

Characteristics of Stone Age Man

only be suggestions, for we can never know in which ways the history of our societies paralleled those of contemporary primitive peoples.

However, observations of primitive peoples can provide us with new ways of thinking about human behavior. They may provide clues as to the patterns of input which determine the learning of specific behavior. They may inform us of possible varieties and extremes of human function which we would not otherwise imagine. Our view of the behavioral repertoire possible to man is extended.

Contemporary Stone Age man is no more uniform a species than is modern civilized man. Lack of breeding exchange between isolated "tribes," the varied selection pressures of different remote environments, and the large effects on such small communities of historical accident, the founder phenomenon, or of gene drift, have resulted in a wide genetic diversity of these peoples. There are great differences in physiological, anthropomorphic, and psychological characteristics and in the linguistic and behavioral characteristics among them. This is determined in part by the fact that man in isolation is an imaginative cultural improviser, and has thus chosen independent routes of cultural evolution which have directed his behavior to diverse patterns more than has his genetic variance. The variations between different primitive groups scattered from the Arctic to the tropical climes, and from small atolls and islands to central continental plains and mountain ranges, indeed exceeds those encountered between civilized societies or between individuals within such societies.

Most of the people living today in what we usually call primitive societies, or Stone Age cultures, are to be found on the island of New Guinea. This island, the largest in the Pacific, the second largest in the world, and the central land mass of Melanesia, harbors 2,500,000 dark-skinned, spiral-haired native people who live in over 400 separate cultures, each with its own completely distinct language. The outlying Melanesian islands: New Britain, New Ireland, Solomon Islands, New Hebrides, New Caledonia, etc., together with New Guinea, contain over 700, or one-third, of the world's languages. It is in New Guinea and the surrounding Melanesian islands that I have had most of my experience with contemporary primitive societies.

Cannibalism and Headhunting

Cannibalism is both a trait of human societies and a behavior pattern found in many lower mammals. The

incorporation of cannibalism into complex ritual behavior, however, is a particularly human trait; and, strangely, it is through cannibalism that we have the earliest evidence of ritual behavior in man. Paleolithic sites, from even 250,000 years ago, have given clear indication that man was already practicing ritual or symbolic cannibalism. The association of cannibalism with headhunting is close and has apparently remained a human trait from Paleolithic times through the present.

Kuru

All cannibalism in contemporary primitive cultures is not associated with headhunting. Many of the Highland populations of New Guinea, which have practiced cannibalism into the present decade, have eaten their own dead as a rite of respect and mourning for their close kinsmen. Thus, a remarkable fatal disease, kuru, which Dr. Vincent Zigas—currently director of the Malaria Service in Papua, New Guinea—and I found to be a plague and the principal cause of death among 30,000 Highland cannibal people in Eastern New Guinea's central ranges, attracted our attention. It was a new, rapidly progressive, subacute degenerative hereditary disease of the central nervous system, killing mostly women and children, decimating many villages in less than a decade, and leaving a male to female ratio of almost 3:1. The sheer magnitude of the fatal plague, killing over 2 percent of the population each year yet showing no associated high genetic advantage, made the apparent and strongly suggested genetic explanation of the disease untenable. For the first five years of our investigations, we could find no signs of inflammatory pathology, which was at the time of our investigations considered necessary if we were to entertain the suspicion of a viral or infectious etiology.

Kuru has been transmitted to the chimpanzee and the spider monkey using bacterial-free filtrates of tissues. We have now demonstrated that kuru is a slow viral infection. In fact, it is the first subacute or chronic degenerative disease of man of proved viral etiology. Its peculiar familial spread through the Fore population is now understood as the tragic outcome of contamination of the infants and children with infectious tissues of their dead relatives during the ritual cannibalistic rites of mourning.

The study of kuru has resulted in the discovery that a group of fatal presenile dementias that occur throughout the world may be similarly transmitted to the chimpanzee, and in the demonstration that the measles virus causes the slow death of children throughout the world one to 15 years after they have suffered the acute disease.

Headhunting

In contemporary New Guinea only a few Melanesian cultures practice cannibalism—or practiced it in the recent past. Most, but not all, such cultures are headhunting cultures where the quest for heads is given more import than the ritual consumption of the carcass. In fact, in some cultures, such as the Asmat, eating of the dead bodies is not associated with unusual ritual, and the human meat is mixed with other meat from the hunt and with fish, rather indiscriminately.

The collection and use of heads, however, is of vast social and ritual significance. It is from the ritual use of heads and their collection that the paleontological record has revealed human cannibalistic ritual and human sacrifice in the Paleolithic times. It is thus tempting to draw parallels with the headhunting and cannibalism practices of current-day primitive peoples.

In order to release the brain from the cranial cavity, the skull must be smashed or otherwise opened in some way. In many parts of Melanesia, from the Solomon Islands and D'Entrataux to Western New Guinea, this has been accomplished by mutilating the base of the skull of the victim by careful symmetric incising of the periphery of the foramen magnum. Such artifactual mutilation has been found in the Monte Carcao Neanderthal skulls of La Chapelle-aux-Saints and in the 11 mutilated skulls at Ngandong in Java. There is an even earlier find of such mutilation in skulls of *Sinanthropus* from a Choukoutien cave near Peking. The finding there of a further 40 skulls without fragments of other bones points to headhunting. Other faunal remains in the cave were represented by every part of the skeleton. Thus, from pithecanthropian times, over 250,000 years ago, through "early" and "late" Neanderthal and Bronze Age in Germany—where buried mutilated skulls also revealed the practice of ritual cannibalism—to the present, in recent headhunting from Melanesia, we have the survival of this very human ritual behavioral complex.

With the contemporary Stone Age peoples and those of the last few centuries, who practiced headhunting and the ceremonial use of human skulls or heads, the methods employed and purposes of the headhunting have been most varied. The intricate technology ranges from the production of shrunken human heads by the Jivaro in the Montagna of Peru, and the fine painting and decoration of heads in Melanesia, to the display of the enemy's skull on strings outside the houses or over graves or worn as neck pendants by the Asmat people. In New Guinea, dead relatives and ancestors are often remembered by

Among the Marind Anim, a newborn child could not be named until a head was provided; the head was valueless unless the name of the previous bearer was known and the infant was given his name.

Brain tissue of kuru victims contains over ten million infectious units of virus per ml. The ritual butchery of the dead body was performed by women using their hands with sharp bamboo blades for knives while their infants were in their laps or crawling about. We must assume that the unwashed hands of the mothers contaminated in the cannibal ritual infected all their infants and toddlers by scratching or picking their sores, wiping their eyes and noses, and feeding them—with resulting accidental subcutaneous, conjunctival, respiratory, and oral infection. The steam cooking of the tissues at over one mile of elevation was not sufficient to inactivate the virus. Since the eating of the dead was restricted to close kinsmen, disease transmission followed familial lines. In fact, genealogical data still presents as good a case for hereditary or genetic etiology of the disease as is the case for diabetes and many other genetically determined disorders. The youngest patients were about five years of age, which is an indication of the shortest possible incubation period. It is often much longer, varying from five to over 20 years. In recent years the age of the youngest patient has increased, and now there are no cases of kuru in children below mid-adolescent age. We believe this is the result of the cessation of cannibalism about a decade ago.

