

## **Intellectual development and the erect posture / by Wm. Colin Mackenzie.**

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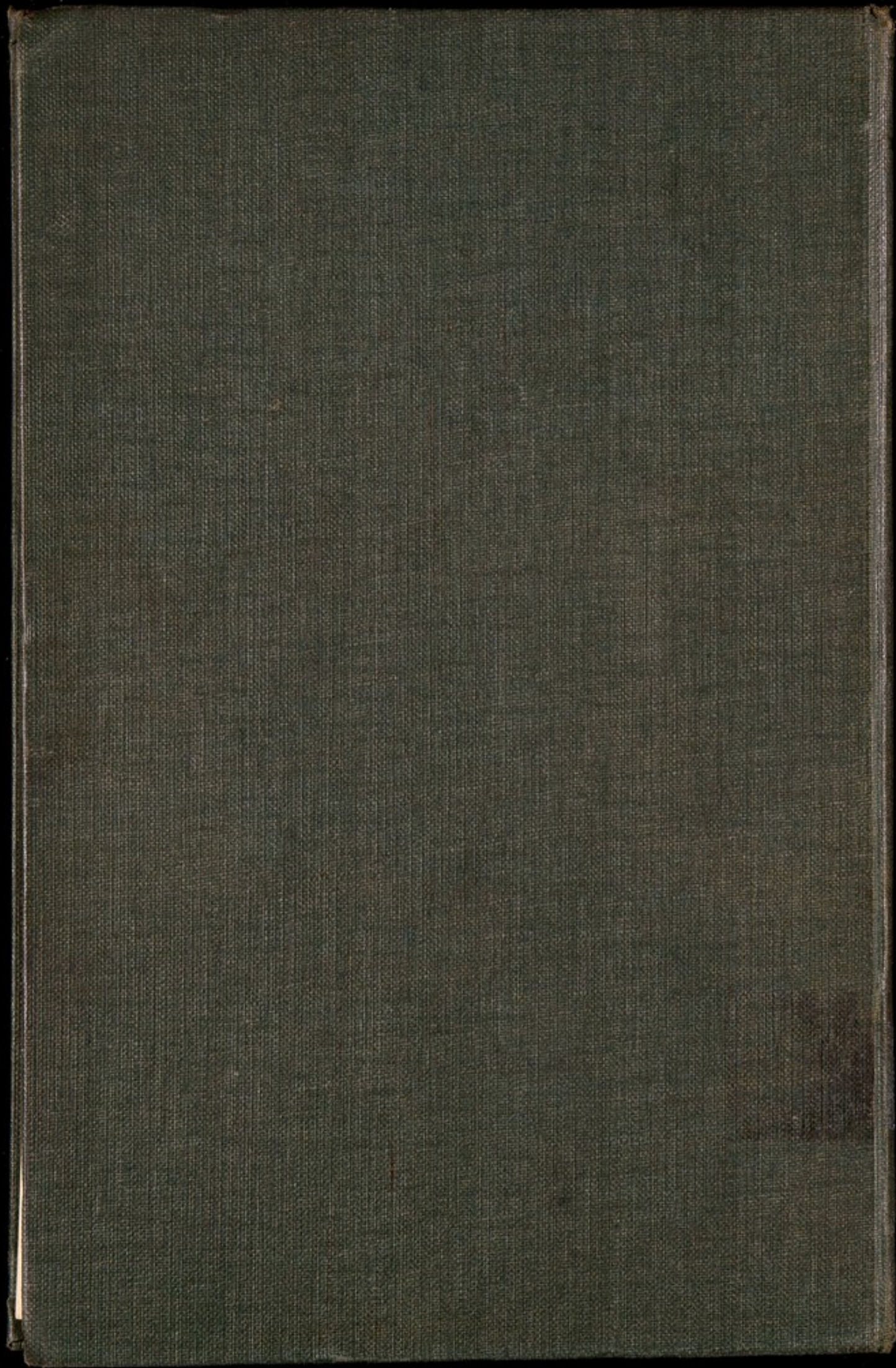




INTELLECTUAL DEVELOP-  
MENT AND THE ERECT  
POSTURE

BY EUGEN MALKINZIE







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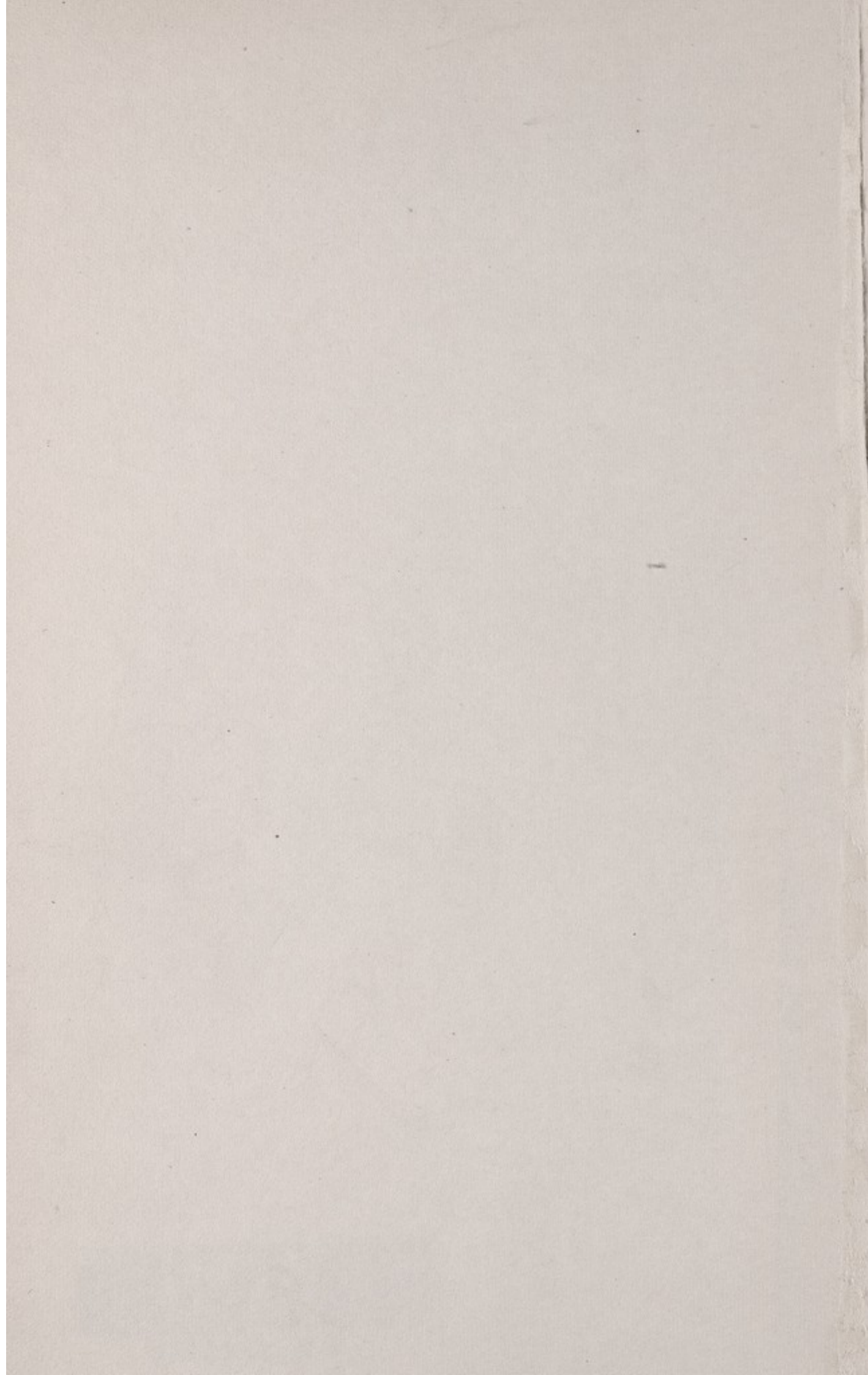


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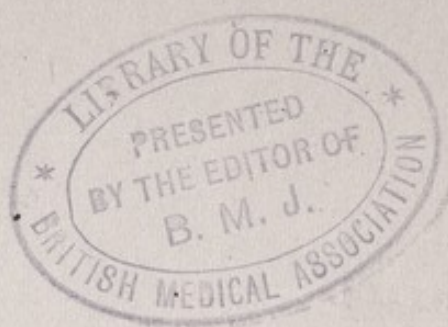




