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HOMO SAPIENS—WHENCE AND WHITHER[1]

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INTRODUCTION

THE male human creature in our society is supposed to have "come of age" when he has completed his twenty-first year. An alleged scientist ought to have attained his majority when he has passed the twenty-first anniversary of his professional career. Unfortunately he may remain forever a minor, even if he has reached the "age of discretion." Nevertheless, I propose to survey the increments to our knowledge of that animal, man, during the past score and odd of years, whether my utterances be the brash pipings of the callow juvenile, the resounding platitudes of waisty middle age or the reminiscent quaverings of senility. In any event, I firmly absolve myself from responsibility for the anthropological accretions of which I here take note, since any pebble which I in passing may casually have dropped upon the rock pile, has simply disappeared in the chinks between the ponderous contributions of my more substantial colleagues. In short, like the famous young man on the hearse, I have just come for the ride.

[1] The thirteenth annual Sigma Xi lecture, given at a joint session of the American Association for the Advancement of Science and the Society of Sigma Xi, Pittsburgh, Pa., December 28, 1934.

NEW VIEWS OF PREHUMAN PROBLEMS

One may well begin with some new angles from which recent observers have viewed prehuman problems. These are zoological angles rather than mathematical angles. Nevertheless, some of them are acute and others are obtuse. The first problem which may be viewed thus askance is that of the origin of the primates. (I refer to the zoological order rather than to the ecclesiastical order.) The research of the last two decades has aroused suspicion that the primates

had an origin which was at once lowly and lofty—lowly because they appeared to have sprung from primitive and timorous insectivores, lofty because these insectivores in some previous incarnation had been chased up a tree. There they remained, supposedly, cutting down their litters and their claws, sacrificing philoprogenitiveness for security, and efficiency in scratching for facility in gripping with opposable thumbs and great toes. In the fullness of time and species gestation, some ambiguous and generalized insectivore was suspected to have given birth to a primate. And believe it or not, this adventure in obstetrics was accomplished by an animal whose static collateral descendant is called a tree shrew (a designation which seems to have been a sort of *ex post facto* prophecy of the articulate gift of that ultimate primate, woman).

However, this simple view has been challenged by the recent ruminations of comparative anatomists. Thus W. E. Le Gros Clark has lately reached the conclusion that the tree shrews must be recognized not as progenitors of the primates, but rather as early secessionists from a primitive primate stock which had already spawned proto-lemuroids.[2] Thereby a mother is degraded to a niece. Some of you may have swallowed our alleged affinity with the anthropoid apes without even a gulp, may have choked down our putative relationship to the regrettably obscene monkey, but may have gagged over the glassy-eyed, frozen-faced lemur, which suggests the product of some unhallowed alliance between a degenerate fox and a libertine marmoset. For these, if such there be, I have a word of cheer. Le Gros Clark and other meticulous primatologists have summarily banished from the assemblage of our ancestors the lemur, the loris and all their ilk. This means that it is no longer "legitimate" to speak of a "lemuroid" phase in the evolutionary history of the Anthropoidea, which include monkeys, apes and man. You may well inquire whose tree it is upon which our simian forbears have perched. The answer is "Tarsius spectrum." Who then is this Tarsius who comes knocking for admission to the genealogical order of Daughters of the Human Evolution? The contemporary animal is the size of a small rat, with a furry body terminated by a long tail bare in the middle and hairy at both ends. It has monstrous eyes, seemingly directed forward, very large ears and a pinched and retracted snout. Its ankle bones are enormously elongated (whence the name Tarsius). It hops on its hind legs like a miniature kangaroo. The five digits of its hands and feet are provided with sucker disks; the thumb and the great toe are opposable to the other digits; the second and third toes are clawed. Tarsius is arboreal and nocturnal; it produces one young at a birth and feeds itself with its hands. This otherwise somewhat eccentric animal, found to-day only in the Indo-Malayan Archipelago, has become the storm center of a zoological controversy. It displays a certain number of features suggestive of a real affinity with the higher primates—among them the absence of a moist muzzle, the conformation of the external genitalia, the form of the incisor and premolar teeth, the type of the placenta, the tubular shape of the auditory meatus, *et cetera*. In some other features it is related to the lemurs or merely "apes the apes."[3] Particularly because Tarsius sits erect, feeds itself with its hands, has a short snout, frontally directed eyes and a brain in some respects well-developed, ingenious anatomists have made it the hero of a sort of scientific Just So story of primate evolution. Thus hopping and squatting on the hind limbs encourages an upright body poise and "emancipates" the fore limbs. These pentadactyle extremities, clawless and with opposable thumbs, may now be used for all the varieties of mischief which Satan has for idle hands to do. They can investigate the animal's whole corporeal entity and adjacent objects of the external world. They can be used to lift things toward the eyes for visual examination, toward the nose for olfaction and toward the mouth for tasting, chewing and swallowing. In short, these emancipated hands become not only mere conveyors of nourishment, but instruments of research and investigation and the potential creators of tools and all the appurtenances of material culture. However, the mere prehensile function of the hands is of small import in comparison with the secondary effects of this new usage upon other organs. The exploratory digits relieve the snout of its tactile function; the feeding fingers absolve the jaws from grazing duties; the protrusive muzzle recedes, and the laterally directed eyes (apparently in a strabismic effort to ascertain the fate of the vanishing snout) swivel round to the front so that the fields of vision converge. The animal can now look down its nose to examine with stereoscopic clarity and depth the object presented by its prehensile hands. The recession of the overbalancing jaws gives poise to the head and facilitates rotary movements, so that parts of the body previously invisible are presented to the sight, as well as being accessible for palpation. Sound waves are now caught by turning the head instead of cocking the ears; the latter curl up. As the jaws shrink, the temporal muscles relax their constricting grip upon the skull vault, and reluctantly retreat down the parietals. This of course gives the brain its chance. But the modest yet ambitious neopallium has other incentives for expansion. The investigative

[2] W. E. Le Gros Clark, "Early Forerunners of Man," p. 250, London, 1934.

[3] Le Gros Clark, *op. cit.*, p. 265.

digits seek and acquire in the brain cortex not only motor representation but also adjacent areas of pictured movements; now the animal can not only see what it is doing but can also recall to the mind's eye past actions and can even build castles in the air. Naturally association areas then spread like a rash; the neopallium becomes furrowed with thought; the brow bulges with cerebration. All this we owe to Tarsius—a humble primate Prometheus. If you are a functionalist, you may thumb your nose at the specter of Weismann, and accept as your ancestor this spectral tarsier thumbing its way along the ascending road of evolution—hopping toward humanity. A slight difficulty may indeed obtrude itself when one considers certain specializations of this, our ratlike ancestrix. We ought with such a pedigree to have the gait and pedal extremities of a kangaroo, and eyes like teacups, millstones or towers—such as those possessed by the three marvelous dogs in Hans Andersen's story, "The Tinderbox." For it appears that even the earliest fossil tarsioids exhibit evidence of enlarged orbits and elongated ankles. Here, forsooth, we find ourselves impaled upon the horns of a dilemma: either we are descended from a tarsioid which had not yet become specialized for hopping and had refrained from orbital exaggeration, or else our tarsioid or subsequent ancestors have violated the law of the irreversibility of evolution. In the former case we are indeed lost, because if there was no hopping there could have been no handling, no hand feeding, no cortical representation, no Anthropoidea, no *Homo sapiens*. In the latter case we dare not face the paleontologists.