It is tempting to hypothesize that the brain-to-mouth serial passage of a viral agent, perhaps well known and ubiquitous, has selected for a slowly proliferating neurotrophic strain which causes kuru. It is furthermore of interest that the genetic information transmitted to a child from his family and responsible for his later developing of kuru may have reached him from a sister or aunt rather than from his mother and father.

preserving their skulls, highly decorated with clay, red ocher, and shell, or beautifully hand-polished. More interesting than the different techniques of using the human skull is the complex social organization of headhunting to serve different purposes.

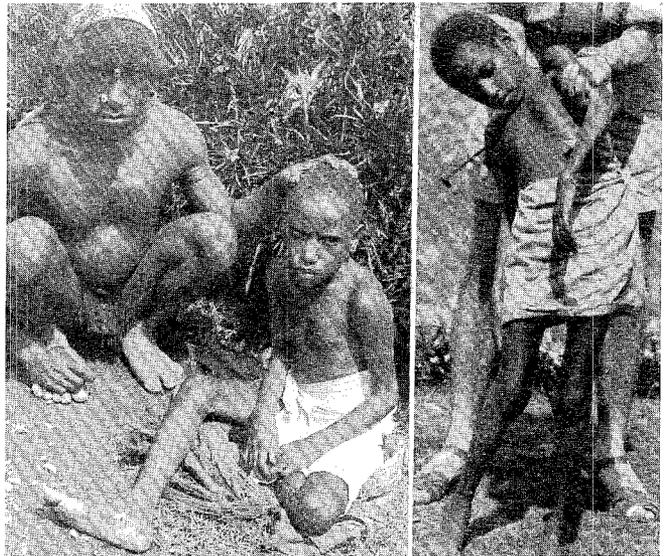
Ritual headhunting occupies a complex position in the societies of the southern coast of New Guinea between the Purari delta and the Asmat and Mimika coasts. The motives for headhunting were many: revenge, aggression, to assuage a fear of insecurity, and the acquiring of prestige, but once undertaken, the headhunting acquired additional symbolic significance. In all cases the entire social order revolves around the practice with social status, age grading, and initiations depending on the headhunting complex. Cannibalism was incorporated into it, as was a complex pattern of fertility rites and sexual relationships. A group of southern New Guinea peoples (the Kiwai, Marind Anim, Fredrik Hendrik Islanders, Jaqai, Asmat, and the Mimika) form the largest headhunting complex on the island. Only the Marind Anim were so organized that they carried their raids beyond the frontiers of their own cultural and linguistic group, rarely raiding their own tribal neighbors. All other groups, however, raided those in adjacent communities of their own culture. Although raids were often carried out to avenge the death of kinsmen, which was attributed to the work of sorcerers in the raided community, the requirement for heads was determined by a much more complex social pattern. Thus, among the Marind Anim, a newborn child could not be named until a head was provided; the head was valueless unless the name of the previous bearer was known and the infant was given his name.

On Fredrik Hendrik Island the head was needed to hang over the grave of a recently deceased kinsman. Among the Jaqai a head was required by young men seeking marriage, for until their prospective spouses were presented with heads, they had not proved their manliness, nor provided a sufficient magical stimulus to fertility in their new wives. The adjacent Asmat father dutifully headhunted to assure the puberty and genital maturation of his pre-pubertal and early-pubertal son, who then slept with the head between his legs. The Asmat also hung the heads in their gardens to further the growth of their crops. The Kiwai attributed their headhunting to the need to promote fertility in their crops, especially sago.

Both in legend and recent practice the victims have often been guests who have been treacherously invited to feast or offered hospitality for the night. At other times, the victims have been allies who were duped into a rendezvous with their attackers, under the illusion that the two groups would proceed in unison to attack a third enemy group. The feigned alliance was established only in order to assemble the unsuspecting allies for their butchery. Coupled with the practice has been a diplomatic immunity afforded to the young men who have grown up bearing the name of victims after whose head they were

named, or whose head provided for their pubertal growth. Such young men, in practice and in myths, were sent to receive special hospitality from the victim's group, a privilege to which they were entitled by their special relationship to the victim—through the use of his head. The purpose of their visit was recognized as that of espionage: an attempt to learn sleeping places, and the needed names of new potential victims. However, the cultural tradition and legend provided a precedent for such diplomatically immune spies to accept a wary, but warm, hospitality so thoroughly that they might turn on their own group, serving as informants to the enemy group they were sent to spy upon, in return for sanctuary and other reward.

The headhunting ritual was associated with dancing and feasting, periods of licensed sexual promiscuity, and the complex initiation and training period for young prospec-



Kuru, a fatal neurological degenerative disease in the New Guinea Highlands natives, has reached epidemic proportions through the rite of ritual cannibalism. The two children here are in the middle stages of kuru and already require extensive support. The child at the left falls over unless held upright by her father; the other child can no longer stand without support.

tive headhunters by older mentors, which usually involved an adopted father-son, and eventually homosexual, relationship. The failure to headhunt was considered to interfere with a man's fertility and his power to procreate. Most victims were well known and neighbors to the headhunters. Most interestingly, a vast ambivalence entered into the whole complex. The killing of an enemy was thus used to enhance genital growth and stimulate puberty, to endow fertility in a boy or girl, to bestow a name on an infant or novice, to avenge a death by sorcery, or to invoke fertility in the hunter, or a garden or sago planting. The headhunting thus coincided with weddings or ceremonials of initiation, and with mourning periods. The apposition of life and death, and the symbolic rendering of fertility and new life by the head of the dead victim, permeated the practice everywhere.

In the Asmat languages the human body is associated with a tree: the legs, the roots; the body, the trunk; the arms, the boughs; and the head, the fruit. We too use this metaphor: "trunk" for body and "limbs" for extremities. The "fruit of man" in Asmat is his head, enclosed, like fruits or nuts, in a hard shell like a coconut. Headhunters are called the "brothers" of fruit-gathering birds, fruit-gathering squirrels, and tree kangaroos.

As the fruit of a tree contains germinative power, so the fruit of man is collected and used to bestow germinative power on the boy's genitals, on crops, on the hunter, on his women. Here we see man doing what no lower animal does—using a ritualized signal as a metaphor, or a symbol which can be displaced to serve one and then another and yet another cultural need, as his imagination dictates.

When headhunting is unsuccessful and heads are scarce, a wooden head has been carved to serve the same symbolic purpose; and with the advent of missionaries, coconuts have replaced in displays, rituals, and ceremonies the head, which originally had symbolized the coconut or sago nut, metaphorically assuming the fertility endowed in these seeds.

In our own history the ceremonial display of human heads has not been without ample precedent: the Medusa of Perseus; Salome and the head of John the Baptist; the display of heads on pikes in England's War of Roses; skulls of martyrs in Catholic reliquaries; and piled skulls and altars made of skulls in the catacombs under the churches of Europe.

Garn and Black have recently pointed out that a grown "man a week" would only serve to provide a useful protein supplement to a group of about 60 people experiencing protein malnutrition. Zegwaard recorded that about 1 to 2 percent of the Asmat died per annum from headhunting before government administrative control of the area. The consumption of its own number of people per year would only just prescribe an adequate protein intake for a group. Thus nutrition is a poor excuse for cannibalism.