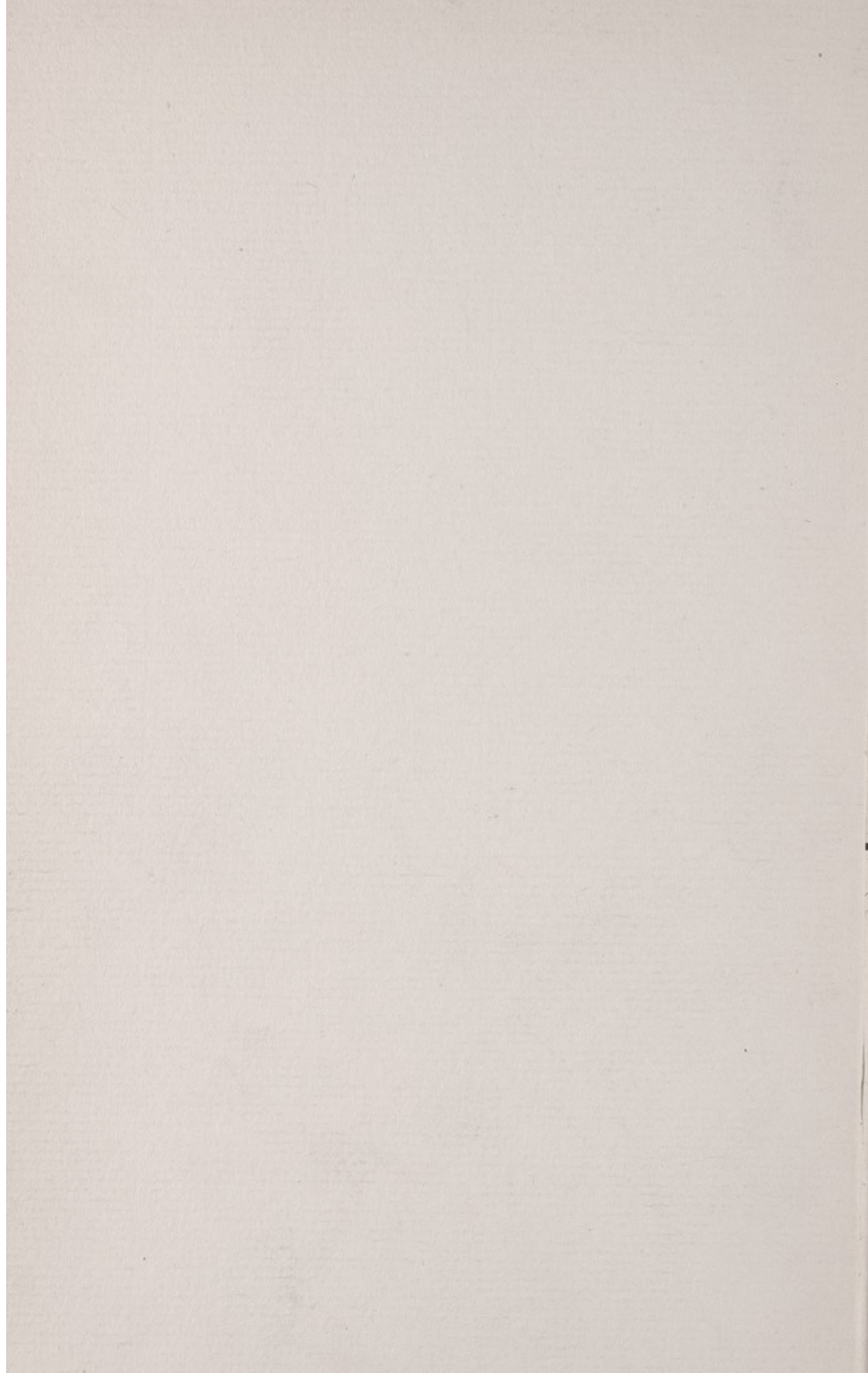




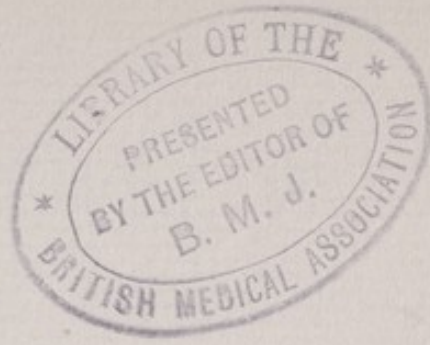






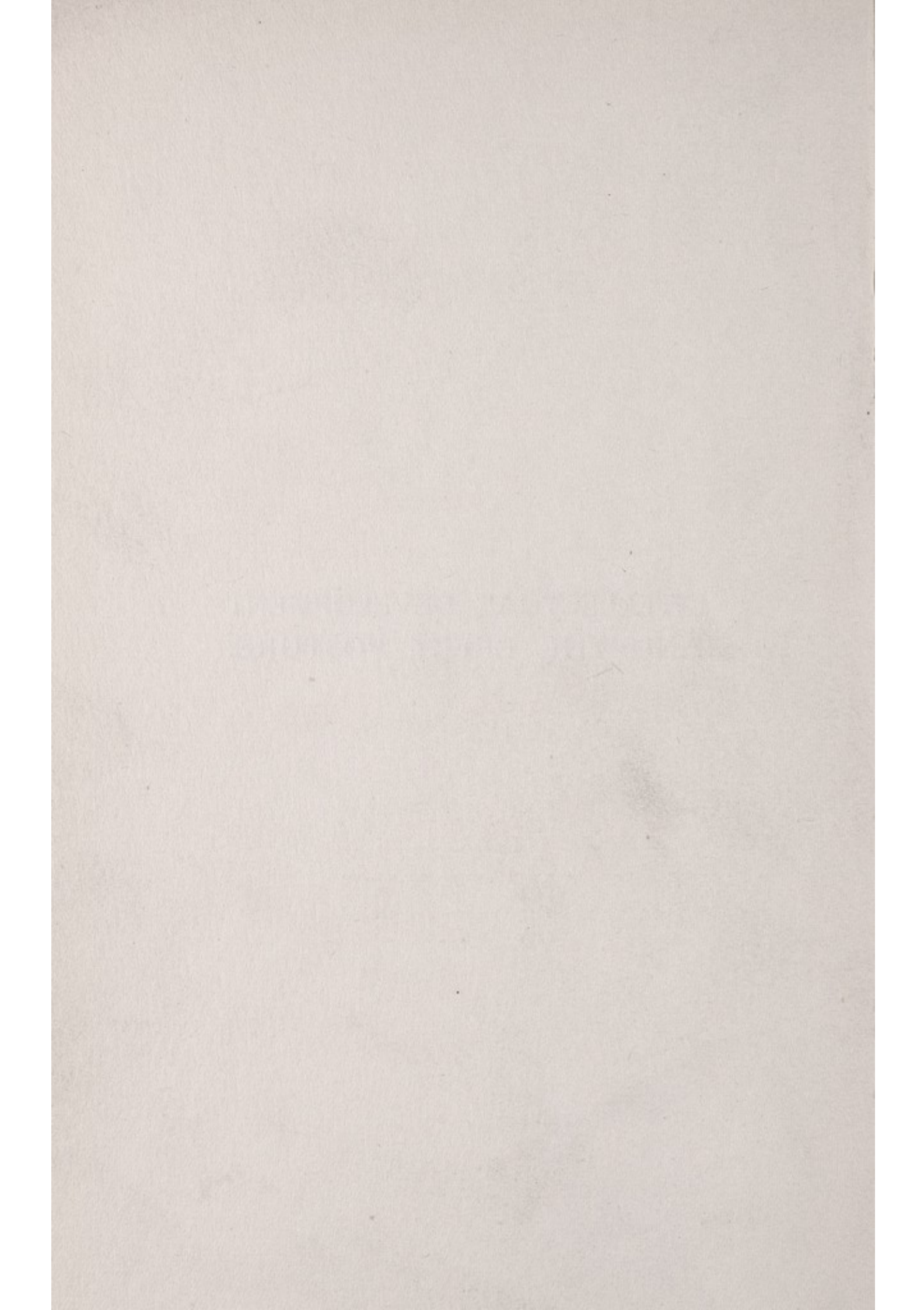






INTELLECTUAL DEVELOPMENT  
AND THE ERECT POSTURE.







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# INTELLECTUAL DEVELOP- MENT AND THE ERECT POSTURE

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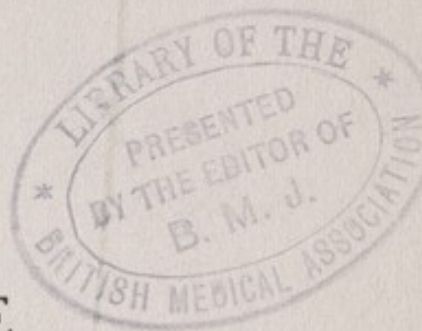
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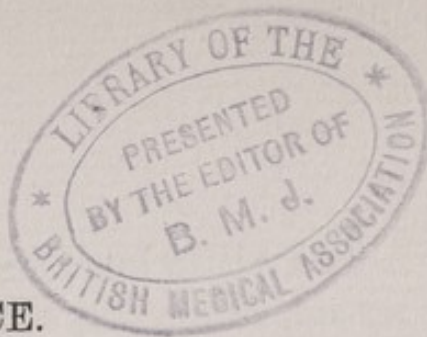
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## PREFACE.

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Until the occurrence of the Great War, there was no portion of the human body to which less attention was paid by the student of medicine, than to the muscles, although they form its largest part.

In this respect, it is interesting to note that in the latest edition of Quain's Anatomy, the muscular system has been considered important enough for a separate volume. Myology is at last coming into its own.

In these days of free and compulsory education, it has to be remembered that, although the aim is mental efficiency, this necessitates muscular efficiency as well. In fact, the former is dependent on the latter—before the development of a brain, there was bodily movement.

That the importance of muscular fitness is generally recognised, is evidenced by the increase within recent times amongst all classes, in both young and old, of what we may regard as physical pastimes, notably tennis, eurythmics, bowls and golfing. In Australia, with its essentially-outdoor climate, our tendency is towards the apotheosis of the physicals, not the intellectuals.

The writer has already defined the law of muscle action, and in this work he shows that the impetus in development from the reptile to the highest mammal is improvement in muscle function, culminating in the erect posture. Not only is intellectual development correlated to the latter, but bodily function in general.