As a matter of fact, it is comparatively simple to evade both of these difficulties. In the first place we need not accept literally the Lamarckian lucubrations of Professors Elliot Smith and Wood Jones, whereby Tarsius in merely sitting up initiates a perpetual motion of motor cause and cortical effect which inevitably leads onward to humanity. The only existing primate of certain tarsioid ancestry is the diminutive goggle-eyed beast of Borneo, which is apparently no farther away from man than the most of the twenty fossil species of Eocene tarsioids. The dog-faced baboon is not only an inveterate hand-feeder but also a confirmed quadruped, which has either redeveloped a prodigious snout in utter defiance of the law of irreversibility or, having preserved and enlarged a primitive primate snout, has nevertheless managed to rotate his eyes around to a frontal plane and to achieve stereoscopic vision, with a complete disregard of the views of Professor Frederic Wood Jones.

The so-called law of the irreversibility of evolution is easy to circumvent by a sophistry which enables the paleontologist or zoologist to include in man's ancestral line the fossil precursors of almost any primate, however specialized its modern descendants. Thus in the case of tarsioids it is merely necessary to state that man's ancestors have sprung from a generalized proto-tarsioid stock which had not yet developed the evolutionary specializations, which would rule the modern tarsier and most fossil tarsioids out of the human line of descent. In this way the zoological genealogist manages both to eat his cake and to have it.

Another convenient device much used in evolutionary dialectics is known as the "law of convergent or parallel evolution." This law affirms that similar or identical variations may be developed independently in unrelated forms "which happen to be subjected to similar environmental forces."[4] Citation of this law enables the fabricator of family trees to dismiss as irrelevant and illusory all morphological similarities in those animals which he wishes to exclude from close relationship to man. Wielding the law of irreversibility of evolution in one hand, and that of convergent evolution in the other, the brain trusters of the zoological New Deal can excommunicate from the assemblage of man's ancestors any unfortunate stock of which the contemporary representatives seem undesirable poor relations. Conversely, by a skilful blending of motifs upon the same two instruments, the pied pipers of primatology lead off ratlike tarsiers and godlike men in one genealogical rout. Actually these alleged evolutionary laws are more honored in the breach than in the observance, even by those who most loudly invoke them. Hence the mere anthropologist remains unimpressed when Professor Wood Jones in a single burst of zoological rhetoric reads out of man's party the tree shrews, the lemurs, all the monkeys and even the anthropoid apes. However, even the ardent advocates of parallelism and irreversibility are ill content to leave man out on the end of a limb with no company in his family tree except that of a nebulous, nocturnal tarsier.

Yet, apart from the heresy of Wood Jones, who has seceded in a body from orthodox opinion as to man's descent, other minor dissensions have arisen in the ranks—voiced at times by major dissentients. Thus we have to deal with the growing heresy which maintains that man is not descended from a giant brachiating ape, but from some small ground-walking anthropoid which had abandoned tree life and cut himself off from relationship with the arboreal ancestors of the great apes as far back as the Oligocene period. This infant Ishmael seems to owe his existence principally to an unhappy afterthought of Professor Dudley J. Morton, added to his otherwise

[4] Le Gros Clark, *op. cit.*, p. 5.

admirable memoir upon the evolution of the human foot.[5] Morton observed that the mid-tarsal pattern of the gibbon resembles that of the monkeys, whereas in the great apes this region of the foot is decidedly shortened. Man appears with the more primitive pattern of a long mid-tarsal region. Morton therefore infers that man could have avoided the mid-tarsal shortening only by separating from the great ape stock before it occurred. He suggests that the shortening of the mid-tarsal region in the great apes has been the effect of the attainment of a great body bulk, the weight of which has crushed the mid-tarsal bones, and that man gained this great increase in size after he had adapted the use of his foot so that the crushing effect of body-weight would not be exerted upon the mid-tarsal area. Dr. Morton further concludes that "the retention of the more primitive mid-tarsal pattern supplies evidence of three phases in man's history; the early attainment of the erect posture, separation from the great ape stock before it had attained its modern large size and early adoption of terrestrial habits." This sweeping conclusion has been greeted with acclaim by the protagonists of the Homunculus theory, *i.e.,* the diminutive dawn man. For my part, I see no reason why "Wolff's law" of atrophy and hypertrophy, which Dr. Morton frequently invokes, should turn a somersault by "crushing" the mid-tarsal region when the bodily weight is transmitted to it, although enlarging the heel-bone when the bodily weight rests upon the latter. If one insists upon crying "Wolf! Wolf!" when there probably is none, one may as easily ascribe the supposed shortening of great apes' mid-tarsal region to adaptation for greater mobility in grasping; or to atrophy as a result of these animals' brachiating habits, whereby they suspend the weight from the hands rather than rest it upon the feet.

On the whole it seems to me that it is most unsafe to attempt to determine degrees of phylogenetic relationship solely by the examination of resemblances and differences in such a highly adapted organ as the foot. The only safe bases for reckoning affinity are hereditary, non-adaptive variations of organs in which form is not closely dependent upon function. The foot and the pelvis in man are perhaps of all skeletal parts the most rigorously adapted to human bodily habits and to functional needs. By virtue of such stringent adaptation they are the least suitable structures from which to deduce phylogenetic conclusions. Zoological classification should never rest upon the evidence of any single anatomical character, however important, but always upon the cumulative testimony of as many non-adaptive hereditary features as can be marshalled for examination. Beware of special pleaders who would chart the course of primate evolution by the use of a compass whose needle points always to the same magnetic pole—whether it be the tarsus, the tympanic ring, the frontal sinus, the placenta or the pattern of molar teeth! Gifted persons may conjure rabbits out of silk hats or *Homo sapiens* from a hopping tarsier, but though the hand may be quicker than the eye, no one need believe that the topper has conceived a bunny.