Cannibalism, and special attention to the human head with resulting headhunting, are two examples of the

transformation of a primitive behavior complex into a signal, a process of ritualization. These ritual signals have then later attained symbolic meaning. Once ritualized and then given metaphorical or symbolic import, the new symbolic behavior can be incorporated into different cultures. The form is modified, and its content, purpose, and meaning are shifted, but most of the basic elements of the expressive behavioral pattern, not originally employed for communication purposes, are retained.

Slow Growth, Late Puberty, Early Aging, Short Stature, and Nutrition

The primitive or Stone Age societies of New Guinea exhibit a wide range of physical variability. This is reflected in differences in their outward appearance, anthropometric measurements, and studies of genetic pleomorphisms of red cell and serum factors, as well as in a number of biochemical differences in serum and urine specimens. The geographic isolation and restriction of each population to its own area, which may vary from tropical tidal swamps devoid of dry ground and stone, to high-altitude mountain valleys over 3,000 meters high where frost often endangers food supply, has produced very different forces of genetic selection and very different problems to be met by man's improvisations with cultural themes. Within these various ecological niches, enclaves of Neolithic man have diverged during their periods of isolation to their current-day status of great diversity.

Retarded Puberty

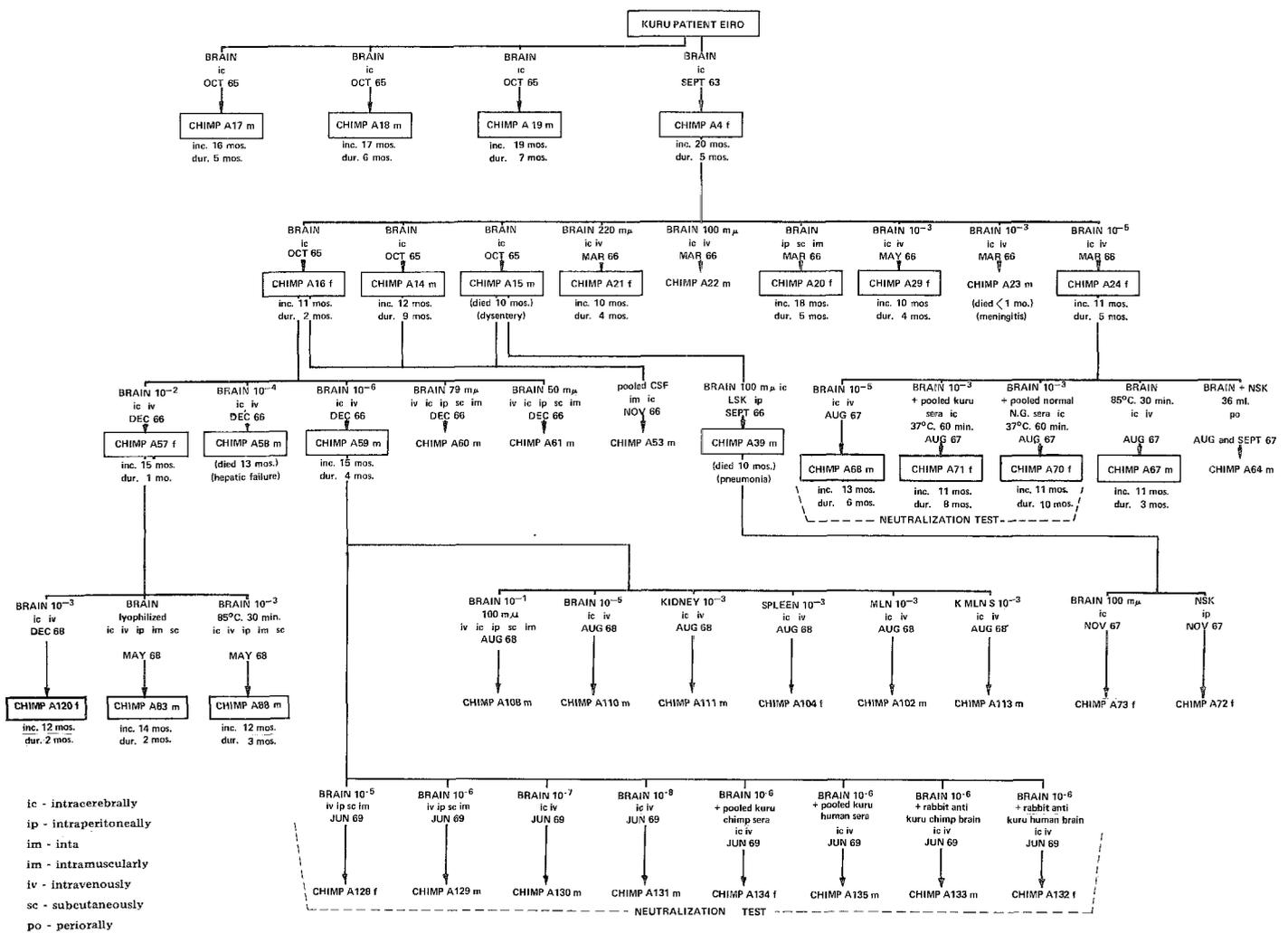
Recent growth and development studies in isolated communities of New Guineans have revealed extremely slow growth patterns with very delayed puberty. In fact, the slowest child-growth rates on earth have been found in some of these short-statured communities, with early signs of puberty first appearing in girls and boys only at about 15 years of age and the menarche at over 18 years of age in many communities, and at over 20 years in some. This contrasts with the mean menarchal age of 12½ and 13½, respectively, in Chinese and English studies. Thus, with a short life expectancy, many New Guineans have spent over two-thirds of their life attaining full sexual maturity.

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The people exhibiting the most extreme growth retardation are regularly found to be suffering from malnutrition with low total protein and caloric intake, but often without overt clinical manifestations of malnutrition. Such communities have markedly increased disease susceptibility and very high infant and, especially, high toddler death rates. Protein-feeding experiments in schools and in labor compounds have demonstrated dramatic growth

acceleration. It is thus a matter for further inquiry to know how much of the pigmoid habitus (build) of some New Guinean societies, in many of which the height and appearance of a 12-year old is that of a six-year-old European, is determined by genetic factors, and to what extent environmental factors, particularly nutrition, have contributed to this condition.

We have found unusually high pituitary growth hormone



This diagram traces the transmission of kuru from the brain of a human patient, EIRO, through four generations of chimpanzees. Blocks indicate positive evidence of kuru based on clinical disease and histopathology or on histological findings in the absence of clinical diseases. Incubation period and the duration of clinical disease are shown as months after inoculation and months after onset of clinical signs until death.