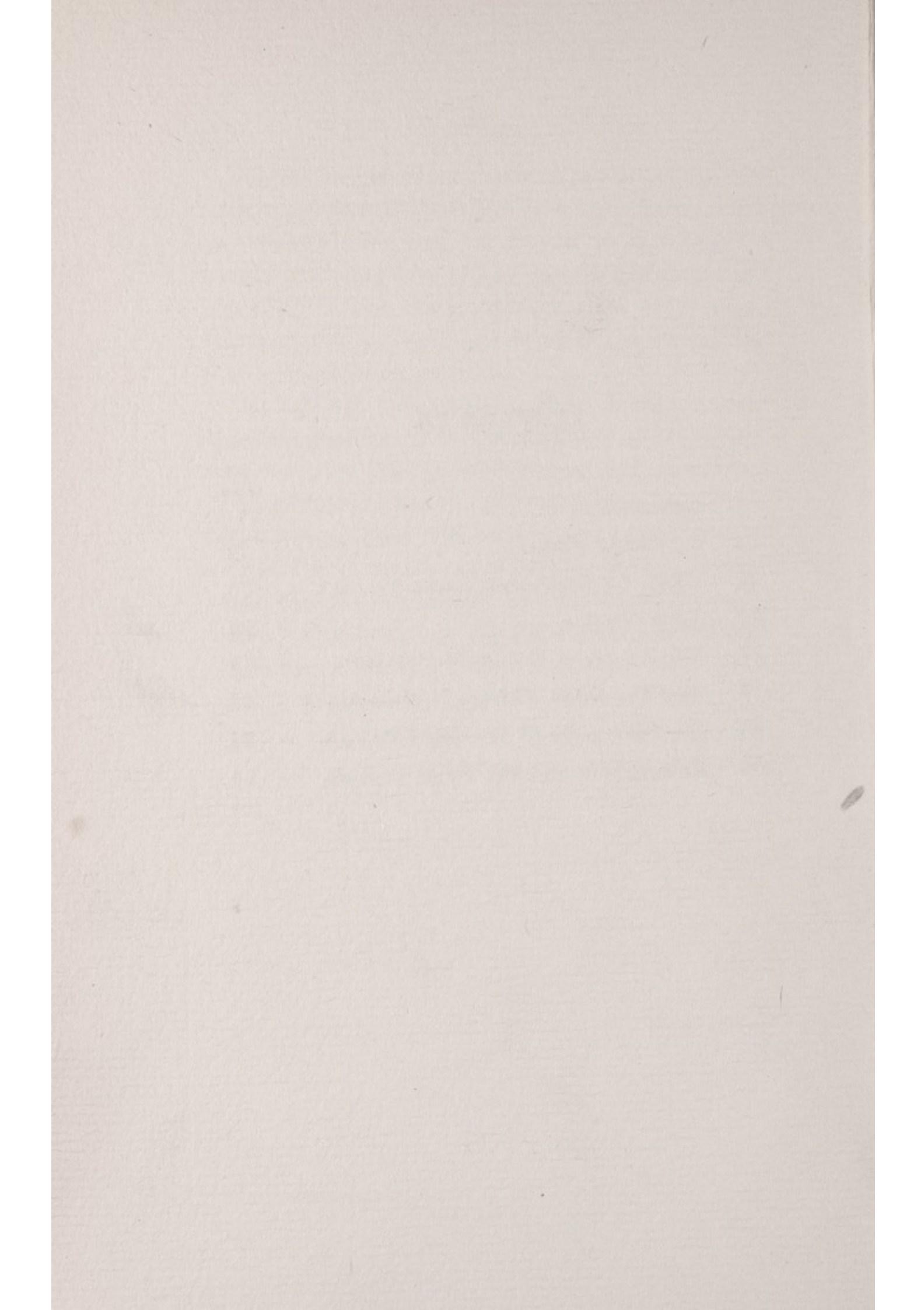
Throughout the civilized world to-day, a disquieting feature is the multiplicity of hospitals necessary for the accommodation and treatment of the "chronic sick." Chronic illness is, in the main, preventable, and we are now realising that its basis is muscular inefficiency. Hence, to discover the physical defect and its scientific treatment, a knowledge of the development of muscle action is essential.



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# INTELLECTUAL DEVELOPMENT AND THE ERECT POSTURE.

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## INTRODUCTION.

Apart from its political significance, the landing of the First Fleet under Governor Phillip, at Sydney Cove, in 1788, was a scientific event of first-rate importance. The mist that had hidden our island continent, isolating it from the rest of the world, was suddenly lifted, and a form of life was revealed, corresponding to that which existed on the earth in bygone ages. The past was suddenly brought into contact with the present. Man, regarded as the "highest" mammal saw, still living under natural conditions the two "lowest" mammals—the echidna and platypus.

Australia became known to scientists as "the land of living fossils."

Although even to-day so little is known by the average Australian about the unique, but fast-disappearing fauna of his native land (computed in fifteen years to be almost extinct), it is interesting to note that the first collector of specimens

was the Surgeon-General of Australia, in 1788, Dr. John White.<sup>1</sup> These were sent to London to the celebrated John Hunter, and the first scientific descriptions of the Australian fauna are from that great man's pen. Our animals are teeming with points of scientific interest. In them the apparent complexities of the human body are revealed in their simpler form. A study of them is really a study of living human embryology, i.e., embryos in which we can study not only structure, but function, on which structure depends; for to the medical scientist, the latter must be regarded as the register of the former. It can be truly said that there is not a problem in human anatomy or physiology on which a study of these animals fails to throw light. In this treatise, in so far as it deals with the Australian fauna, I intend to confine myself to the lessons our animals furnish in explaining the mechanism of man's erect posture, for on that posture depends, I consider, what we

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1.—Journal of a voyage to New South Wales (1787-88). By John White, Esq., Surgeon-General to the Settlement. "There was no person to whom these could be given with so much propriety as Mr. Hunter, and it is to him that we are indebted for the following observations upon them." (White's Journal.) Hunter writes: "The animals which have come from New Holland (New South Wales) are, upon the whole, like no other that we yet know of." It was the irony of fate that the platypus was not discovered till a few years after Hunter's death, which took place in 1793.



call human intelligence—the power that is supposed to raise us above the beast. This power is muscular—in other words, intelligence has a muscular basis, and the genesis of its study is in our Australian reptiles.

The great epochs, culminating in higher mammalian development, are represented by improvements in muscular function.

But there is also another side to the question. If we survey an average community in the world to-day it cannot be denied that the mental supremacy of the erect posture is associated with a multitude of physical ills. In a healthy city like Melbourne, with some 800,000 inhabitants, in spite of the fact that there are eight great metropolitan hospitals there is a constant appeal for funds for new accommodation to cope with the ever-increasing multitudes seeking admission. The human body would appear to be the playground of disease. The invaders of the human citadel are multiple, and to repel them, numerous methods are devised. But much more important is it to discover the breaches in the citadel that have allowed the invading organisms a free entry. In the writer's opinion, this can be best effected by improvement of the physical condition, which necessitates a knowledge of the history of the ac-



quisition of the erect posture. Decrease, not multiplication, of hospitals must be sought. The basis of preventive medicine is maintenance and strengthening of the human erect posture, and increase in centres for physical culture on scientific lines the desideratum. In a recent article,<sup>2</sup> W. A. Cochrane, of Edinburgh, deals with the importance of physique and correct posture in relation to the art of medicine, basing his remarks largely on the researches of J. E. Goldthwait, the distinguished American orthopædist, in connection with the "Anatomic and Mechanistic Conception of Disease." He points out that many of the chronic conditions requiring treatment in hospital (and in a city like Melbourne chronic cases form the majority treated at our institutions), represent a derangement of the mechanism which regulates and maintains the proper and correct posture of the body. Dr. Cochrane also draws attention to the lack of physical education in the young, especially at colleges and universities, and writes, "the lines on which such education should be carried out are indicated in an appreciation of proper posture and resulting efficiency. Such work represents the best kind of preventive medicine, and should have

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2.—British Medical Journal, February 23rd, 1924.



a place in the programme of those who have charge of the health of the country."

When we refer to chronic conditions, the question of cancer, which takes such a toll of the population, must be considered, since it tends to attack a part previously diseased.

## I.

### THE ERECT POSTURE.

The highest order of mammals is that of primates, the name given by Linnaeus, the great Swedish scientist. The first and highest member of the order, from the intellectual point of view, is man. The lowest member is that little monkey-like form to be seen in any zoological collection—the lemur. In between we have the anthropoids (gorilla, chimpanzee, orang), and the varieties of monkeys and baboons. Since man is the highest intellectual, he is known as *Homo Sapiens*. He is also known as *Erectus*, since his usual mode of progression, unlike that of all other animals, is on the lower or hind limbs. His two upper or fore limbs hang freely, taking no part in the support or balance of the body, but are capable of being raised against gravity above the head. The lower or hind limbs are alone used, not only for bodily support, but for bodily progression as well. Man, the most intelligent of all animals, is the most erect. Of the animals nearest to the human (anthropoids) we have, firstly the gorilla, secondly the chimpanzee, and thirdly the orang. Apart from physical differences to which I shall presently refer, some observers have disputed which



is the more intelligent—the gorilla or the chimpanzee. The former has the more richly-convoluted brain, and better frontal development, and alone of the anthropoids, shows mastoid prominence. The latter is imitative, and frequently used in music-hall performances. The experiences of Miss Cunningham, in London, with John Gorilla, during the years 1918-1921, should dispel all doubts as to the higher intelligence of the gorilla.

This animal, whose table manners were excellent, could ride in trams and trains without a chain, had his own sleeping apartment with spring bed and blankets, and "his cleverness and quickness of perception were shown in a variety of ways." The superior intelligence of both gorilla and chimpanzee over the orang, is undisputed. When we consider the physical characters, i.e., the approach to man's erect posture the order gorilla, chimpanzee, and orang still holds. The gorilla is less arboreal than either the chimpanzee or orang, living mainly on the ground. Though usually moving on all fours, with the soles of the hind feet flat on the ground, and with the back of the closed fingers of the fore limbs used for balance, it can stand and walk better on the hind limbs than the other two, though the gait is rolling. In this latter manner, the gorilla attacks man when cornered.