It is with relief that one turns from the school of prestidigitative or saltatory evolutionists to the tortoisian plodders who escort our postulated progressive primate to the goal of humanity by a slower and less spectacular, but surer route. As the heavyweight champion of the great ape theory of human descent, we may acclaim Dr. William King Gregory, who has suffered the bludgeonings of Wood Jones and the pro-tarsioids and has emerged with head not only unbowed, but not even perceptibly bloody. Dr. Gregory neglects no biological system which may furnish evidence apposite to the solution of the problem. He makes a clean sweep through the whole range of vertebrate evolution. Although he displays an astounding familiarity with all the minutiae of vertebrate anatomy, Professor Gregory is perhaps most intimate with the development of the skull and the teeth. He is indeed such a consummate master of odontology that, were we to start anew with a planned, controlled and supervised organic evolution, we should without doubt entrust to him the destiny of dentition, merely stipulating that he devise this time a less cumbersome and misleading terminology. In his most recent monograph entitled "A Half Century of Tritubercuły" (which is not to be mistaken for the autobiography of a trebly afflicted unfortunate), Dr. Gregory convincingly describes eleven stages of molar tooth development leading from primitive fish to modern man, the ninth or anthropoid ape stage giving rise to a five-cusped lower molar with a so-called Dryopithecus pattern of cusps and grooves, which is preserved in the first molars of the most primitive and many modern men. Gregory considers the evolution of the locomotor skeleton, the jaws and teeth, the face and the brain-case, carrying the story of each from the early vertebrate forms up to the human culmination, all themes of the various narratives leading to the conclusion that man developed in late Tertiary times from a giant, brachiating, arboreal ape of a generalized Dryopithecus type. Dryopithecus is the name of a family of anthropoid apes represented by numerous fossil jaws and teeth from the Miocene and Pliocene deposits in Europe, Africa and Asia. Unfortunately the remains are

[5] Dudley J. Morton, *Am. Jour. Phys. Anthrop.*, V: 4, 305–336, 1922; VII: 1, 1–52, 1924. *Cf.* especially p. 36.

usually restricted to jaws and teeth, because these are the most durable parts of the skeleton, being also especially tough and indigestible morsels. But a femur from the Lower Pliocene in Germany, referred to Dryopithecus, apparently represents the anthropoid thigh bone before it was affected by giantism, and is long and slender like that of a gibbon. Schlosser could discover in it nothing that would forbid its giving rise to the more specialized and shortened femora of the great apes or to the hypertrophied thigh-bone of an upright bipedal man. Moreover, the humerus supposed to belong to this same early anthropoid ape is shorter than the femur, contrary to the condition in the modern specialized great apes.

An important discovery of the past decade is that of the skull of a juvenile anthropoid ape at Taungs, Bechuanaland, South Africa. This specimen consists of most of the face and forehead and a cast of a portion of the brain. Professor Raymond Dart, the describer, gave it a place between the highest anthropoid apes and the lowest grades of humanity. Sir Arthur Keith has concluded that this fossil, Australopithecus, was an ape with a closer resemblance to the chimpanzee than to the gorilla, but a cousin form to both.[6] Nevertheless, in the volume of the brain, in the reduced size of the milk canine and in the persistence of certain infantile traits, Keith thinks that this ape approaches nearer to the human prototype than any form heretofore discovered.

More recent still is the preliminary notice of new anthropoid apes from India by the Yale North India Expedition.[7] These finds include several new genera and species which, in the shape of the dental arch, the reduction of the canines, the absence of diastemata, or gaps, are said to approach so closely to the human type that they may well be near the stem which led to the Hominidae proper. Such finds raise high hopes that we may yet discover the remains of that miraculous evolutionary deviant among the apes, which eventually foisted upon the faunal world Huxley's erect and featherless biped.

Within the past year Dr. S. Zuckerman has published a fascinating work on the functional affinities of man and the other primates.[8] He has assembled the evidence relating to differentiation of the mechanism of reproduction, blood reactions, visual and olfactory processes, behavior patterns, diseases and parasites, affinity and divergence, as shown by hybridization, psychological measures of intelligence, implications of cortical physiology. Zuckerman concludes:

> Man's immediate phyletic relationship to the ancestors of the anthropoid group of Primates cannot be doubted, unless it be argued that he developed the same blood groups, the same serum proteins, and the same peculiarities in purine metabolism independently of the anthropoids.[9]

Nevertheless, after an impartial review of the physiological evidence, he feels that it is impossible, in our present state of knowledge, to determine whether man's divergence from the common anthropoid-humanoid stock took place in the Oligocene before the present great apes had differentiated or at some subsequent period. For he points out that such physiological peculiarities as the blood groups, which man shares with the anthropoids, seem most probably to have developed independently in the different stocks, and are therefore due to convergent or parallel evolution and orthogenetic evolution within the confines of a natural subgroup.

In the past two decades experimental psychologists have become ape-conscious, and one of our great universities has been a pioneer in the recognition of the academic status of the chimpanzee. There has been accumulated a mass of experimental data tending to show that monkeys and apes differ from other mammals in that the former manifest a characteristic called "insight," which implies a complete solution of an experimental problem as a result of a general survey of the entire layout. This behavior with "insight" is contrasted with the "trial and error" method generally believed to be characteristic of lower animals. Gradually an edifice has been built up which seems to start with the inferior intelligence of rats in the basement and to progress upward story by story until it reaches the almost human faculties of the anthropoids on the roof, man with his supreme endowment hovering over all. Thus Yerkes and Yerkes in 1929 were able to conclude their colossal work upon the great apes with a formidable list of psychological contrasts between primate types:

> phylogenetic differences in behavioral expressions of curiosity, interest, attention, emotion, mood, sentiment; confidence in man and intelligent cooperation with him, rapidity and extent of adaptation to captivity; diversity and complexity of receptivity, sensibility, and perception, functional importance of contact senses, degree of value and dominance of hearing and vision; analysis and synthesis of mental objects; vocalization, approach to speech, intercommunication by visual and auditory signs and symbols; diversity of actions in problematic situations; frequency and importance of accidental (trial and error)

[6] Sir Arthur Keith, "New Discoveries Relating to the Antiquity of Man," pp. 37–116, New York, 1932.

[7] G. Edward Lewis, *Am. Jour. Sci.*, XXVII: 161–179, March, 1934.

[8] S. Zuckerman, "Functional Affinities of Man, Monkeys and Apes," New York, 1933.

[9] S. Zuckerman, *op. cit.*, p. 169.

adaptations; ability to perceive and react adaptively to relations (structure-function) *versus* familiar objects; insight, understanding, anticipation, expectation, disappointment, foresight; preadaptation; temporal span and complexity of memory; creative imagination, versatility, ingenuity, inventiveness, constructivity; adaptive modification of environment, modification of other organs by tuition or instruction, use of objects as instruments, construction or fashioning of implements.