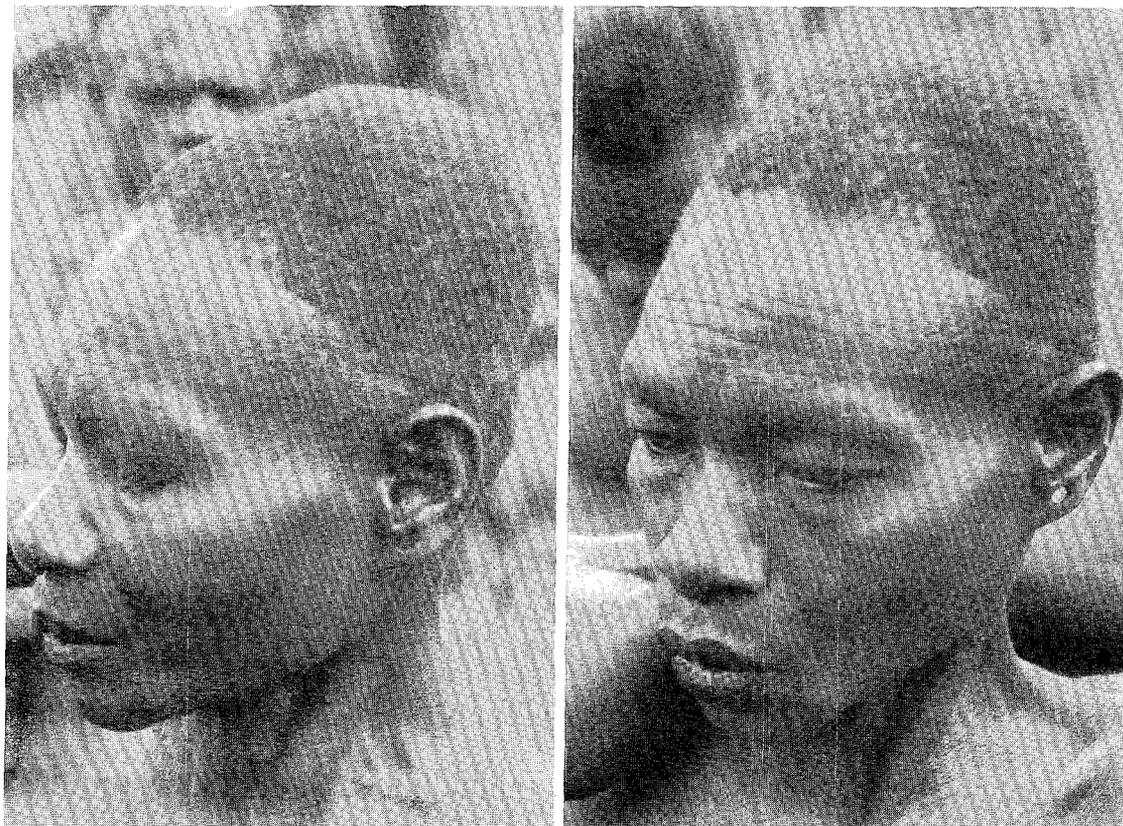
levels in autopsies done on young New Guineans, and Rimoin and Malcolm have found the highest serum growth hormone levels in man in these New Guineans. This may reflect a compensation for the low protein intake of these populations.

The life cycle of the Stone Age New Guinean thus starts with the lowest recorded birth rates for man, proceeds through a slow growth in infancy and early childhood at a slower rate than that found in any civilized culture to a delayed puberty, with final sexual maturation

at the end of the second decade of life and with the prospect, then, of a reproductive life of only one further decade. Physiological childhood and immaturity are long; social and psychological childhood and dependency are short. Boys and girls 16 to 20 years old are easily mistaken, by European criteria of age, for children of 10 to 12.

Early Aging

However, adults past 30 often already look aged. There is a continued progressive decrease in weight and skinfold thickness with age that starts just after the attainment of maturity. Before the third decade of life one commonly observes wrinkles of skin on hands and feet and facies, and the appearance of excessive age in the face and hands and breasts of women. This "aging," however, is not accompanied by an atherosclerosis or the vascular changes and hypertension of aging civilized populations. Serum cholesterol levels are low, and blood pressure is low in adult life. How much of the entire pattern is the result of the peculiar New Guinean low protein, low fat, low caloric, high potassium/low sodium, high carbohydrate and high fiber/low sugar diet throughout life, we do not know. Certainly the growth and development of these children and their puberty are accelerated by protein supplemented diets.



Among the Mamusi people of the Central Ranges of New Britain, infants' heads are deformed for cosmetic purposes by a tight circumferential band wound around their heads each day (above). This long, backward-sloping forehead with an elongated skull results (below). The deformation produces no known neurological disability.

Sodium Deprivation and Low Urinary Output

Although coastal New Guineans have no dearth of salt in their diet, the landlocked people in the interior mountain valleys of New Guinea, not unlike those in the continental mountain ranges of Asia and of the Andes in South America, live in a sodium-scarce environment. Unfamiliar even with the existence of the oceans, they do not know of sea salt; yet they prepare a condiment of their own by burning sheets of pounded bark fibers which have been soaked in mineral springs, or from complex leeching of salts from ashes of burned reeds and bark, which contain more potassium and calcium salts than salts of sodium. It is not surprising, therefore, that we have found in these people a complete reversal of expected values for urinary sodium and potassium excretion from those of the civilized peoples of the world. In fact, so dramatic was this finding that, when we stumbled upon it, our laboratory technicians thought that the labels of the sodium and potassium value columns had been interchanged through clerical error. Their daily intake of NaCl of 40-70 mg is less than 1 percent of what is considered normal elsewhere. Their potassium intake is over four times that in civilized societies. Urinary K/Na ratios are often 200-500:1, or 400 to 1,000 times the expected so-called normal values.

Similarly, sweat of New Guinea highlanders contains less than one-tenth the amount of sodium found in normal

people elsewhere in the world.

The excessively low salt intake, coupled with a daily protein intake often under one-third that which on European standards would be minimum daily requirement, leads to low values of nitrogen excretion, extremely low values of amino acids in the urine, and low urine sodium excretion. Thus, the astonishingly low urine output for many Highland peoples, and their lower sweating, can be more readily understood. In fact, lactating women and men on long journeys often drink little or no water, and inapparent evaporative loss through skin and respiration leave little water for urine production. Daily output values have been recorded at so low a level that one would anticipate uremia in a European on an average diet within a few days.

Optimal Habitus for Heavy Work Load

Life in the fortified stockaded hamlets, built on high narrow ridges for security against raids, is rigorous. Steep descents and ascents of over 1,000 meters must be made to the garden sites and sources of drinking water and firewood. Heavy loads of sweet potato and other tubers, firewood, and water-filled bamboo cylinders are carried up to the villages. A woman who weighs only 45 kilograms may carry a load of over 20 kilograms down and up the

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Excerpts from . . .

Socio-Genetic Influences of Chromosome Complements

by Kennedy McWhirter

Accurate diagnosis of genetically influenced behavioral disorders is fundamental to the treatment of any kind of deviation. That these ideals have lapsed in a number of areas invites grave criticism of administrators, lawyers, politicians, and, not least, of the opinion-forming public . . .

The whole current concept of criminal responsibility rests on a logical fallacy, which has been incidentally exposed by the unresolved arguments over the status of subjects with the abnormal XYY chromosome complement. I propose a shift in the onus of proof from those who argue for some genetic component in criminality to those who claim that there is *no* genetic component . . .

For years, various sociological writers have quoted each other to the effect that crime is due to poverty. Several nations have enormously increased their standards of living recently, yet crime has not abated. This experience should have been enough to make the environmentalist penologists and sociologists reconsider their position—but this they show no signs of doing. Environmentalist penology has become a vast self-perpetuating and self-fulfilling industry . . .

Once we recognize that penology has no right whatsoever to assume completely environmental causation of crime, the way is opened for new and, we hope, more fruitful concepts. If we make the minimum assumption of some genetic influence, we are ethically precluded from dressing up our penal proceedings in terms of righteous indignation and retribution. *Instead, our main concerns are the restitution of victims' losses (for the state has failed to protect its sub-*

jects), rehabilitation of the offender, and prevention of further offenses . . .