In man, the fore limbs, when erect, reach to about the middle of the thigh, whilst in the gorilla they nearly attain the knee, and in the chimpanzee reach below the knee. The comparison in length of the fore or upper limbs with trunk shows little difference between this ape and man. The chimpanzee is less a ground animal, and more arboreal than the gorilla. It usually goes on all fours, balancing by means of the backs of the hands, but can assume the erect posture, though with difficulty. The bones of the foot of the gorilla resemble the human more so than those of the chimpanzee. There is a bigger heel, and the foot is flatter on the ground than in chimpanzee, whose whole foot is narrow in proportion to the length, and inverted. In other words, the foot of the latter ape is an organ for grasping and climbing rather than for the support of the body weight in walking or standing. The orang is essentially arboreal, and its foot is more inverted than even the chimpanzee. It is interesting to note that the big toe of the gorilla and chimpanzee approaches nearer the human character than that of orang, which does not come as far forwards as the distal end of the second metatarsal. In other words, in the latter, the big toe is more a prehensile organ or thumb, and less valuable as a fulcrum for support and ambulation, as in man.



## II.

### WHAT THE AUSTRALIAN FAUNA TEACHES.

When reference is made to the erect posture, we are apt to think of some development peculiar to man, whether primitive or modern, and the anthropoid apes. The student of natural selection might assume an ancestor arose capable of supporting the body, and walking on the two hind limbs, the advantages of which conferred a "survival" value. But structure is correlated to function; it is the register of cause, and the cause or function that has given rise, finally, to the erect posture has been operating for æons past. Man, surveying the vista from the top of the mountain, or the ape struggling a short distance from the summit, is a somewhat different type to the animal that commenced the journey at the mountain's base. It has been a titanic struggle to reach the crest, and, fortunately for us, the evidences of this struggle are still to be found in Australia, though in some 15 years they will have vanished, never to return. The genesis of the study of the erect posture, whether from the point of view of muscle, nerve, heart, or intestine, is in the Australian

reptile. On one occasion, when motoring along a road last summer in the Healesville district, three reptiles (two black snakes and one blue-tongued lizard) were noticed, that had been crushed by passing motors as they lay basking in the sun. Their senses of smell and vision availed them nought. Approaching Lilydale, another reptile (the bearded lizard) was observed on the road. The ability to raise its body off the ground by means of its limbs, enabled it to take bearings, and it readily escaped from the approaching car. The former reptiles had their belly walls on the ground. They used their limbs for body propulsion, not for body support. (Fig. 1.) The latter represented a decided step upwards towards the erect posture. Its limbs were used for bodily support as well as for body propulsion. Thus in Australia there are two great divisions of lizards, one including varieties such as the blue-tongued and stump-tailed lizards, and the other or higher, the bearded, frilled and Queensland red-bellied lizards. These three latter have long and flexible tails. The tail has been an important factor in the acquisition of the erect posture.

The two lowest mammals in the world are the echidna and platypus. They are peculiar to Australia. Although both are egg-laying mammals,



yet between the two is one important difference—the brain of the former is larger and rich in convolutions, whilst the brain of the latter is flat and unconvoluted. This has been a great puzzle to



FIG. 1.

In the upper illustration the reptilian use of limbs for bodily propulsion, not bodily support, is shown. In the lower—the echidna—the limbs are used for bodily support as well as bodily propulsion.

scientists for a century past. The reason would appear to be, and this is demonstrated in kinema records, that in movement the platypus still shows its reptilian affinity, whilst the echidna is definitely off the ground, well balanced on its four limbs. The echidna represents the accomplish-

ment by Nature of a remarkable feat, viz., the raising of the belly wall off the ground, with the use of limbs, not only for propelling the body, but for supporting it as well. (Fig. 1.) This means more effort with an improved respiratory function, and so we have the four-chambered heart, lungs confined to the chest, and the introduction of a respiratory piston or diaphragm separating the lungs from the abdominal cavity, as compared with the three-chambered heart of the reptile, and the absence of a diaphragm. Again, if we examine anatomically the body of the "lowest" mammal (echidna), with that of the "highest" mammal (man), we find little difference between them. The general structural scheme, in spite of the millions of years intervening, is the same. We have in both a four-chambered heart, complete respiratory piston or diaphragm, big spleen, lungs similar and confined to the chest, and the grey matter of the richly-convoluted brain of both is external, and not the white, as in the reptile's brain. Furthermore, if we examine the organs microscopically, we find the same structures as in man. What, then, constitutes the great difference? Is "higher" mammalian development such a complex thing, then, after all? The great difference between the lowly echidna and us is actually a muscular one.



We have the erect posture, and it has not. And that is really what is meant by "higher" mammalian evolution. The great advance from the reptiles, along the mammals, up to man, is one in muscular action. Of further experiments towards the erect posture, Australia furnishes two interesting examples.

In koala we see the ability to raise the arm above the head for the eucalyptus leaf (its sole

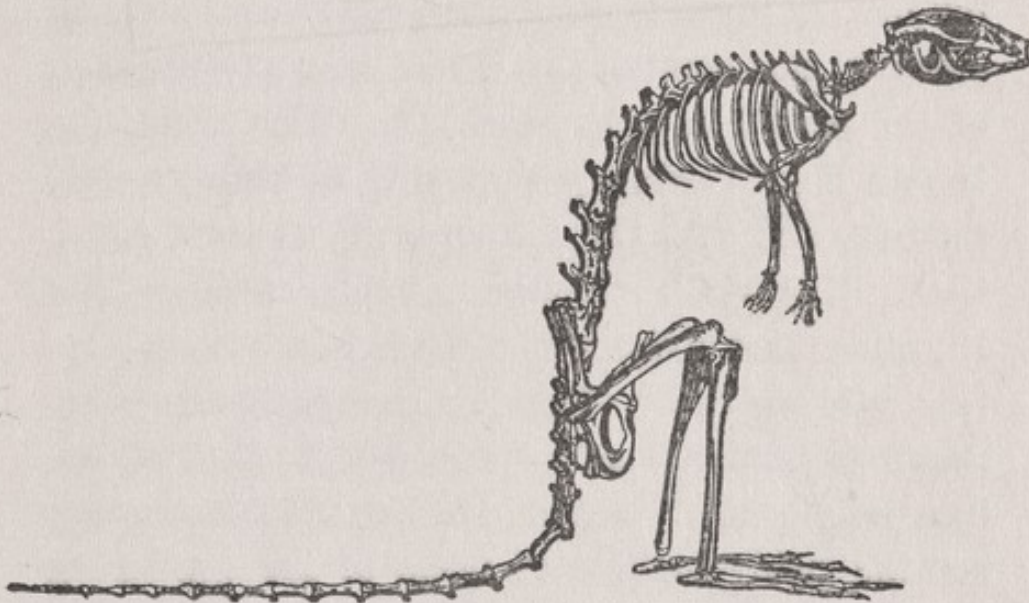


FIG. 2.

The "erect posture" in the kangaroo.

article of diet), when sitting in the fork of a tree. This is not correlated to changes in bodily support, for when on the ground the koala is an ungainly

walker on all four limbs. The kangaroo, when erect, rests on a tripod consisting of two long feet and a powerful tail. (Fig. 2.) With that support he can swing his trunk erect at the centre of motion of the body, viz., the hip joint. He uses his fore limbs when feeding, but has lost the opposable thumb, which in the anthropoids is such an important factor in balance. In Vol. 4 of the recently-published, "Outline of Science," Prof. Arthur Thomson suggests two factors to account for higher mammalian development, i.e., development of the mammalian brain, viz., prolongation of the period of ante-natal life, which means intimate physiological partnership of embryo with mother, and also the influence of internal secretions of certain ductless glands, notably the thyroid. But viviparous birth is met with in reptilia, and the brain of the viviparous stump-tailed lizard is certainly an inferior one to that of the bearded lizard. Further, that would not account for the richly-convoluted brain of the egg-laying mammal—the echidna—and the relatively smaller smooth unconvoluted brain of the placental rabbit. As regards the secretion of the ductless glands, a study of the thyroid in kangaroo shows that it is not as essential to mammalian life as is thought.

Furthermore, the platypus, the "lowest" mam-



mal, has a similar well-developed internal secretory system to man, including a retained thymus, and constant parathyroids, and in addition, has three ductless glands not so far discovered in man, viz., sex, scapular and parathymus glands.

### III.

#### BRAIN STUDIES.

It is generally taught that the reptilian brain, without a thorough knowledge of which no medical student should attempt a study of the human brain, is an olfactory or smell organ, i.e., is instinctive rather than intelligent. A study of Australian reptiles shows that this is not so. If we take the brain of the stump-tailed lizard (Fig. 3), a reptile using its limbs for propulsion and not for support—although the olfactory or smell nerves are large—we find it is not at the front, but at the back of the brain where the big collection of nerve cells are—cells that have to do with movement, balance, feeling and vision. The brains of higher Australian lizards, such as the bearded (Fig. 3)—reptiles using their limbs for support as well as propulsion—show a brain of a different type. The olfactory nerves are diminutive, and the olfactory registration is becoming limited to a special area on the under surface. Neither smell, nor vision, nor hearing have produced this difference, but muscle action.