Some of these phenomena are observable in all primates, some in all except the Prosimiae, others only in ape and man, and a few in man alone. Usually vast gulfs separate the types, and with a few exceptions the indicated or definitely demonstrated trend of development and serviceability is from lemur to man.[10,11]

Unfortunately, even this grand and towering structure has been scarred recently by bullets of revolutionary and communistic snipers who will have none of this primate hierarchy. Thus Zuckerman points out that the term insight is no explanation of behavior, but simply an aid to description which leads nowhere if too much reliance is placed upon it.[12] It is rather disconcerting to discover that behavior with insight, so far from being an exclusive prerogative of higher primates, is also characteristic of cats, dogs and even of rats. It is even more discouraging to learn that an ordinary American monkey tested by Dr. Haan seemed to be no less intelligent than the chimpanzee and much more so than the gorilla, orang, and gibbon. Various other investigators, whose work is summarized by Zuckerman, have apparently found that there is no exact positive correlation between zoological status within the primates and so-called measures of "intelligence."

On the whole, then, it would appear that the labors of paleontologists, comparative anatomists and psychologists have not yet led to any precise determination of man's relationship to individual genera and species of the primate order. No primate with a properly developed instinct of self-preservation would be willing to entrust his weight to any of their zoological family trees.

For myself, a naive physical anthropologist, the way still seems comparatively straight and plain. I adhere to the old-fashioned belief that the more numerous and detailed the resemblances between two animals the closer the relationship between them. Effects of similarity or difference of habitus can not obscure man's fundamental likeness to the great anthropoid apes, and especially to the gorilla and the chimpanzee.

[10] R. M. Yerkes and A. L. Yerkes, "The Great Apes," p. 578, New Haven, 1929.

[11] This quotation recalls Huckleberry Finn's comment upon Bunyan's "Pilgrim's Progress": "The statements was interesting, but tough."

[12] S. Zuckerman, *op. cit.*

I therefore persist in the opinion that these two apes are our nearest collateral relatives, and as yet am aware of no convincing evidence which conflicts with the theory that the gibbon was an early deviant from a small and primitive generalized anthropoid ape stock; that the main line of anthropoid-humanoid development continued at least into the Miocene period, when giantism began to affect simultaneously the diversifying strains of these arboreal apes. Then it would appear that the ancestors of the orang-utan first began their course of evolutionary divergence, leading ultimately to a rigid specialization for slow brachiating. For some time thereafter it seems probable that the ancestors of man and the African apes pursued similar evolutionary courses, until accident or initiative (and I favor the latter explanation) led the protohuman stock to take its chance on the ground. This radical change of habitus must have taken place before our ancestors had undergone any of the excessive specializations consequent upon brachiation, which have involved the hypertrophy of the upper limbs and comparative atrophy of the lower limbs in contemporaneous great apes. But I see no reason for supposing that the descent to the ground occurred before the latter part of the Miocene period, when man had already stamped upon his molar crowns the indelible sign of his Dryopithecus heritage.

The Enigma of Fossil Man

In the past two decades the specialists who deal with fossil man have been confronted with an ever-increasing number of geologically ancient skeletal remains, each succeeding one apparently adding to an existing confusion. At the beginning of the century the tale of fossil man was brief and apparently fairly intelligible. A series of finds in Western Europe had revealed the bony remains and the stone implements of a race of men who inhabited caves during the last glacial advance. These Neanderthaloids were short, bull-necked, barrel-chested individuals, with many features of the bones of the trunk and of the extremities suggesting an affinity with the great apes less remote than that of modern man. The most striking features were, however, those of the skull. The long and narrow brain-cases were of moderate size or even large, but flattened down and low; their orbits were surmounted with huge bony browridges, behind which the forehead retreated in an ignominious fashion. The jaws were protrusive to the verge of snoutiness; the chin receded practically to a vanishing point; the teeth were massive but without canine projection; the pulp cavities of the molars were enlarged, as in animals which chew the cud. These apish men seemed to fulfil the requirements of an early ancestral human

type which had not yet sloughed off many of its anthropoid attributes. They were succeeded in the upper strata of the European caves, representing the last glacial retreat, by several morphologically modern types of man. In 1907 a sand pit near the university town of Heidelberg yielded a massive human jaw which looked like a plausible progenitor of the Neanderthaloid race. This mandible was referred to the first or second interglacial period, many scores of thousands of years before the flourishing of the Neanderthalers. Also in 1892 a Dutch scientist had unearthed a most extraordinary humanoid fossil in the island of Java, apparently dating from the beginning of the Pleistocene period or the end of the Pliocene. This specimen consisted of a very apish skull-cap, too large for any existing anthropoid ape and too small for any man except an idiot, a few ambiguous teeth and a thigh-bone which certainly belonged to an erect biped. This thing was christened *Pithecanthropus erectus,* "the erect ape-man," and was generally conceded to be nature's finest effort in production of a "missing link." Without unduly stretching phylogenetic possibilities, one might conceive of Pithecanthropus as a late survivor of a stock which had already crossed the threshold of humanity, having achieved erect posture and biped gait, without as yet having attained a full quota of brain. It was further possible to suppose that some Pithecanthropidae with superior genes had produced the higher Heidelberg type, which again, stimulated by the Kultur of the Pleistocene, ultimately evolved the Neanderthalers. These last, in the throes of species parturition, were held by some to have given birth to modern man, apparently themselves expiring with the effort. These were the short and simple annals of the poor Hominidae. It is true that certain recalcitrant Thomases had interposed doubts, calling attention to various skeletal finds which suggest that morphologically modern man existed in Europe even before the advent of the Neanderthalers, and asserting that Pithecanthropus was a paleontological monster fortuitously assembled from spare parts of men, apes and microcephalic idiots.

However, about the time that the politicians were stirring up a world war, an inquisitive amateur geologist trespassed upon a small gravel pit in a Sussex lane near Piltdown Common and disinterred some skull fragments which were subsequently named Eoanthropus Dawsoni, but might better have been called Pandora. The brain-case of this early English female, although of extraordinary thickness, was of essentially modern configuration and of capacious size, lacking low forehead and great brow-ridges, whereas the half of the mandible discovered was chinless and almost indistinguishable from that of a chimpanzee. There was also included in the Piltdown remains a tusk-like projecting canine tooth. Hence, if the associated remains were assigned to one individual, it was necessary to suppose that at the beginning of the Pleistocene period there existed a type of man with a modern brain-case and a projecting, chinless, apelike jaw. Such a being could not be fitted into the line of descent which includes Pithecanthropus, Heidelberg man, and the Neanderthal race, since all these fossils were probably provided with large brow-ridges and receding foreheads. Some authorities attempted to solve the problem by supposing that the brain-case and the mandible belonged to two different individuals—one a man and the other a chimpanzee. But this supposition involved an incredible stretching of the long arm of coincidence. Although it was rejected by the majority, few seemed to possess the imagination to grasp the implications of this radically disharmonic type of fossil man, and to deduce from it the logical conclusions as to human descent. Almost alone, Sir Arthur Keith committed himself unhesitatingly and definitely to the theory that human evolution has been a multiple and asymmetrical process, involving the differentiation of a number of distinct genera and species of man, of which Pithecanthropus, Heidelberg and the Neanderthaloid group represent lines which are not directly ancestral to *Homo sapiens.* According to this view, Piltdown man (Eoanthropus Dawsoni) represents a survival into the Early Pleistocene of a Pliocene form which had already developed modern brain size, but had not as yet undergone the reduction of the jaws and the refinement of the dentition characteristic of morphologically modern man.