Where XYY subjects have developed a criminal subsyndrome, the uselessness of present "rehabilitative" methods has been acknowledged. It may not be different with appreciable portions of the far more numerous XY convicts . . .

The interactionist philosophy, of course, requires that society should not tolerate environmental conditions which can be shown to be conducive to crime. But society should also not tolerate the lazy acceptance of a system that is continually providing its own pernicious failure. Like so many other areas of behavioral studies (for instance education, alcoholism, and drug addiction) penology must now be converted into an interdisciplinary science. The exclusion of the natural sciences from such fields invariably leads to inefficient and inhumane policies.

They seem as able to detect minimal painful stimuli as are subjects of other races; however, their ability to disregard the painful stimuli almost completely is remarkable.

mountainside several times a day. A wiry habitus (build) with little subcutaneous tissue, thin skinfolds, and easily visible ribs, with no excess fatty tissue, may well provide an ideal low-weight frame for such high load-to-body weight ratios. Perhaps this habitus is well adapted to the high work requirements with concomitant scarcity of protein-rich foods. In this connection we have observed that schoolboys and young laborers going off to work on coastal plantations have rapidly changed their habitus in less than a year on enriched diets containing rice and ample fish and meat. The change is such that they are hardly recognizable any longer, even to their kinsmen. Such youths returning later to their homeland and no longer receiving the enriched diet are noticeably unfit for the rigors of hunting and the primitive subsistence farming. Their load-to-body weight ratios are much lower than that of their "undernourished" kinsmen, and their high requirement for water on the parched, grass-covered waterless mountain slopes produces an added physical burden. Since the community cannot sustain that high level of protein intake for them, their efficiency and health often fail rapidly back in their homeland.

Summarizing some of the adaptations that have occurred: delayed growth and maturation, short adult stature and low weight, reduction in metabolic rates, lower water intake and urine volume, and decreased sweating and sweat sodium content and, surprisingly, a high level of physical fitness. There is an increased proportion of nitrogen excreted in the feces, increased hippuric acid excretion, decreased urinary amino acid excretion, increased serum gamma globulin, and lower levels of serum cholesterol and lower blood pressure in adult life.

Deformation, Mutilation, and Scarification

The practices of mutilation and deformation are encountered in contemporary primitive peoples, and the historical record carries them far back through the civilized cultures of Europe and Asia, and the archaeological and paleontological record extends these practices into man's distant past. They are present on all continents and in all races of man, and they fill needs that are common to all mankind, usually that of adornment and its signal role in sexual attraction, but at times more as a symbolic need as well. The ascribed motives for mutilation and deforma-

tion are usually aesthetic or magical, but they are also performed in the nature of a sacrifice, as the removal of fingers from children and adults as a mourning rite for their deceased relatives. Healing of injuries or illness is a common reason. At times the practice is performed for ascetic mortification, as in initiation mutilations. In many Melanesians, and certain aboriginal groups in Australia, we still have an opportunity to see a wide range of these practices.

Cranial Deformation from Headbinding of Infants

Although headbinding and other artificial cranial deformations of infants for magical or cosmetic purposes have been described over the centuries, the actual practice has virtually disappeared from the world in the past few decades. Thus, the possibility of examining infants with these severe cranial deformations, and observing their neuromuscular growth and intellectual development, is all but gone. In 1956 and again in 1960, I noted that the practice was still universally employed in a few villages in the central mountain ranges of New Britain among the Mamusi and Mangsing peoples. The coastal Arawe people in southwestern New Britain, who were previously known to value a markedly elongated cranium and backward sloping forehead, and who also achieved this by tight circumferential binding of the head with bark cloth, have



The extensive keloids on the shoulders and back of this Waragu warrior of the Great Papuan Plateau are the result of burns inflicted when the youths of his longhouse have gone to dance at a neighboring longhouse. The women of the host village thrust burning brands at the visitors during their frenzied dance.

not abandoned the practice. Other New Britain groups, like the West Nakanai, had already abandoned the practice almost a century ago.

Deformation of the skull can only be accomplished by compression during infancy. The process is, therefore, dependent upon the foresight of the parents who desire to endow their child with the head shape which is fashionable in their group. The deformation has been accomplished in various people by the use of bandages, boards, and tightly fitted caps and headdresses. It has been practiced in many parts of the world, especially by various American Indian tribes, the Milanau of Borneo, the natives of Malekula in the New Hebrides, the Mayogo and Mangbetu in the Congo in Africa, and until recently, even in parts of Europe. In ancient Peruvian mummies similar artificial cranial deformation is observable, and drawings in Aztec manuscripts illustrate the results of the practice.

Response to Pain

Melanesian groups provide us with a further physiological and psychological pattern of failure of response to pain which is both unusual and somewhat baffling. The juxtaposition of current-day Melanesian peoples who still demonstrate an incredible tolerance to painful stimuli, with hypersensitive, almost hypochondriacal Polynesian groups, provides a natural laboratory for assessing the phenomenon.

It is not unusual to find small children or toddlers submitting voluntarily to scarification procedures or burning to produce keloids, which are performed purely for cosmetic purposes or as healing rites. Children from five to 12 years of age often sit together in groups, burning themselves or each other with the tip of a burning stick taken from the fire, to make circular, third-degree burns up and down their arms and forearms. These later fester and heal to produce the desired keloids. The unwincing toleration of these voluntary, often self-inflicted, burns is remarkable. At times, the smell of burning flesh has first made me aware that children in my house were engaged in this activity.

Many Highland groups, such as the Fore and Gimi, practice self-amputation of fingers as a mourning rite at the death of relatives. Most adult women are missing two or more fingers from their left hand and often as many from their right. Small girls, related to the deceased, submit without crying to the procedure. It is usually done by the tight binding at the first or second interphalangeal joint with a cord, pulled so tightly that the distal phalanges become gangrenous and slowly drop off. In some instances the finger is quickly cut off with a knife or axe.

Few children of the northern Auyu peoples are lacking a large series of circular burn scars, one to two centimeters in diameter, over their precordial region and upper chest anteriorly. Many also have similar burns on their shoulders and on their cheeks. The latter are produced to relieve severe toothache, often in childhood. The shoulder

burns are produced for generalized illnesses, and the chest burns for illnesses involving cough.

Among the Waragu and other Bosavi peoples of Great Papuan Plateau most late-adolescent youths and men have extensive, huge keloid burn scars over their backs and shoulders. These are produced during frenzied dancing when dance teams of youths visit neighboring, usually enemy, longhouses during brief periods of truce to dance all night for their hosts. During these visits they receive hospitality which includes the thrusting of flaming bands on the dancers' shoulders. Extensive, sometimes fatal, third-degree burns are produced without interruption of dancing.

Among the Awa people of the Eastern Highlands, young teen-aged boys submit to continued snapping of a bamboo rod against their upper arms by the young girls during courting, to produce slash-like traumatized lesions which undergo necrosis and inflammation and eventually keloid formation.

Asmat men and women produce both with bamboo knives and with burning an extensive, highly controlled decorative keloid scarring of well-executed traditional designs.

Frequently, when the Melanesian men and youths are carrying our supplies over mountain ranges in the New Guinea jungles, we have found that a single carrier may assume the load of two or more carriers, fastening it over his shoulders with vines, instead of using the pack frames. While trudging behind my carriers, I have only belatedly been aware of their injury on finding blood along the trail; and later, on overtaking the carriers, I have found that one or more have cut the skin over their shoulders and clavicle through to the bone without bothering to stop to place pads under the vines or change to a pack frame.