In Fig. 4 the great difference between the brain of the echidna and platypus is shown. Both are



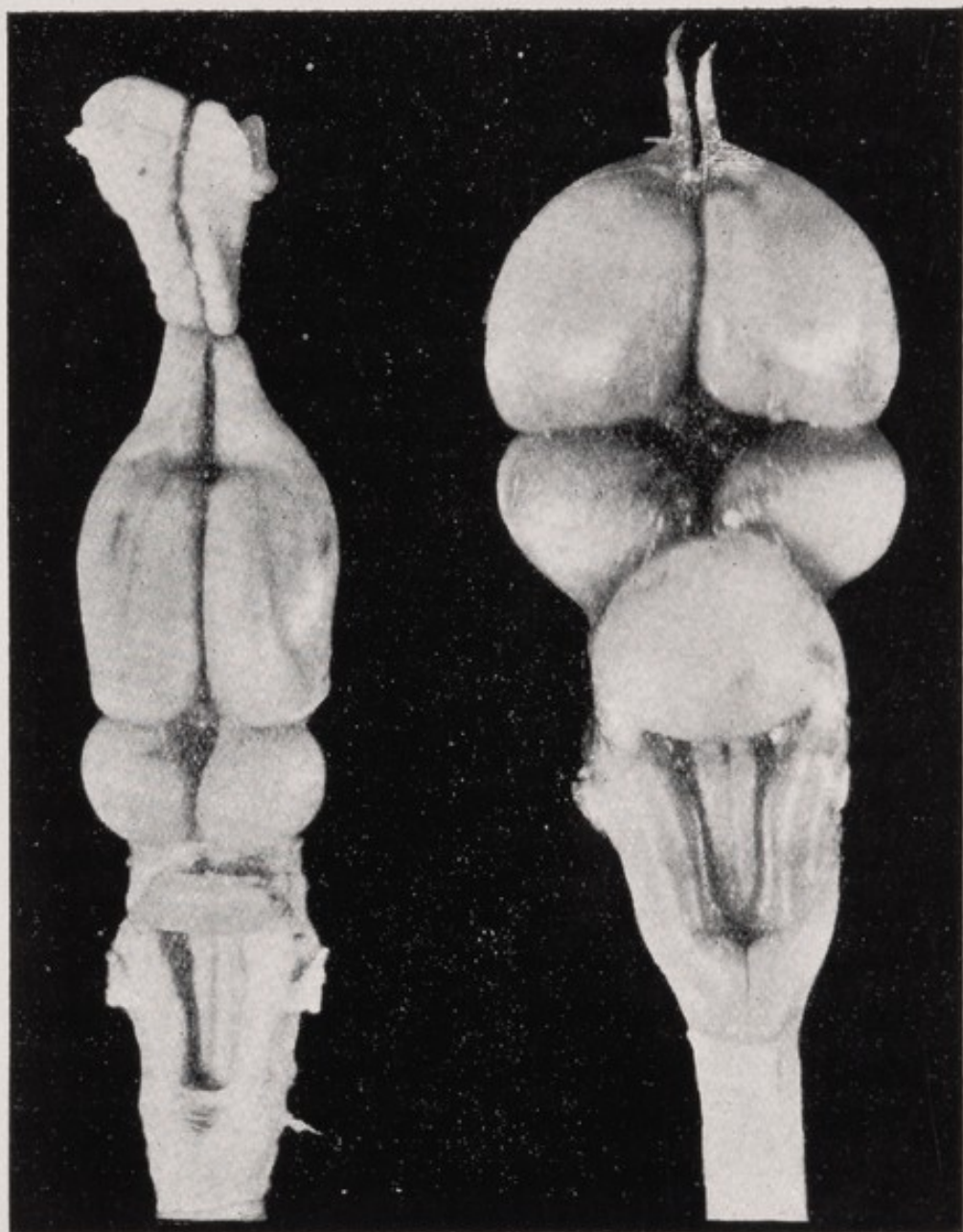


FIG. 3.

Brains of Australian reptiles. On the left is the brain of the Stump-tailed Lizard with in front the well-defined olfactory nerves. On the right is the brain of the Bearded Lizard with diminutive olfactory nerves.

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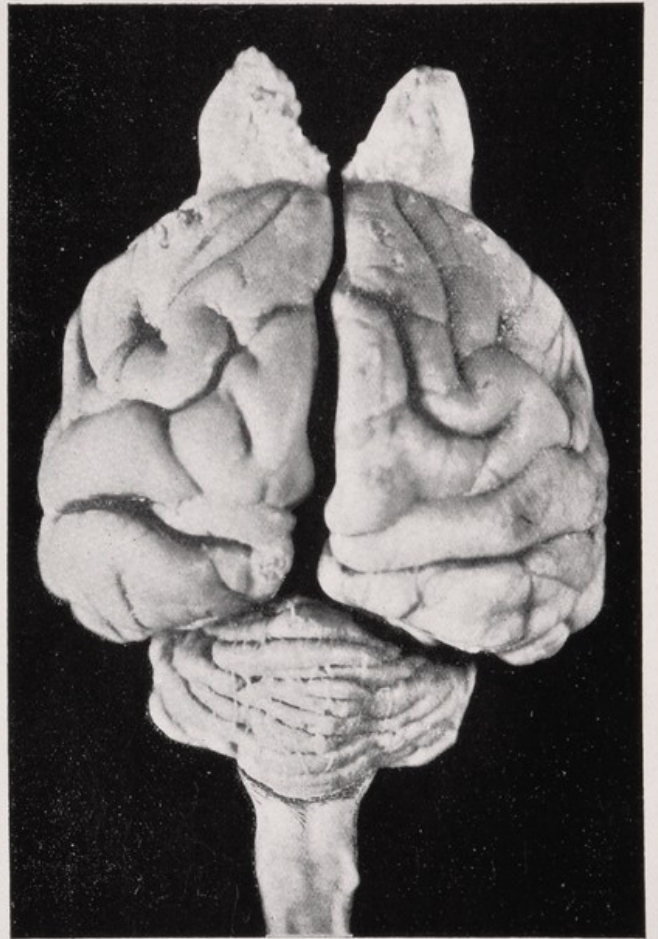
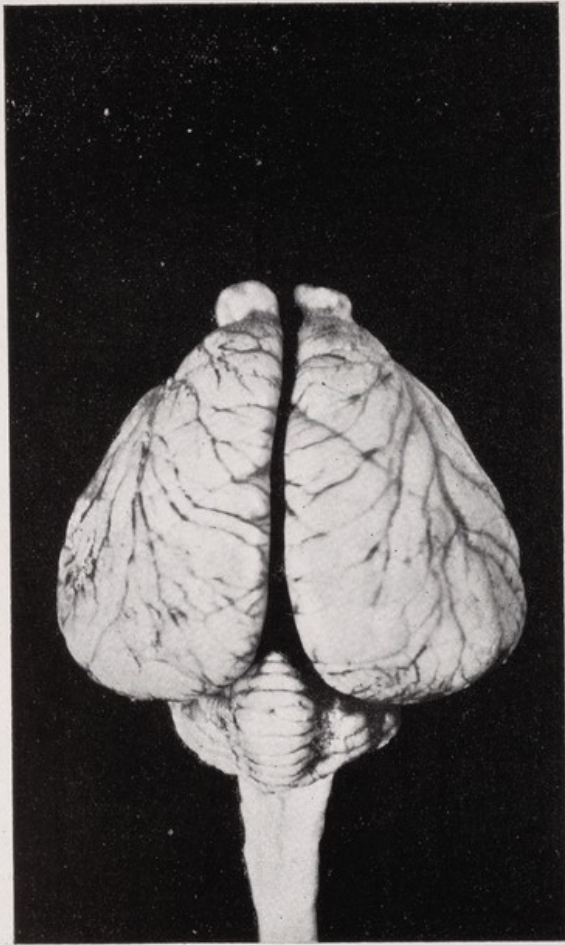
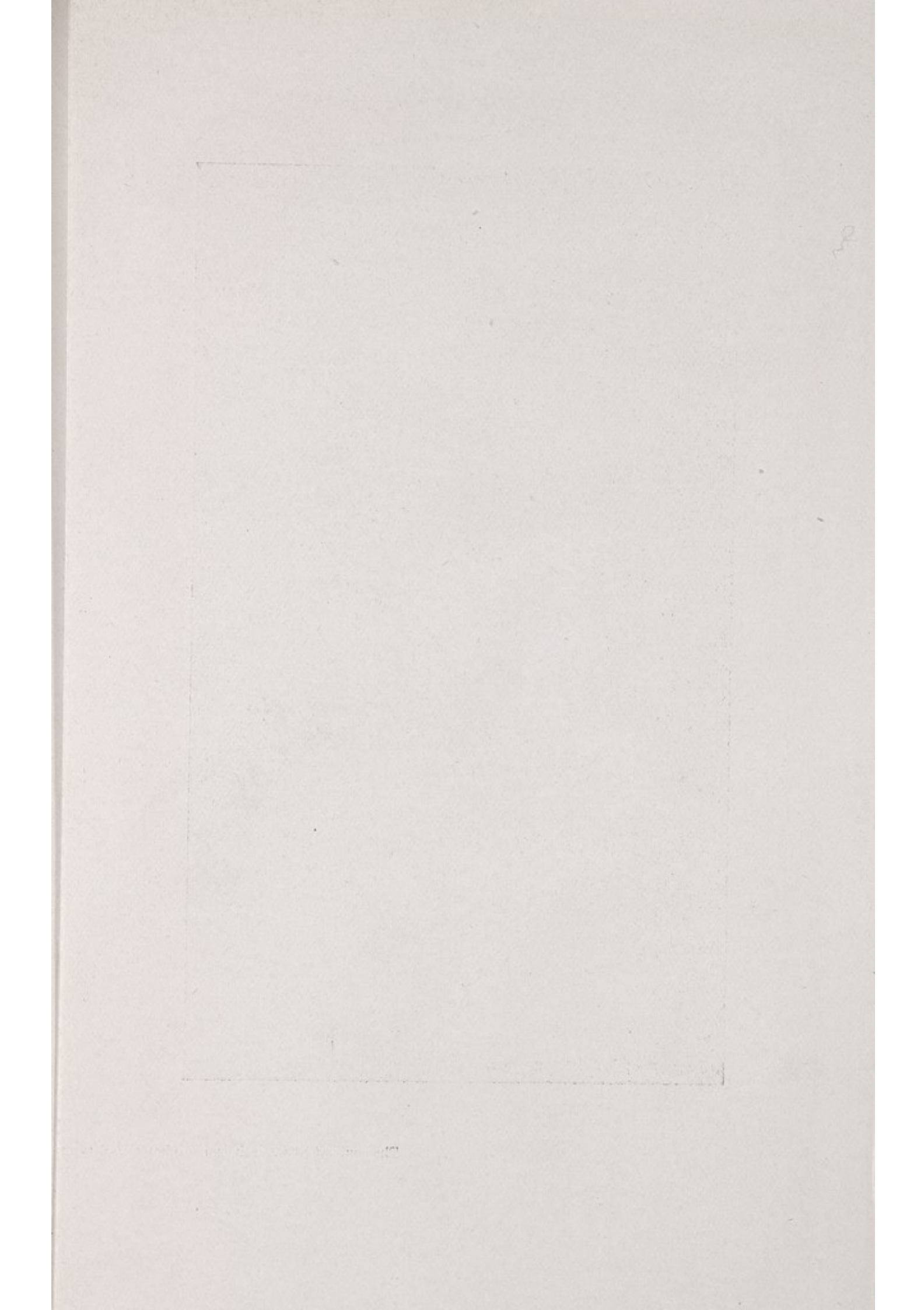


FIG. 4.

