion of the situation in the kuru region of New Guinea (Michael Alpers and D. Carleton Gajdusek: Changing Patterns of Kuru: Epidemiological Changes in the Period of Increasing Contact of the Fore People with Western Civilization, *Amer. Journ. of Tropical Medicine and Hygiene*, Vol. 14, 1965, pp. 852-879), where some thirty thousand persons live, belonging to nine different language groups. To set the scene, a detailed description is provided of the geography, climate, ethnology, and history of these people and of the impact of Westernization upon them. In this area of the Central Highlands a complete epidemiologic study of morbidity and mortality records was carried out and the results analyzed, with a consideration of the possible genetic and environmental factors that have been postulated as causative agents of the disease. According to the evidence, there has been a spectacular drop in kuru incidence and mortality, especially among children. For example, in 1957-1959 there were 193 reported deaths among persons under fifteen years of age, but in 1961-1963 the number was only 101. Similarly, in 1957-1959 some 117 children under ten were found to be suffering from kuru, but in 1961-1963 only 28 cases were found. The reasons for this dramatic improvement cannot be ascertained, but they point to the presence of an environmental factor, probably connected with, or acting upon, some genetic factor or predisposition. The disease is a puzzling one, but, hopefully, further research will illuminate some of the obscurities that now surround it.

—IRMA S. JARCHO

GEOGRAPHICAL NEWS

THE FIRST INTERNATIONAL CONGRESS ON THE HISTORY OF OCEANOGRAPHY. Under this designation a body of scientists and scholars assembled during the week of December 12-17, 1966, in the princely surroundings of the Musée Océanographique in Monaco. Besides the ceremonial opening and closing sessions, the former of which was honored by the presence of Prince Rainier III and Princess Grace, nine working sessions were held, at which fifty-seven papers by authors from fifteen countries—if a Chinese resident in France is credited to his country of origin—were read. Participation was by invitation, though a goodly number of *auditeurs* also attended.

The Congress was organized by the Princely Government of Monaco and the Institut Océanographique with the assistance of UNESCO and the International Union for the History and Philosophy of Science. The president of the international organizing committee was Commander Jules Rouch, former director of the Musée Océanographique, whose services to oceanography extend back to his participation in the Antarctic voyage of Jean Charcot's *Pourquoi-Pas?* in the first decade of the present century. Commander Rouch, in his eighty-third year, was the patriarch of the Congress, delivering eloquent opening and closing addresses and at most sessions sharing the high desk in the lecture hall of the Musée with the chairman of the session. As secretary-general, Dr. Jean Théodoridès of the Laboratoire d'Évolution, Paris, did most of the work of organization; the efficient editor at the Musée Océanographique, Mme. Jacqueline Carpine-Lancre, edited the preprints of the papers presented and will edit the proceedings in their final form. Publication of these proceedings is planned for the spring of 1967, as *Special Issue No. 2* of the *Bulletin de l'Institut*

Océanographique (the issue will not be distributed on exchange to recipients of the *Bulletin*; it should be ordered from the Service des Publications of the Musée Océanographique, Monaco-Ville).

Arrangements for the convenience of attendants at the Congress were superlative. Simultaneous translation between the two official languages, French and English, was provided. Receptions and musical performances were scheduled for the evenings; special showings of two underwater films by the present director of the Musée, Commander J.-Y. Cousteau, were given; and an opportunity was offered of visiting an Italian research vessel temporarily docked in the yacht harbor. Each participant was presented with a copy of an elegant new edition, issued specially in honor of the Congress, of "La carrière d'un navigateur," by Prince Albert I of Monaco (1848-1922), first published in 1902, and with one of the commemorative postage stamps issued for the occasion, mounted in an appropriate folder. The one shortcoming in the arrangements was the lack of anyone to revise the preprints written in English, which made up about half of the entire number. Most of these were written by persons to whom English is a foreign tongue. Mme. Carpine revised the contributions written in French, but the language of many of the papers written in English—by Scandinavians, Belgians, Germans, Russians, Yugoslavs, Israelis, an Italian, and an Egyptian—as it appeared in the preprints was often deplorably bad. It is to be hoped that these papers will be revised for their final publication.

With few precedents to guide them and the whole history of investigation of the oceans before the death of Prince Albert I in 1922 to choose from, it is no wonder that the authors of papers dealt with a great variety of topics. Some presented summaries of accomplishments by their respective nationals: Eugène Leloup and R. H. Charlier spoke of Belgian contributions to oceanography; O. H. Oren of Jews in cartography and navigation in the Middle Ages; J. B. Tait of oceanography in Scotland; Ming Wong of the discovery of the West by Chinese navigators. Others discussed, perhaps more appropriately, work done in the past on particular physical and biological problems: Georg Wüst, the deep circulation of the Atlantic; M. D. Grmak, scurvy among sailors; L. A. Fedoseyev, estimates of the quantity of water in the oceans; Joseph Schiller, controversies over the anatomy of the tunicates; Wolfgang Matthäus, methods and instruments for measuring the temperature of water at depth. Some traced the history of investigation of specific parts of the ocean: the Gulf Stream (T. F. Gaskell), the Strait of Gibraltar (Margaret Deacon), the Adriatic (Miljenko Buljan and Mira Zorè-Armanda), the Antarctic Ocean (G. E. R. Deacon). Prominent individuals of the past received due attention: the name of Prince Albert I, founder of the Institut Océanographique, was invoked by many speakers; and other worthies, from Ahmad Ibn Magid, an Arab navigator of the fifteenth century, through Count Luigi F. Marsigli and Michael Sars to Gustave Gilson, were remembered in special papers. This bouquet plucked from the program is intended only to provide a sample of the papers read.

The organizing committee of the First Congress continues in existence and is contemplating the possibility of a second, to be held in 1972, which year will mark both the fiftieth anniversary of the death of Prince Albert I of Monaco and the hundredth anniversary of the departure of the *Challenger* on its historic voyage. With the experience of the First Congress behind it, the committee for the second should be able to organize an even better program. All of those in attendance at Monaco could heartily concur in the sentiment expressed in the final words uttered by Commander Rouch in adjourning the Congress: "Le Premier congrès est fini; vive le Second congrès!"—JOHN LEIGHTY