Many other stories of similar obliviousness to the painful injuries on the trail could be cited. One might presume that these accounts related to incredible feats of endurance. However, when one realizes that they are already experienced by young children, often voluntarily, this becomes more remarkable. On the other hand, the civilized observer, attaching vast import to the pain inflicted, may often be surprised by the reply from the victims that "it does not hurt very much," accompanied by laughter or a smile.

In the hospitals in the outer regions of Melanesia, where both Polynesian patients from the Polynesian outlying islands in Melanesia are attended together with Melanesian patients, the contrast between the responses of the two groups to pain and suffering from injury or other illness is amazing. Melanesians, but not Polynesians, with severe fractures, lacerations, or burns suffer and undergo painful procedures without complaint, often themselves testing their fractures for crepitus. Similarly, the excruciatingly painful disease of tropical multiple pyomyositis, of presumed filarial origin, which occurs frequently among both races on these islands, produces

comparable excruciatingly painful and tender swelling with much less disability and complaint from the Melanesian than from the Polynesian patients. In other diseases, such as advanced pulmonary tuberculosis, the disparity of behavior between the two races is equally remarkable, with nearly moribund Melanesian patients still seeking to remain ambulatory and at work, and less severely ill Polynesian patients long since having become completely bedridden.

We have no evidence of increased pain perception threshold in the Melanesians. They seem as able to detect minimal painful stimuli as are subjects of other races; however, their ability to disregard the painful stimuli almost completely while they are engaged in other activity is remarkable.

Elisabeth Beck, of the Neuropathological Service of the Maudsley Hospital in London, and I have found unexpected variations in fine structures of the brain in Melanesians, including the size and shape of the septal nuclei, massa intermedia, thalamic and hypothalamic nuclei, lateral geniculate bodies, and the frontal lobes. Neuro-anatomical detail may vary with individual and group as do facies, hair, and habitus. The awareness or response to intractable pain in cancer patients has been dulled in man by stimulation of the septal nuclear area by R. G. Heath. It is tempting to wonder whether neuroanatomical differences in this area in Melanesians might not permit their less exaggerated response to pain.

Penile Display

Limbic Neurology

The paleocortex, the rhinencephalon or smell brain of older literature, has emerged in the newer neurophysiology as the seat of integrative activity involving our emotions. It lies between our "reptilian" brain or brain stem, and the neomammalian cortex. It is this paleomammalian brain, the brain of our tiger or horse between our crocodilian brain and our human cortex, as Paul MacLean, Director of the Laboratory of Limbic Integration and Behavior of the National Institutes of Health, has put it, which controls the mobilization of emotional responses for self-preservation and for the preservation of the species.

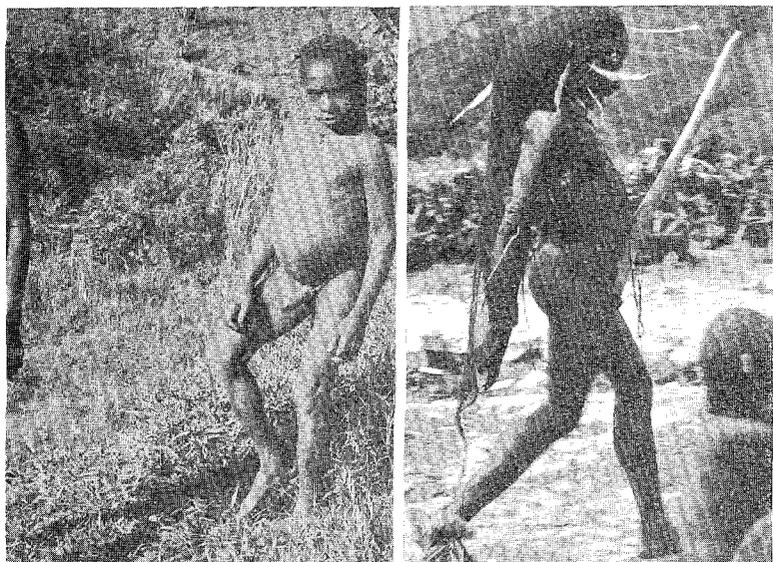
Close neural relationship accounts for the spillover of electrical excitation in one part of the limbic system into another part. This limbic neurophysiology explains the interplay of primitive oral and sexual behavior as well as their connection, at times, with agonistic behavior. Thus kissing in lovemaking, feeding with associated penile erection in babies and animals, and sexual excitement of pyromania that is aroused by fear-inducing fires, and sadism and masochism are all more easily understood.

The display behavior of the Gothic variety of the squirrel monkey (*Saimiri sciureus*) in presenting an erect phallus when responding to another monkey in situations of courting, aggressive challenge, or dominance, or from a distance as a greeting, involves a patterned behavior of



vocalization followed successively by thigh spreading, penile erection, scratching, and some urination. The animal also performs this patterned display response when confronted with its own image in a mirror. In a group, the displaying animal makes a forward encounter with a female or another male, spreads the thighs, and thrusts the erect phallus toward the face of the other animal. Display to the female presumably serves as a signal in courtship behavior, as it precedes attempts at copulation. In the case of two males, however, it appears to be primarily an aggressive act because it occurs in exerting and establishing dominance. If the recipient does not remain quiet and submissive during the display, it may be viciously assaulted. When performed at a distance between two or more animals, the display seems to serve as a greeting, as is the display evoked by the animal's own image in a mirror, or it serves as a social signal of appeasement, employed by the dominant intruder to diminish the fleeing or avoidance of the excited group. A reflection of only one eye can trigger the mirror display, but not the reflection of an extremity, tail, or trunk. The display reaction has been used to investigate the cerebral localization and neural mechanisms of visually guided sociosexual behavior.

I have noted a quite similar presentation and display in both spontaneous and socially ritualized behavior in some New Guinea groups. It is similarly used to express both aggression and dominance, in the form of a distant greeting or appeasement, in obviously erotic dancing, and also as a spontaneous expression of anxiety, joy, or elation. This is particularly obvious among the Asmat and Auyu-related peoples of southern New Guinea. When frightened excited, elated, or surprised, groups of Asmat men and boys spontaneously meet the precipitating event by a penile display dance, which involves much the same sequence as the presentation display of the squirrel



The phallocrypt is the traditional dress of over a million people in the highlands of New Guinea. It appears to be a flamboyant extension of the use of smaller gourds and other display ornaments worn by lowland peoples. Within the prescribed form of attire is ample room for individual preference. At times this genital boasting (under the guise of genital concealment and prudish modesty) may reach such extremes as to interfere with binocular vision, as in the figure on the right.

monkey. This behavior is performed on the arrival of strange visitors, on the departure of strangers who have been received with friendship, or in response to excitement or anxiety-producing events, such as the burning of a house, victory in fighting, a severe thunderstorm, completion of a communal effort involving exertion. In more formalized ritual form, the vocalization, thigh spreading, genital grasping and rubbing, erection and pelvic thrusting behavior pattern has been introduced into the traditional night dance of the Asmat and Auyu peoples, which at times may become even more overtly erotic and copulatory.