One of the cardinal tenets of Sir Arthur Keith's position was his defense of the Early Pleistocene dating claimed for the Galley Hill man, a skeleton discovered in the 100-foot gravels of the Thames Valley as early as 1888. The bones were those of a short-statured adult male with no especially apelike features. The skull is very long and narrow, without excessive development of brow-ridges or of frontal slope; the jaw has a well-developed chin and the teeth are not extraordinary. This find is merely the most famous of a fair number of morphologically modern human bones for which Middle Pleistocene or earlier age has been claimed. All these finds had been rejected by the majority of anthropologists on the explicit ground that their geological provenience was questionable, but implicitly because of the belief that the occupation of Europe at the end of the glacial epoch by apelike Neanderthalers delimited the extent of human evolution at that period. It was then in-

conceivable that an anatomically modern type should have ranged Europe one or two glacial cycles previously.

In the meantime fresh discoveries seemed to substantiate the opinion that modern man must have evolved through a generalized Neanderthaloid stage. In 1921 the Rhodesian man was exhumed in South Africa—a specimen which in size of face and upper jaw exceeded any human type previously known, and which, in the hugeness of its brow-ridges, virtually out-gorillaed the gorilla. Yet this skull displayed also a mixture of anthropoidal and modern human features, and the limb bones uncertainly associated with it were those of a recent type of man. Nevertheless, most authorities elected to classify Rhodesian man as a variant of the Neanderthal type.

Then came the series of discoveries in Peking, China, beginning in 1927 and closely associated with the industry and scientific acumen of the late Professor Davidson Black. The Sinanthropus crania, of Lower Pleistocene date, are of an evolutionary status intermediate between that of *Pithecanthropus erectus* and the well-known Neanderthal race, although possibly neither the descendants of the one nor the progenitors of the other.

Certain other new discoveries might be interpreted as consistent with the hypothesis that *Homo sapiens* has evolved through a Neanderthaloid stage. These include the Galilee and Steinheim crania, the skeletons from the Wady-al-Mughara in Palestine, and the so-called *Homo Soloensis*—the latter including several Late Pleistocene crania recovered near the same site which yielded *Pithecanthropus erectus*. Most of the finds just enumerated have not yet been described adequately. Incomplete information indicates that several of them show a mixture of Neanderthaloid characters with those usually found in *Homo sapiens*. For example, the series of nine Palestinian skeletons, at present not yet disengaged from their stony matrices, are said to combine truly Neanderthaloid frontal tori with high skull vaults, low attachments of the nuchal musculature, well-developed chin eminences, and limb bones of modern conformation. If these preliminary indications are substantiated it is evident that at least three possibilities must be considered: (1) that these skeletons represent Neanderthal man evolving into *Homo sapiens*; (2) that they are hybrids between Neanderthal and some form of *Homo sapiens;* (3) that certain skeletal characteristics, usually regarded as peculiarly Neanderthaloid features, were sporadically distributed through a number of separately evolving human stocks.

Most recently, however, there has been announced a portentous discovery, which, if completely validated, should once and for all relegate such forms as Sinanthropus, Heidelberg and all the Neanderthaloids to the blind alleys branching off from the main highway of human evolution. These new remains were recovered from a site on the south side of the Kavirondo Gulf of Victoria Nyanza, British Africa, by the English archeologist, L. S. B. Leakey. At Kanjera were found fragments of three skulls, in a stratum which yielded implements of the Chellean type of industry, and fossil bones which seem to date the deposit from the Middle or Early Pleistocene. While complete reports are not yet available, it is stated that all these fragments belong to a type of man devoid of a supraorbital torus and in no wise distinguishable from *Homo sapiens,* except in the retention of certain infantile and primitive characters. At another and older site, Kanam, a fragmentary human mandible was found *in situ* in a stratum characterized by fauna which must be at least Lower Pleistocene if not earlier in date, together with stone tools of a pre-Chellean type. This mandible is pronounced by the finder to be very similar to that of *Homo sapiens,* and quite possibly an ancestral form. Thus it is wholly probable that here at last we have the complete vindication of Sir Arthur Keith's opinion of the high antiquity of *Homo sapiens.** We may then have to rescue from the Potter's Field of human paleontology Galley Hill, Olmo, Castendolo, and I know not what other dusty and neglected bones, and accord them their rightful place in the gallery of our early ancestors.

While the scientists have been steadily adding to the number of accredited remains of fossil man in the Old World, during the past quarter of a century that formidable and indomitable veteran, Dr. Aleš Hrdlička, has stood like Horatius at the land bridge between Asia and North America, mowing down with deadly precision all would-be geologically ancient invaders of the New World. In fact, the story of alleged fossil man in America is virtually the tale of how well Hrdlička kept the bridge. With penetrating analysis and devastating criticism he has annihilated *seriatim* the claims of each successive fossil pretender. Undoubtedly he has preserved science from a credulous acceptance of many spurious Pleistocene Americans. It is indeed passing strange that, if man really inhabited the New World during the Pleistocene epoch, we have not found his implements and his bones *in situ* in indubitably Pleistocene deposits, and associated with extinct animals which do not incur the suspicion of having survived into recent times.

A reliable authority upon the present status of the

* Subsequent to the delivery of this lecture, new investigations in East Africa have cast serious doubt upon the validity of these finds.

problem of man's antiquity in the New World, the paleontologist, Alfred S. Romer, says:

> The association of man in America with certain fossil forms is unquestioned, and there is a growing body of evidence strongly suggesting his contemporaneity with a considerable number of mammalian types no longer living. Such contemporaneity, however, by no means indicates any remote geological antiquity for man on this continent, and there is at present almost no palaeontological evidence suggesting his presence here at a time earlier than that of the withdrawal of the last Pleistocene ice-sheet.[13]

The canny and conservative archeologist, N. C. Nelson,[14] is even more pessimistic and positive in reaching a similar conclusion.

Nevertheless, evidences suggesting a considerable antiquity of man in the New World keep cropping up, and each succeeding growth is tougher and harder to trample down. There is, for example, the case of Minnesota Man, who appears to have been a young lady who fell into a lake which preceded the postglacial Lake Agassiz, and whose remains, sealed under a concrete highway, were brought to light by the combined efforts of Jack Frost and a road-scraper. This young woman, although of an ordinarily modern appearance in most features, nevertheless possessed teeth and jaws of altogether exceptional size—quite outside of the range of civilized debutantes. Her doughty champion, my friend Professor A. E. Jenks, is now engaged with his colleagues in a definitive report upon her anatomical characteristics and the geological circumstances of the find. This discovery calls for consideration by a commission of impartial experts from every field of science concerned. Meanwhile we must not blackball Miss Minnesota, but rather put her on the waiting list.