The contrast between the smooth brain of platypus (left) and the richly-convoluted brain of echidna (right).





egg-laying, and at the bottom of the mammalian scale. The overflow of grey matter external to the white has occurred in the brain of both, but the echidna is the first mammal whose body, during ambulation, is definitely lifted off the ground, supported on four limbs.

Amongst the marsupials from the point of view of relative size and convolutions, the brain of the kangaroo approaches nearest the higher mammalian type. This animal, as stated, can, by the use of a tripod, adopt the erect position, and in the opinion of Andrew Wilkie, the Director of the Melbourne Zoological Gardens, whose observations extend over a period of 50 years, is easily the most intelligent. In Figs. 5 and 6 a comparison is also shown between the brains of the catarrhine monkey, the anthropoid ape, and man. The monkey is wholly arboreal, and uses his tail as well as his limbs for support. The ape is partly arboreal, partly a ground animal, able, though with an effort, to walk and stand erect, and the tail is absent, balance depending solely on the limbs. Man is erect on two limbs, having no tail, and being able to dispense with the use of the fore or upper limbs for support. In connection with the brain there are two other points of interest. The size of the cerebellum or small brain is,



throughout reptilia and mammalia, correlated to that of the main brain or cerebrum. Normally we never meet with a relatively large cerebrum and small cerebellum, or large cerebellum and small cerebrum. Again, motor impulses coming from the brain are received at a relay station at its base, called the striatum, and re-issue along the motor tract, and pass down the spinal cord.

Even in the reptile there are two striate bodies, one for each brain. The sensory impulses also pass to a relay station called the thalamus, before passing on to the white matter of the brain, and so to the cells.

Throughout the mammals up to the orang, there is only one thalamus as can be seen on sectioning between the hemispheres. In erect man the complete separation of the thalamus into two portions, a right and left, may be met with—more often we have a connecting band between the two—the mesial commissure. In the human brain, shown in Fig. 6, the area of thalamus still connecting the two sides was greater than in that of the average individual. It is more in the Australian aborigine, and would be still more in gorilla and chimpanzee. Division of the thalamus into a right and left portion, with its associated finer sensory discriminations, is correlated to the erect posture.



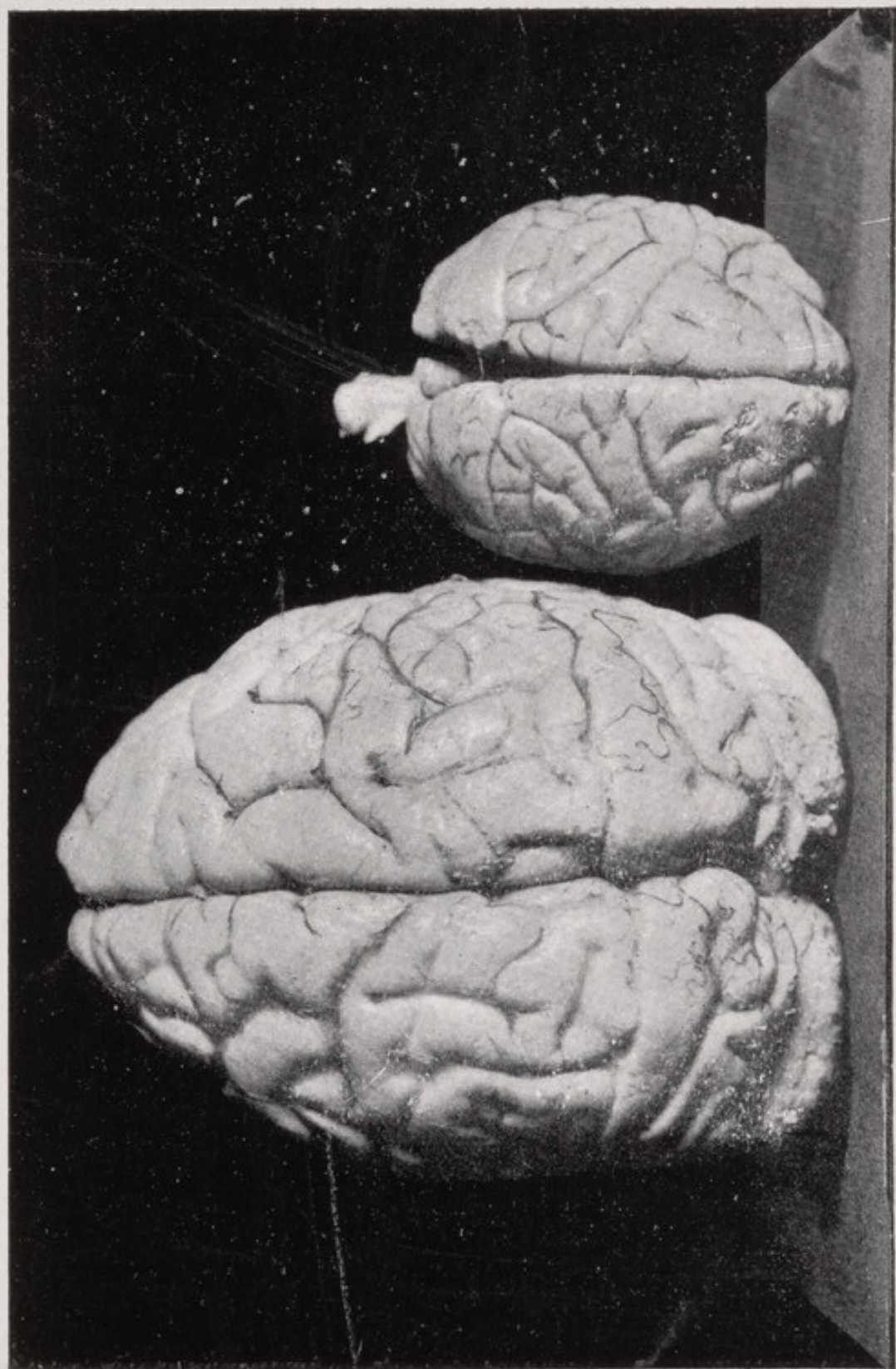


FIG. 5.