The males of these and surrounding groups on the coastal plain wear no genital covering at all. In the cultures further inland, however, the males have adopted a less active and more continuous genital display with the male attire consisting of a wide array of prominent penis coverings: nuts or shells, or braided sheaths or gourds; the beak of the hornbill has been used by many groups for this purpose. In most of the Highland cultures of western and central New Guinea, this phallocrypt has become an enormously elongated gourd. To the north of the central ranges, in the Sepik headwaters, the penile covering has been replaced by a baseball-sized spherical gourd, worn only over the distal part of the penis. The ritual dance of the Waina-Suwanda peoples leaves no ambiguity, explicitly emphasizing the display nature of the performance. Thus, *for the purpose of the dance, the usual glans penis-covering gourd is replaced by a much larger and longer gourd, which throughout the dance is flipped from between the legs up against the abdominal wall by undulating movements of the thighs and pelvis.*

We have, thus, a full complex of genital display performances which, at their extremes, are closely similar patterns to the display performance of the squirrel monkey, the neurointegrative mechanisms of which are

Our own slang of aggression contains many threats of anal and genital presentation and assault, as do our aggressive gestures.

How great is the leap from Stone Age Man to our modern civilization?

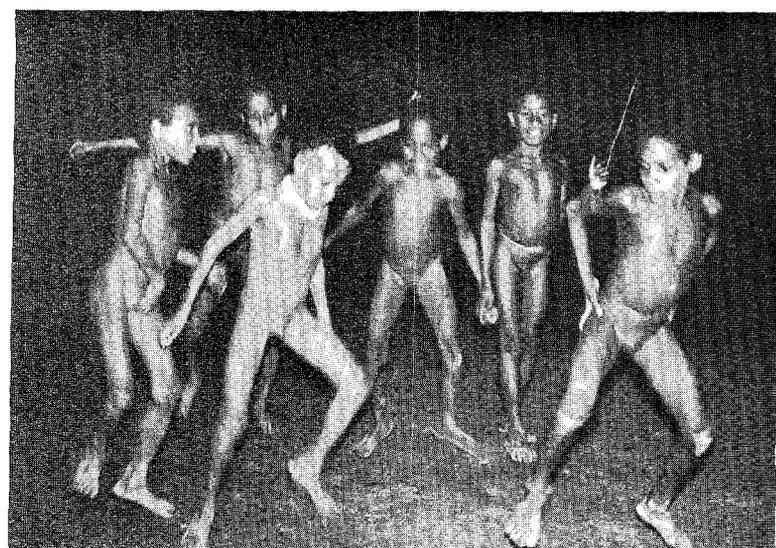
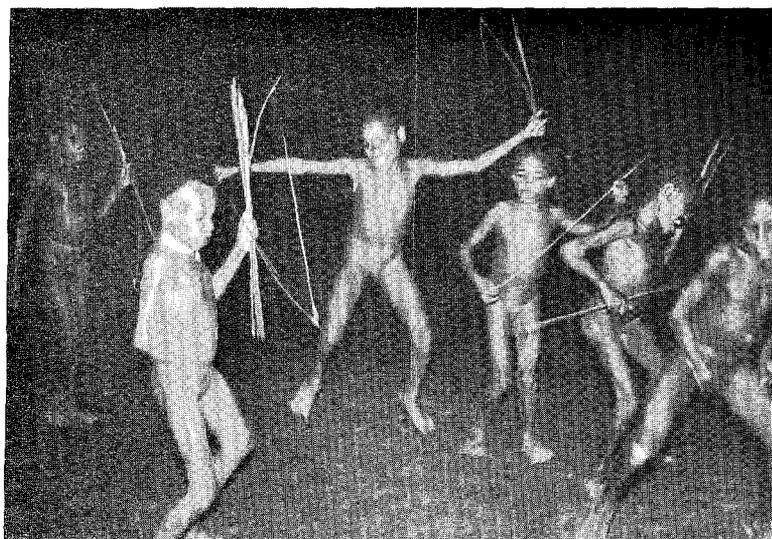
today well understood. MacLean has noted that while Old World monkeys and also pygmy marmosets use a rear-end presentation, or anal-perineal region display in courting and aggression, and while these New World squirrel monkeys use phallic erection and pubic display and thrusting for the same purposes, the white-lipped marmoset instead uses the protrusion and phallus-like elevation of his tongue for these purposes. Here displacement has occurred in the body part employed for the same signaling purposes. On the other hand, with the patterned phallic displays, an integrated genital or courting response appears to have been displaced to serve other social functions.

Exhibitionism has its concomitant signs of physical arousal everywhere, and every pediatrician is aware of the erection in small boys that often accompanies their being undressed. Needless to say, our own cultures have not failed in the elaboration of this basic biological pattern; one need only be reminded of the prominent cod pieces of male attire of only a few centuries ago and the dances of the past decade. Our own slang of aggression contains many threats of anal and genital presentation and assault, as do our aggressive gestures, and the sticking out of the tongue is not unlike that of the white-lipped marmoset.

We thus have, in this genitalia display response, a behavioral pattern—gestalt of behavior, if you will—which belongs to the behavioral repertoire of primates. It appears in slightly modified form in different primates, and in different cultures of man it has been variously modified, emphasized, or suppressed. It originally had an easily recognized purpose in the monkey, fulfilling directly a basic reproductive function; as with most sexual signals it has also been used in aggression.

In human groups the goal to which this response complex is directed, however, has been easily shifted in the process of cultural improvisation. In the diverse cultures spread over the complex terrain of New Guinea, we can see a great variety of modifications of the form of display reactions, with emphasis and deemphasis of certain elements of the behavioral complex, and at times slight, and at other times great, displacement of the original biological aim.

Thus, genital presentation and display have been displaced from their primary goal of courting and coupling to an expression of aggression, to an anxiety-quelling behavior complex, to ritualized dance, and to ceremonial greeting, appeasement, or rejoicing. The kinetic, active patterns of response have been abstracted to a less dynamic form in penis-emphasizing sheaths, nuts, shells and, finally,



Young boys of the Kombai Village of Be'a on the Upper Mappi River of West New Guinea dance at night with the genital display and presentation traditional of the peoples of the area.

into a static symbol for the whole rite, in the wearing of long phallics. In the group most disguising the whole pattern of genital display, the Anga, who modestly hide their genitalia under two or three dozen grass sporans, wear so many sporans that they produce a phallic-like anterior projection from the body wall of the piled sporans themselves. In their dance they jump about, with their feet slightly spread, so as to flip their voluminous skirts up and down. In its most exuberant climax they do this in such a way that the heavy pile of sporans flaps against their abdominal wall and exposes their genitals. This is accompanied by copulatory rhythm chants and with a whoop at climax. Thus, even with an ostentatious gesture to mute and disguise the whole response, they finally return to it in symbolic ritual behavior in a form closely parallel to that of the Asmat dancer and the squirrel monkey.

Mock Combat

In the Sepik River area among Auyu of southern New Guinea near Maprik, arguments within a residential community, and even those between adjacent communities, are at times settled without resorting to warfare or raiding, but are left to the individuals involved. The parties concerned are usually fully armed and, with great shouting, feign combat; they stand at opposite sides of the village hurling insults and epithets loudly at each other, hurling spears or shooting arrows at each other, which miss or at least fail to cause severe injury. Later they continue to snap their bow strings, without actually discharging the arrows, or they merely go through the motions of spear throwing or arrow shooting. In their anger, they often pace back and forth, or go around in a circle, to periodically stop and confront their adversary with recriminations.