If the recent discoveries in the Old World prove an Early Pleistocene existence of *Homo sapiens*—or morphologically modern man—it is no longer possible to discredit the geological antiquity of fossil American finds on the sole ground that they do not exhibit Neanderthaloid features or other morphological characteristics unmet in the recent American Indian. It is indeed conceivable that we, like the cheering Romans who remained on the safe side of the Tiber, presently may be impelled to shout "Back Aleš! Back Hrdlička! Back ere the ruin fall!"

WHAT RACES ARE AND HOW THEY ORIGINATE

Some of us less favored or more meagerly gifted physical anthropologists have neither fossil apes nor fossil men, but must content ourselves with the common or garden varieties of *Homo sapiens*. The study of race can occupy the liveliest intelligence, since race is no dead issue. It abides yesterday, to-day and forever.

At the onset of the twentieth century anthropology had barely shaken itself loose from spurious notions of race based upon language, geographical areas and national boundaries. Gradually there had become dominant a zoological conception of races as varieties, each characterized by the common possession of combinations of featural variations inherited from related ancestors. Race was the individual's less immediate physical heritage.

Here is no place to relate the ludicrous yet tragic history of the prostitution of the scientific conception of race to base political motives, to religious intolerance and to economic advantage. There can be no doubt, however, that progress in the scientific studies of human races has been obstructed by a vicious misuse of this important field of anthropological research. This perversion has gone on until the very term "race" has become a stench in the nostrils of most fair-minded and intelligent individuals. Nevertheless, in countries where liberty of speech, thought and action is still permissible, considerable progress in the analysis of race has been made during the past two and one-half decades.

Earlier classifications of race by physical criteria were largely based upon the variations of a few features, the hereditary transmission of which was naively and uncritically assumed.

In the early part of this century certain advances in biology began to influence and to stimulate the study of race. The first of these was the rediscovery of Mendel's law of heredity. When botanists and zoologists began to investigate inheritance in plants and animals, to tabulate the results of breeding experiments and to formulate rules whereby the transmission of physical features became predictable, the application of these findings to anthropological studies was imperative. The first effect of the genetic influence in physical anthropology was to force the student of race and of human heredity to develop a minute and exhaustive system for classifying immensurable morphological variations in man. For example, the rough categorization of hair color into light, medium and dark classes was obviously inadequate for any serious investigation of inheritance. Since it quickly became apparent that Mendel's laws of heredity concerned themselves with numerous small unit characters, it became necessary for the anthropologist to go beyond records of more or less composite dimensions, arbitrary indices and crude classifications of morphological features. He was now forced to

[13] Diamond Jenness, editor, "The American Aborigines"—Alfred S. Romer, "Pleistocene Vertebrates and their Bearing on the Problem of Human Antiquity in North America," p. 81, Toronto, 1933.

[14] Diamond Jenness, editor, "The American Aborigines"—N. C. Nelson, "The Antiquity of Man in America in the Light of Archaeology," p. 130, Toronto, 1933.

examine meticulously and to grade and measure as accurately as possible every variation of each physical feature which might be of potential value as a criterion of race.

Experimental genetics forced students of man, and particularly of race, to consider seriously, almost for the first time, whether the characters which were relied upon for racial classification were really heritable features or merely similar adaptations. In opposition to the genetic viewpoint there arose a powerful school of environmentalists, who were in revolt against Nordic propaganda and who subjected the supposed immutable hereditary criteria of race to a destructive criticism. Here we may recall the classic study of Professor Franz Boas, in which he demonstrated changes from the parental type in the American born offspring of European immigrants. For instance, the children of dolichocephalic aliens became perceptibly less long-headed, whereas those of brachycephalic antecedents suffered a diminution of relative head-breadth.[15] Apparently children changed their head-form with their birthplace. Somewhat later A. Ivanovsky recorded a series of modifications which took place in Russian populations, somewhat callously measured before a famine, during it and, if they were alive, after it. Besides the shrinkage of most bodily dimensions, a number of these hapless Russian groups showed a relatively greater decrease in head breadth than in head length, thus becoming somewhat more dolichocephalic or, literally, less fat-headed. However, this remarkable study also showed the resilience of head-form under environmental impact, since these famine-stricken Russians resumed their regular meals and their original cephalic indices almost simultaneously.[16]

Again, Arthur Thomson and L. H. Dudley Buxton offered evidence that the relative breadth of the nose (the nasal index) depends upon the environmental factors of moisture and humidity. Their theory was that a narrow nasal aperture is an adaptation to a cold dry climate, since it limits the intake of air to such amounts as may be sufficiently warmed in the nasal passages, thereby preventing the respiratory organs from being unduly chilled. Thus the fresh air-loving Englishman opens wide the window, but closes his nose to the merest crack. Conversely, broad nasal apertures are suitable for snuffing up generous drafts of warm moist air, and the Negro extensively ventilates his interior. These authors accordingly attempted to show that mean nasal index could be predicted from mean annual temperature.[17] This effort was moderately successful and seemed to show that the form of the nose was to some extent an adaptation to climate. A New Englander on this theory should develop automatically expanding and contracting nares, controlled by some somatic thermostat.

Environmentalist onslaughts upon racial criteria, however, have in no single instance terminated the usefulness of any standard measure of race differentiation. What the environmentalists have demonstrated is that over longer or shorter periods of time features which are hereditary in a stock are likely to be modified to some extent in response to functional needs or through sheer perversity. They have merely applied a harsh and well-deserved castigation to rabid hereditarians who have assumed, without taking the least pains to investigate the matter, that physical features in man are solely the result of germinal combinations.

Another notable advance in racial anthropology was again the indirect result of the interest in genetic studies stimulated by the Mendelians. Virtually nothing was known about the physical effects of race mixtures at the beginning of the century. There was indeed a certain mass of speculative and romantic literature concerning race mixture, wherein were enshrouded the casual observations of travelers, the partisan pronouncements of the prejudiced and the theoretical ruminations of scientists. But almost no contributions of appreciable scientific merit were existent, except the work of that great pioneer, Franz Boas,[18] upon the half-blood Indian and a small but valuable study of Edgar Thurston upon Eurasians.[19] In 1913 there appeared Eugen Fischer's[20] excellent monograph upon the crosses between Boers and Hottentots in South Africa—the first attempt, so far as I am aware, to examine in detail the familial inheritance of racial characters in a hybrid stock. Following this there came the work of Dunn and Tozzer[21] upon racial mixtures in Hawaii—a prelude to more extensive studies in this island group by Sullivan,[22] Wissler,[23] and Shapiro.[24] The last named also contributed a splendid monograph upon the Norfolk Islanders,

[15] Franz Boas, *Am. Anthrop.*, 14: 530–562, 1912.