Contrast between the brain of an orang (left) and that of a catarrhine monkey





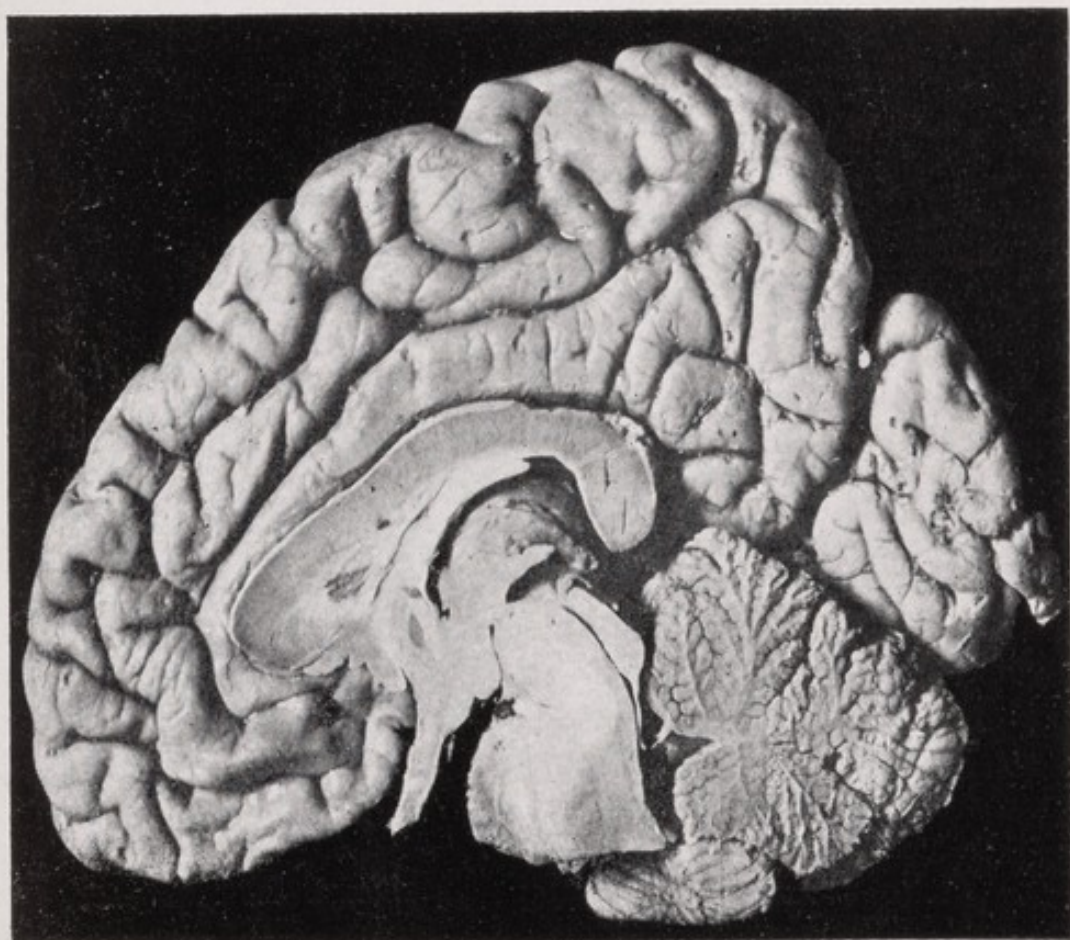
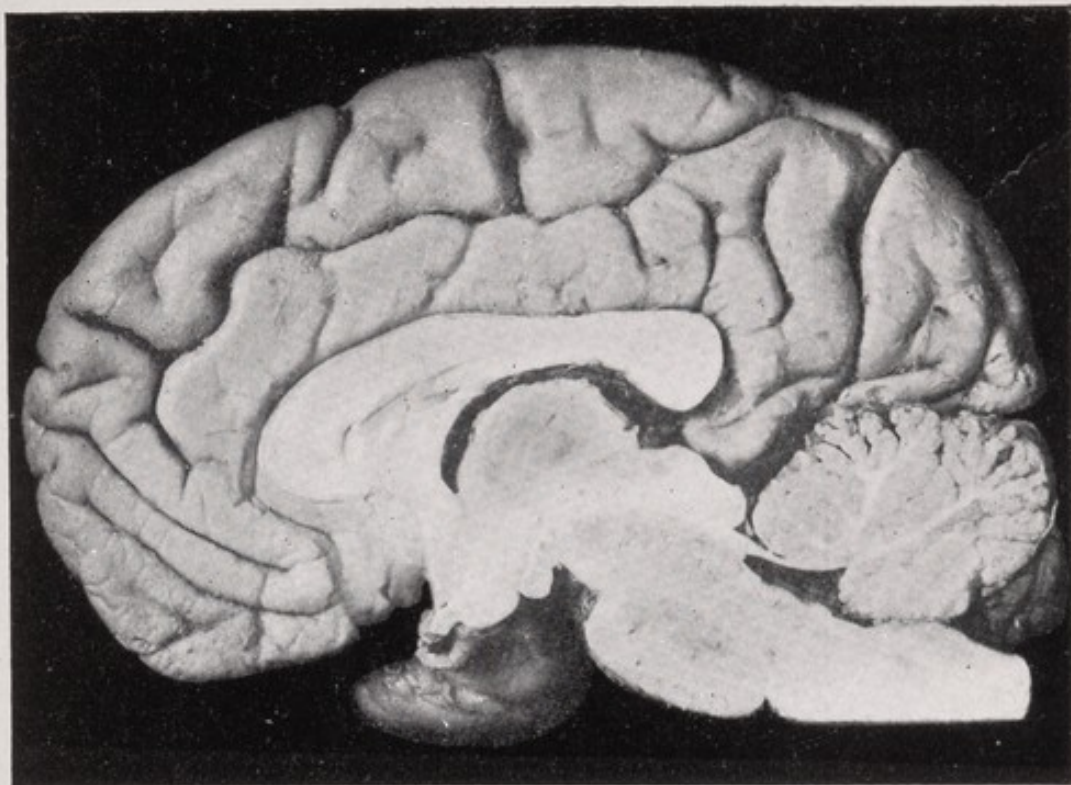


FIG. 6.  
Contrast between the mesial surface of the brain of an orang (top) and a man (bottom).





These latter are late acquisitions, unstable, and easily lost. It is obvious that if goods in Melbourne, destined for Adelaide and Sydney, are all poured into one depot, the rapidity and certainty of dispatch is lessened, compared with the use of a separate depot for each capital. Hence the advantage of a right and a left thalamus.

#### IV.

### ADVANTAGES OF THE ERECT POSTURE.

The immediate advantage of the erect posture to primitive man would be in defence against, or attack on enemies. The reptile, crawling on its belly wall, lives within a limited horizon. He may be attacked from the air or behind. With the erect posture, the horizon is extended. There is a view for miles in every direction. Objects are seen at a distance. Vision and hearing are improved. With improvements of vision and hearing, memory arises, and memory precedes intelligence. With the erect posture, our primitive ancestors could signal easily to one another. To combine was necessary for defence, and speech, which is a characteristic of erect man, was evolved in its simplest form—the child stands and walks before it talks. With the hands free, weapons for attack were fashioned and used, and the tactual sense was improved. It is a fact, with which orthopaedic nurses are conversant, that children paralyzed in the trunk and lower limbs, and unable to walk, show an almost immediate improvement in mental outlook when placed in the erect position,



either by mechanical or operative means. But, the erect posture has its price, to which I shall presently refer.

## V.

### HOW THE ERECT POSTURE IS MAINTAINED.

When we speak of the erect posture, we really refer to the power of maintaining the trunk in a more or less direct line with the lower limbs when standing. This is effected by powerful motor engines, and we have to remember the endless experiments made on the part of Nature to evolve the internal combustion machinery, not only to support erect against gravity a six-foot man, but to enable him to progress erect, and to use his hand when running erect, as in tennis, above his head. The centre of motion of the body is at the hip joint. Man can swing the trunk forward or backwards on the lower limbs when standing (Fig. 7), just as the kangaroo can when resting on the tripod. The power of keeping the trunk rigid is an old one, as can be seen, e.g., in the koala, a marsupial, able to sit on the ground with body erect. There are three lower or hind limb muscles which are associated with human erect posture and gait: (a) The outer or great gluteal muscle, the extender or straightener of the hip, which gives to that region its prominence. This is the



great muscle in the support of the body, preventing the trunk falling forwards on the lower limbs.

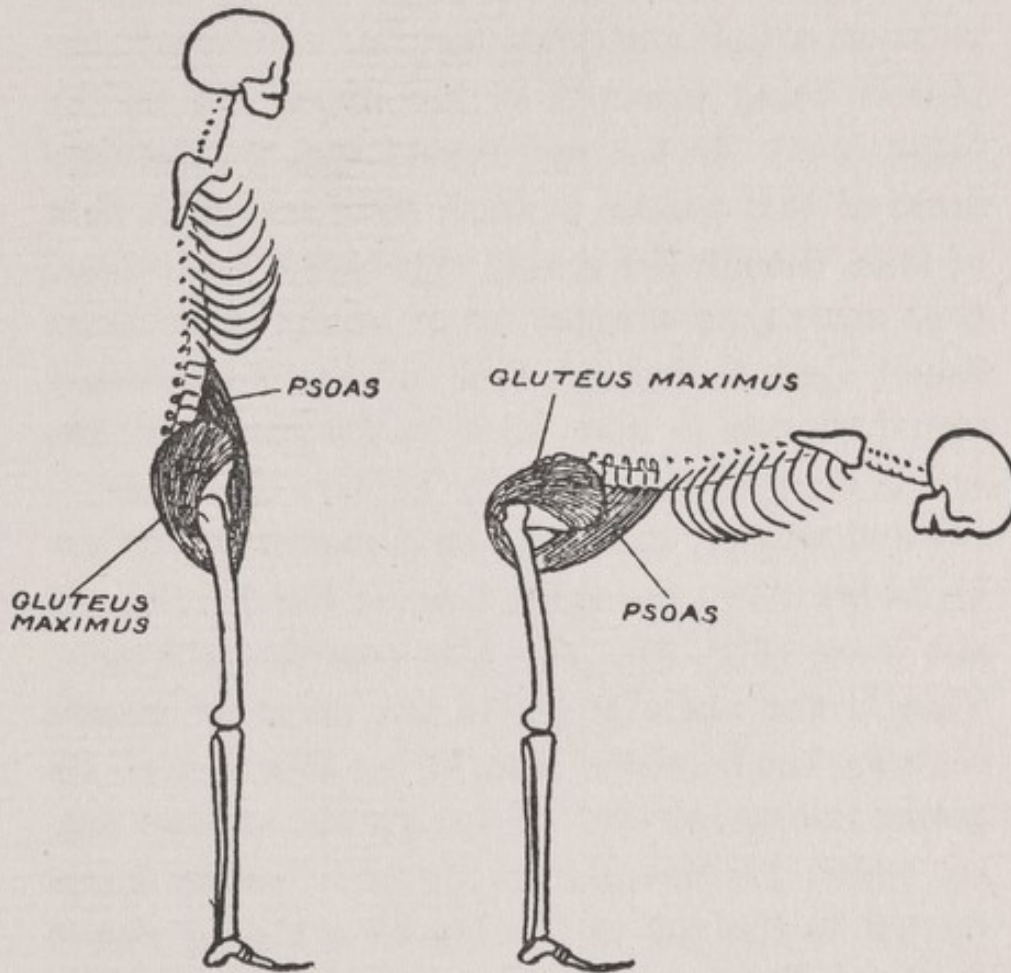


FIG. 7.

Flexion and extension at the human hip joint.  
In one the skeleton is erect; in the other the trunk is at a right angle  
to the lower limb.

In the active kangaroo this muscle is not the great gluteal—the muscle beneath it, known in man as the middle gluteal, is the larger—and it is in-

serted well down the thigh bone by a somewhat narrow tendon. In man, where strength rather than rapidity of action is required, the distance between origin and insertion has shortened, the muscle being inserted at the upper end of the thigh bone. In the anthropoid ape, the development of this muscle is small compared with that of man, though the gorilla approaches the human type more than chimpanzee or orang. MacAlister found that it formed 19% of the musculature round the hip in man, 13% in the gorilla, 12.5% in the chimpanzee, and only 12% in the orang.