The argument is witnessed by the entire community, who withdraw quietly to a distance, and the performers, aware of their audience, state their grievances as they hurl defiant words at each other. Often their kinsmen or friends arm themselves, but stand to one side as "seconds." These vocal battles of mock combat are very reminiscent of those reported in bands of monkeys as the vocal battles of *Alouatta palliata*. Similar threatening and gesturing, without actual combat, have been reported for baboons and other animals.

Echopraxia and Echolalia as a Means of Alleviating Anxiety and Establishing Friendly Contact

During explorations in South America and Melanesia, I have several times made first-known civilized contact with primitive peoples. Among the Tjidak headhunters of West New Guinea on one such occasion, I suddenly became aware of a strange human behavior pattern with which I was already familiar from similar tense moments of early contact with South American Indian groups, and elsewhere in Melanesia.

It consists of the frightened, tense, and anxious people, whose community I had entered, acting in a way which at first seemed a self-conscious, stylized effort to be friendly, but which was, I slowly became aware, an almost unconscious ritual copying of any facial expression or gesture, and at times of even any utterances I made. Thus, if I stroke their chin, belly, or shoulder, or reached for a handshake, they reciprocated in kind; if I nodded, they nodded; when I smiled or laughed, they too did the same; if I walked to their houses with an arm over a shoulder in an attempt to be friendly, they promptly reciprocated. Even if I greeted them with a word not of their language, they at times repeated my utterance. When a colleague pointed out that people at a distance whom I was not aware of, nor had observed, were similarly mimicking my every stance and gesture—crossing their legs when I crossed mine, grasping their hands behind their backs or rubbing them through their hair when I did this—we attempted systematic observations of the matter during these fleeting and demanding moments of early contact.

I have now seen the phenomenon four times, with totally different groups, in first or early contact situations. It is not unlike the phenomenon of echopraxia and echolalia described in the neurological literature for certain pathological states. Monkeys in captivity are noted for a great deal of mimicry interaction with humans, yet they demonstrate less of such behavior when observed in natural bands. This repetitive reciprocation of quantitatively metered responses seems to be a major feature of teasing, joking, or testing behavior between children in some groups at play. It is also seen in captive gorillas and chimpanzees playing with man. In our contact with primitive peoples, this mimicking behavior appears to be carefully balanced between fright and anxiety, fight or flight reactions, and playful smiling and laughter. It is not unreasonable to propose that to mimic and to attempt to respond in such a way as to behave like a strange newcomer, who is a source of fear and anxiety, may be an unconscious anxiety-alleviating mechanism aimed also at evoking a reciprocal controlled and controllable, and thus friendly, response in the strange visitor. Imitation and mimicry have had high survival value in natural selection.

Aesthetic Creativity and Individualism in the Primitive Band

A highly developed art in the form of carvings, sculpture, painting, dance, or song is a rarity among the hundreds of New Guinea cultures. Areas in which art has flourished, such as among the Asmat and the people of the Sepik River plain, and the Papuan Gulf, are few. During a sojourn of several years among most Highland peoples, an ethnologist will often find only a few items of craft or aesthetic production worth collecting. In contrast, within the first hour of visiting in traditional Asmat or Sepik villages, one could see enough carvings and decorative art to fill a museum. The same differences between groups

exist for music; some groups have elaborate song and dance, whereas with others the Euterpean and terpsichorean arts are rudimentary. For myths and other oral tradition, the same contrasts apply. It would obviously be a matter of importance for us to understand the social conditions which, in rare societies, make of each individual a sensitive participant in the arts and of many individuals, artists.

We have not been able to answer the question of what makes the creative arts flourish in a culture, as in the Dordogne in Upper Paleolithic times, the Indians of the Pacific Northwest in North America, in Bali, and among the Asmat and Sepik peoples of New Guinea. On the other hand, I have been investigating two cultures, which are noteworthy for lack of artistic creation, whose repertoire of song, dance, carving, and other art is woefully small. It is of interest that the two groups I have in mind—the Tarahumara of the Sierra Madre Occidentales in Mexico, and the Anga, or Kukukuku, peoples of Eastern New Guinea—have very weak social pressure for conformity, with no central leadership or strong community ties. In both cultures, an enormously self-sufficient individualism is stressed, and the male head of the hamlet or expanded family encourages his sons to be like himself, dependent on no one for his livelihood, suffering no one to make decisions for him, or to give him instructions, directions, or commands. Such individualism seems to demand widely separated family residences or homesteads, or very small villages or hamlets. Thus the mountain Arapesh studied by Margaret Mead have very inferior artistic production and live in very small hamlets of rugged individualists, while the neighboring Abelam with flourishing visual arts live in large, socially complex, tightly packed villages. This individual family unit or small band or hamlet psychology seems to have rarely been associated with the flourishing of the arts.

Why Are They Primitive?

When surveying contemporary primitive societies, one cannot refrain from asking: Why have they remained in or returned to the Stone Age? Thus, why have peoples who are now, or were but recently living in a Stone Age culture remained so long at this historically early level of human social development? These are valid questions.

We know of populations in South American jungles and in Melanesia who, under the impact of warfare and other pressures, have returned to hunter-gatherer life from an already attained stable life as primitive agriculturalists. The Guayaki Indians of South America, who still today roam as hunters through forests of Paraguay without clothing or shelter, were, some 300 years ago, farmers settled around Jesuit missions. In the backwaters of the Upper Amazon, there are communities of unclothed hunter-gatherers and primitive agriculturalists, which have their origins in the literate and eminently civilized “conquistadors.”

On the other hand, we may ask how great is the leap from the Stone Age to our modern civilization? There are numerous examples on record of those individuals who have tried to make it in one lifetime. More often than not, the records are of unsuccessful attempts, which serve to bolster our conviction of our own incredible progress since those ancestral times. Thus, the sad story of Ishi, the California Indian who finally emerged to write his biography with Professor Theodora Kroeber of Berkeley. One wonders if these stories may not be akin to those of so-called feral children who, on emerging from their wolf lairs, have never succeeded in mastering human language or society. The question always remains as to how defective they were to have gotten into the wolf lair in the first place, or whether they had foregone human contact during “critical periods” for the learning of language and social behavior. However, we now have the recent stirring account of Alfred Moari Kiki, who writes in his biography, *Kiki—Ten Thousand Years in a Lifetime*, of his boyhood in a Stone Age New Guinean society, to his training as a pathologist and his current role as leader of the Pangu Parti who are demanding immediate self-rule for New Guineans.

That whole communities of Stone Age warriors converged with the modern civilized world in one generation has been demonstrated repeatedly in the past several decades in New Guinea.

It is by no means certain that fire, cooking, the domestication of animals, and the planting of grain, the use of metals, the wheel, writing and a phonetic alphabet, and many other discoveries have been made more than once—or a very few times—in history. That the tribes of northern Europe would have yet emerged to civilization, had they not been infected with it by direct contact from Asia Minor and through the Mediterranean, is doubtful.

We are left with the observation that communication between groups, and a government that maintains peaceful roads of contact and commerce, is essential to the civilized state. Without it, civilized man can fall back into illiteracy and savagery in only a few generations. Civilization is a fragile flower of human evolution, and all races and groups of men are quickly stimulated to such blooming, if once exposed to it, without impedence to the material rewards that it may bring them.