[16] A. Ivanovsky, *Am. Jour. of Phys. Anthrop.*, VI: 331–353, 1923.

[17] A. Thomson and L. H. D. Buxton, *Journal of the Royal Anthropological Institute*, LIII: 92–123, 1923.

[18] Franz Boas, *Pop. Sci. Monthly*, XLV: 6, 761–770, October, 1894.

[19] Edgar Thurston, *Bull. of Madras Gov. Mus.*, II: 2, pp. 69–114, 1898.

[20] Eugen Fischer, "Die Rehobother Bastards und das Bastardierungs-problem beim Menchen," II Jena, 1913.

[21] L. C. Dunn and A. M. Tozzer, *Peabody Mus. Papers*, XI: 3, 1928.

[22] Sullivan, *Bishop Mus. Mem.*, XI: 105–257, Honolulu, 1930.

[23] Clark Wissler, *Bishop Mus. Mem.*, XI: 105–257, Honolulu, 1930.

[24] H. L. Shapiro, *Am. Mus. Papers*, XXXIII: 225–270, New York, 1933; *Bishop Mus. Mem.*, XI: 1–106, Honolulu, 1929; *Nat. Hist.*, XXXI: 31–48, New York, 1931.

descendants of the mutineers of the warship *Bounty* and of Tahitians—a historic example of miscegenation in which current fiction has aroused a renewed interest. G. D. Williams[25] followed with a painstaking examination of the results of mixtures between Spanish and Maya Islands in Yucatan, Rodenwaldt[26] with a meticulous study of Dutch Kisarese hybrids in the Indo-Malayan region, while crosses between various European stocks with the Negro in the New World were investigated by Davenport and Steggerda,[27] Herskovits,[28] Day,[29] and others.

As a result of these and other studies of miscegenation we can now put forward certain generalizations, which of course may be subject to future emendation or possibly to contradiction. These may be stated briefly:

(1) Crossings between races which are physically widely diverse do not result in any diminution of fertility, either in the first filial generation or in their subsequently inbred offspring. On the contrary, miscegenation seems to be attended by an increased fecundity.

(2) No satisfactory evidence has been adduced in favor of the supposition that racial hybrids sprung from wide crosses are inferior in vigor or in vitality to the parent stocks which have produced them.

(3) The alleged occurrence of physical and mental disharmony in hybrids has not been substantiated by any considerable body of evidence. There is frequently a maladjustment of the hybrid population, but it is sociological and not biological.

(4) While it is clear that many morphological features are transmitted according to Mendelian laws of heredity, it is obvious that simple unit inheritance of morphological and indicial criteria of race does not apply. Unit characters are small and multiple for almost every feature. Segregation and dominance occur, but the genetic situation is usually so complicated that it can not be tested by the application of rules of Mendelian expectation.

Genetic analyses of race mixtures have also affected methods of racial classification and conclusions concerning racial origins. Indeed it now becomes clear that hybridization has played a leading rôle in race differentiation. Observation of the inheritance of racial features in contemporary wide crosses has taught us to identify stabilized hybrid combinations of features in the individual and has enabled us to dissect composite races. We must now admit that the majority of the great human groups which have been accorded racial classification are not the results of evolution acting upon pure inbred lines, but rather the end products of outbreeding followed by intensive inbreeding and selection. Indeed, even the noble Nordic race is not free from the suspicion of a bar sinister upon its escutcheon. It seems wholly possible that the Negro race alone can fling about the term "bastard" with an absolute certainty that it is not shying pebbles in a vitreous domicile.

Another notable advance in racial studies has been due to the development and application of biometric methods. The lion's share of the credit for this achievement must go to Professor Karl Pearson, the monarch of the statistical jungle whose hunting trail we humbler denizens follow at a respectful distance, despised as a pack of unmathematical hyenas, but nevertheless avidly devouring his kills.

In the pre-Pearsonian era almost all physical anthropologists were content to estimate the anthropometric status of any group principally from arrays of raw means of isolated characters. Little attention was paid to dispersion or variability and practically none at all to the adequacy of samples. The interdependence of variables was usually disregarded. Kindergarten arithmetic was generally thought to suffice.

Professor Pearson has invented many fine statistical tools whereby anthropometric series may be thoroughly analyzed. If some of us use them improperly in our ambitious ignorance, we, at any rate, accomplish more than we did with our bare hands. The fork is an admirable implement for table use, even if one insists upon picking one's teeth with it. The greatest boon of the biometric school to the anthropologist was the method of dealing with the sampling problem. Since it was discovered that most anthropometric characters are distributed in an approximately normal fashion, it became possible to utilize the mathematical properties of the normal curve to gauge the reliability of the constants of small samples. Now when an anthropologist wishes to determine whether the differences between two groups are statistically significant or merely due to chance, he can approach the task with some confidence. Other statistical devices have contributed in the transformation of physical anthropology from a more or less futile recording of unintelligible measurements to something approaching a mathematical science of analyzing biological data. It is of course true that some mathematically gifted persons, lacking a proper knowledge of anthropological objectives, have frittered away the pages of scientific journals, playing aimless and endless games with formulae and equations.

It would be hard to exaggerate the importance of modern mechanical inventions in facilitating anthro-

[25] G. D. Williams, *Peabody Mus. Papers*, XIII: 1, pp. 1–247, 1931.

[26] E. Rodenwaldt, "Die Mestizen auf Kisar," 1927.

[27] C. B. Davenport and M. Steggerda, Carnegie Inst. of Washington, Pub. No. 395, 1929.

[28] M. J. Herskovits, "The American Negro," pp. 3–82, 1928.

[29] C. B. Day, "A Study of Some Negro-White Families in the United States," pp. 1–126, 1932.

pometric studies. In the days of hand calculation no anthropologist with any foresight would attempt to gather data pertaining to really large groups of individuals, because he knew very well that the sheer drudgery of the arithmetic involved in the reduction of these data would preclude every possibility of a complete analysis. Therefore the wise virgins made brief and rapid forays into the field of investigation, making sure that they went no farther and no longer than the oil in their lamps would last. On the contrary, some foolish virgins found their lamps extinguished when they were still far afield. Now electric calculators have reduced the arithmetical labor to such an unbelievable extent that the anthropologist faces with complete equanimity series consisting of thousands of individuals, whereas previously he quailed at hundreds. Consequently modern anthropological investigations are both more extensive and more intensive than was possible in the pre-mechanical age, and the results are proportionately more reliable.

One of the defects of method in racial classification and racial analysis incident to lack of mechanical apparatus for the reduction of mass statistics was the practice of judging racial characters by means of isolated measurements and by percentages of observations taken singly. If an investigator found that the average stature of a group studied was tall, that a large proportion of the group had dark eyes and that the mean of the cephalic index was seventy-five, he was inclined to assume that the majority of individuals in his group were characterized by a combination of tall stature, dark eyes and dolichocephaly. Actually the assumption that mean group values of metric features and modal categories of variations of morphological characters are linked together in the majority of individuals is usually incorrect. This method has led to the setting up of fictitious racial types. It has resulted in erroneous racial classifications. Until a few years ago there was available no means of exploring actual combinations of racial criteria in large groups of individuals, except by an endless and maddening process of hand-sorting. Now, however, it is possible to utilize electric sorting and tabulating machines, whereby the data concerning each individual are punched into a single card, and thereafter any desired combination of characters, however intricate, may be selected and counted automatically with incredible rapidity. Service bureaus in large cities do this work at very reasonable rates. When the numerically adequate samples of each racial group, which are now being gathered over the world, are subjected to exhaustive analysis by the use of these mechanical devices, we may hope to establish definitive scientific racial classifications which will endure.

It should be clear to every thinking person, however, that until the physical delimitations of races are definitely determined, any attempt to study their psychological characteristics or their varying capacities for cultural achievement must be wholly futile. At present assertions of racial inequality and of racial equality are alike unscientific.

This brings me to the latter query of my subject "Whither *Homo sapiens?*" There can be no doubt that studies of races, groups or individuals which confine themselves purely to physical description and analysis are comparatively, if not absolutely, sterile. Is anything known of the cultural implications of physique either in the individual or in groups? In the past two decades a number of extensive researches have dealt with the problem of such correlations. Many growth studies of school children have shown that physical superiority is definitely associated with superior scholastic aptitude. Mental deficiency is commonly associated with inferior physique. In 1913 Charles Goring conclusively demonstrated that English criminals, as a group, are vastly inferior in physical development to the law-abiding population. My own weary researches upon the American criminal in ten states are even more decisive. While the complete results can not yet be divulged to a none too impatiently waiting public, it can be stated positively that the biological inferiority of the criminal is no less marked than his economic ineffectiveness and his general stupidity.

We are faced by the sinister necessity of ascertaining whether or no man's most benevolent cultural efforts—medical science and idealistic humanitarianism—are eating him alive by eliminating the evolutionary effect of natural selection. Natural selection is a sort of automatic surgery whereby malignant phylogenetic growths are excised. It is the most effective preventive of stock contagion, since it extirpates the infected.

On the whole, the physically well endowed are likely to have better mental equipment than constitutional inferiors. But it seems certain that one important effect of modern medical practice is to preserve the lives of the weak and the mentally unfit, thereby permitting them to reproduce more of their kind. Thus the average quality of the population is lowered. Medical science is virtually impotent to deal with mental disease or deficiency. It therefore patches up the bodily ills of the mentally diseased and insures their opportunity to perpetuate their taints.

One of the principal teachings of current religious and social philosophy is, in effect, that all human life is sacred and that man's highest mission is to preserve it, however worthless it may be. This well-intentioned humanitarianism forces us to expend more and more of our resources for the preservation and increase of

that part of our population which is least worthy of existence and to protect society from the results of its own irresponsible breeding.

We all admit that our social engine has stalled, and a succession of political, economic and sociological drivers have been pulling and pushing every movable gadget in a futile effort to make it start. May not a biological bystander suggest the possibility that some one has watered the gasoline?

It would be expedient to conclude this survey with an innocuous prophecy of the evolutionary future of man's wisdom teeth, little toes, head hair and other degenerating appurtenances. It would be inspiring to produce evidence that man's body is evolving into a perfect organism and that his mentality is growing apace like the national debt. Unfortunately, I am unaware of any marked improvement of man's evolutionary status since the end of the glacial period. On the other hand, distinctively regressive or degenerative trends, general to the contemporaneous human species, are possibly confined to a few features of the organism—perhaps notably the dentition. What we must avoid is a progressive deterioration of mankind as a result of the reckless and copious breeding of protected inferiors. We have not the knowledge to breed supermen, but we can limit the reproduction of criminals and mental defectives. Let us cease to delude ourselves with the belief that education, religion or other measures of social amelioration can transform base metal into gold. Public enemies must be destroyed—not reformed. We need a biological new deal which will segregate and sterilize the anti-social and the mentally unfit. Intelligent artificial selection should replace natural selection.

SCIENTIFIC EVENTS

BIRD SANCTUARIES IN NEW YORK CITY

THE Park Department of New York City has under consideration a plan presented by the National Association of Audubon Societies for preserving the remaining natural wild-life areas in the city by making them bird sanctuaries. The association, according to *The New York Times,* proposes to establish sanctuaries in five of the larger parks, and the department has agreed to consult the society in preparing plans for these parks and to follow its suggestions if possible. The new sanctuaries will be in addition to those already in operation in Central Park. Dr. Robert P. Allen is in charge of the plans of the association.

According to Mr. Allen, some wild fowl and song birds still nest in the city, but their numbers are decreasing every year as the parks and vacant areas are cleared and improved. It is proposed to fence off and keep unspoiled those areas still in a natural state. In addition he would plant various shrubs for ground cover and to provide food.

In Van Cortlandt Park it is hoped to have set aside the twenty-acre tract north of the boating lake, which has been a natural sanctuary for generations, although considerably reduced from its former size. It was here that last spring the rare glossy ibis was observed, and Virginia rail still nest there regularly. In addition to shrubs, wild rice and other marsh plants would be planted in this area.

In Queens it is proposed to fence and improve the existing protected area in Alley Pond Park, which includes a pond and about forty acres of upland, and to set aside the swamp area in Kissena Park as a second reservation for herons, ducks and other marsh birds.

In the New Springville Park sanctuary on Staten Island Mr. Allen suggests that a salt-water pond be created by damming up the marsh area. This would increase the size of the preserve to 100 acres and would provide the only nesting place in the city for salt-water birds. This tract also needs fencing and further planting.

In Brooklyn it is proposed that the pond on the Dyker Beach Park golf course be preserved as a sanctuary. Even under present conditions it is inhabited by rails, least bitterns, Florida gallinules and other water birds.

The Central Park sanctuaries established last year have proved to be a great success. A record number of birds was observed in Central Park this season. One hundred and thirty-two species were counted, compared with only one hundred and twenty-seven last year. The only birds that now nest regularly in the park are English sparrows, starlings, flickers, purple grackles, song sparrows and occasionally screech owls. It is proposed, if possible, to lay out nature trails, with every tree and shrub properly labelled. Mr. Allen considers that the Fifty-ninth Street lake is well adapted to water fowl and suggests the planting of more water plants in the park as an inducement for them to use it.

FIFTH ANNUAL FIELD CONFERENCE OF PENNSYLVANIA GEOLOGISTS

THE fifth annual meeting of the Field Conference of Pennsylvania Geologists was held at Philadelphia from May 31 through June 3. Headquarters were established at the Academy of Natural Sciences of Philadelphia, from which place all field trips started.