Furthermore, the insertion is narrower, and extends low down the thigh bone in the direction of the knee (Fig. 8). (b) The quadriceps muscle. This is the name given to the sheet of muscle covering the front and sides of the thigh bone. Its power is concentrated on the patella or knee cap, by which its leverage is improved being transmitted to the top of the leg by a strong elastic tendon. This muscle keeps the knee straight when standing, and it is absolutely essential to the erect posture. (c) The calf muscles, which terminate by the Achilles tendon, in the heel bone. They give us the spring off the ground when walking. In the anthropoids, neither (b), nor (c), nor the patella are as well developed as in man. One



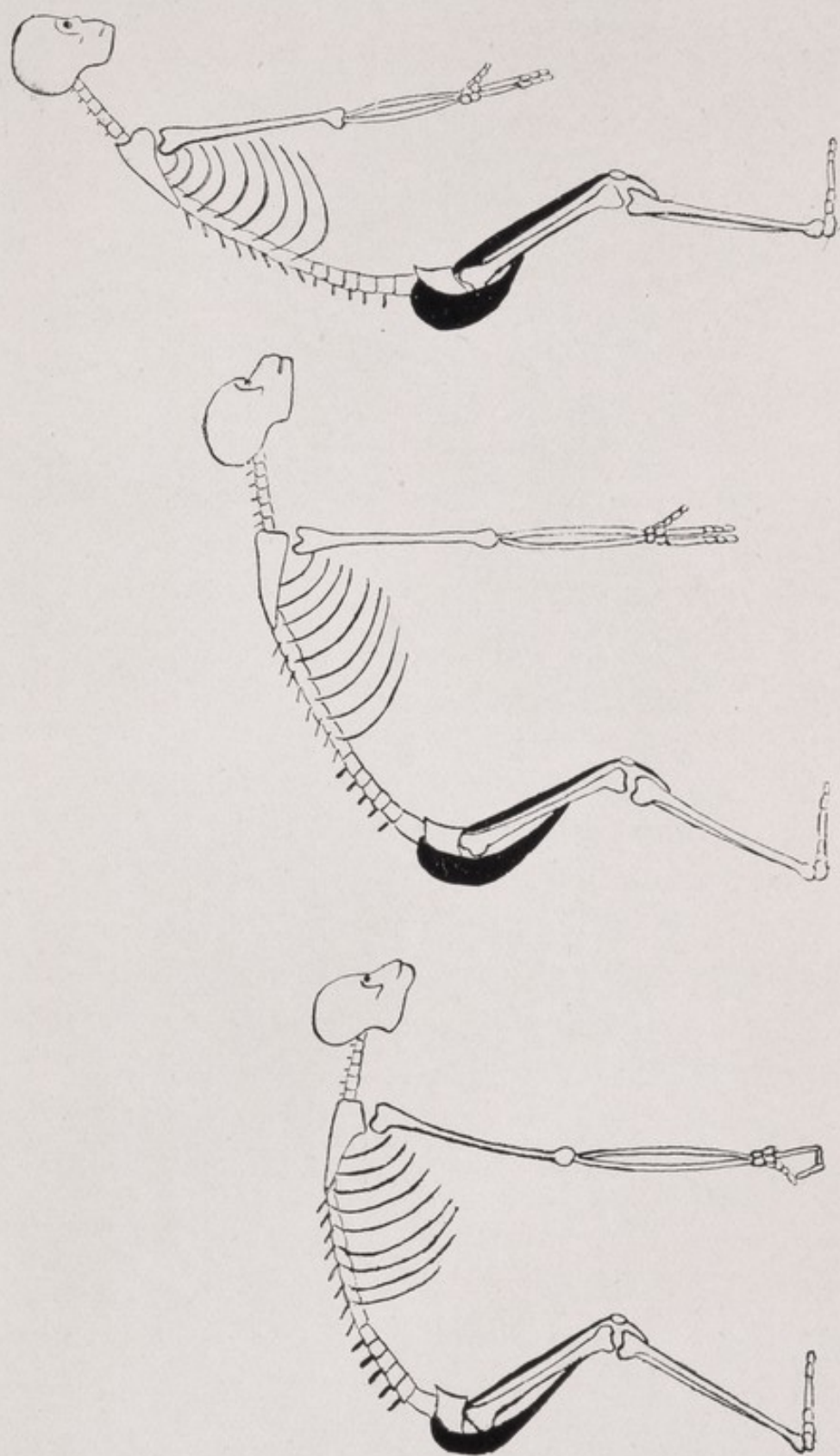


FIG. 8.

Steps in the assumption of the erect position.

Dorsal to the hip is the great gluteal or extending muscle, and on the ventral aspect passing with the patella on the front of the knee is the quadriceps muscle or knee extender.





misses the round, bulging appearance of the latter (c), and it is interesting to know that, whilst in man the muscular attachment is to both bones of the leg, in the anthropoid the attachment is to the fibula only, not the tibia. The biological or comparative plan, which is really the ancestral history, must be the basis for the study of neuromuscular disease in medical practice, and is especially exemplified in the treatment of such a disease as infantile paralysis. The acquisition of muscular action is along a definite plane—there is what may be termed a definite biological sequence. Function is lost in a similar manner, and recovery by re-education repeats the history of the acquisition of muscle function. Muscle functions that are disappearing, such as we see in connection with the human foot, and muscle functions recently acquired, such as the power to lift the arm above the head when standing erect, and the erect posture functions of the great gluteus and quadriceps muscles are unstable and vulnerable to disease. It is worthy of remembrance that, of the wounded men in the Great War, the problems in recovery of nearly 80% were problems of the erect posture.

## VI.

### THE INSTABILITY OF THE ERECT POSTURE.

As scientists refer to man as *Homo Erectus*, we are apt to think of his erect posture as a power old and permanent. On the contrary, it is a power but recently acquired, and in Borneo, within a few days' steam from Australia, lives the orang, a stage in the direct route of ascent, and only differing from the human type in the undeveloped function of muscles which extend the hip and knee joints. Irrespective of any other consideration, if Molly, the orang that recently died after 23 years' residence in the Melbourne Zoological Gardens, could have walked on the two lower or hind limbs, with the upper or fore limbs dependent, she could not have been denied the privileges of a human being. At its present stage the posture is unstable, and a period of three years is spent by the infant in acquiring balance. The stage has not been reached when the child can walk and stand shortly after birth. The medical practitioner dealing with nervous or muscular diseases, recognises its experimental nature, and hence vulnerability to attack especially during the early years



of life. One might assume that nervous and muscular diseases, indicating a vulnerability to attack, flourished during that transition when limbs were used not only to propel, but to support. Could a generalization be made about human disease, it would be along the lines of failure to accommodate to the erect posture. If we consider for a moment, we realize how little of our time is really spent in the erect attitude. We spend as much of the day as possible sitting, and, when standing, we seek relief from the efforts the erect posture demands in supporting ourselves by means of any convenient object; nor can one regard the time spent by the human race to-day in the motor car as conducive to an improvement in muscular function. It must be borne in mind that the primary functions of the upper or fore limbs were body propulsion and body support, and that the biological price of disuse is atrophy.

## VII.

### MODERN LIFE AND THE ERECT POSTURE.

Amongst the ignorant of our day, when the question of man's origin is raised, invariably mention is made of a "missing link," by which is meant an animal which connects man with the ape. It is difficult for them to visualize any connection between the formidable, hairy gorilla and *Homo Sapiens*.

At the time of the publication of "The Origin of Species," in spite of the evident affinity, there seemed a great gap between the ape and man, and the view was propounded that man had not descended from the ape, but that both had come from a common ancestor, and from that common ancestor two types diverged, one specializing in muscular, and the other in intellectual development.

But within the last 30 years, remains have been found of intervening types at Java, Heidelberg and Piltdown—primitive men with a brain capacity considerably less than that of the average modern. After all, it is unscientific to speak of the anthropoid ape as a specialized muscular type. If we



regard it from the point of view of chest, neck and upper limb development then it is, compared with man, a more muscular type, but if we regard the comparison from the point of muscles supporting the body erect, such as the gluteals, the quadriceps, and calf muscles, then it is an inferior muscular type to ourselves. Just as the Madonna, by Van Eyck, a painting scarcely bigger than a man's hand, for which over £30,000 was paid by the Trustees of the Melbourne Art Gallery, stands as a landmark in the development of the art of painting, so does each of the anthropoid apes, and of the primitive men, represent stages in development, finally culminating in modern man himself. These stages are primarily muscular correlated to successive improvements in the erect posture, and secondarily intellectual with improvement in skull capacity.

Without improvement in the function of the extending muscle of the hip (great gluteus), and of the extending muscle of the knee (quadriceps), there could be no erect posture, and on the erect posture is dependent the intellectual improvement that has led up to modern man. In other words, the basis of intelligence is muscular, and the study of psychology should begin in the Australian reptile, where we see the genesis of the erect posture.



The landmarks of the erect posture are not milestones. They are few and far between. The superior race has preyed on the inferior, causing its elimination, as has happened in recent times—the original Tasmanian nation being ruthlessly and completely destroyed by modern man within a period of about 50 years. Unlike the Tasmanians, the ape escaped the venomous destruction of his superior successors, by fleeing to the forests and poison-infested fastnesses of the Gaboon and Borneo. The aborigines of Southern Australia, of whom there is only a remnant left, were, like the natives of Tasmania, short people, and usually described as lazy and stupid. Their lower limbs, compared with those of modern man, were poorly developed. Their laziness and their dullness had a physiological basis. The upright posture to them was a greater mental effort than to us.<sup>1</sup> The Tasmanian aborigine was not so far re-

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1.—“What I have seen and heard convinces me that the Tasmanians are, in every respect, the most wretched portion of the human family. Indeed the shape of the body is almost the only mark by which one recognises them as fellow men; and were it not for the force of other evidence besides that which their condition and habits present to the mind, I should affirm they are a race of beings altogether distinct from ourselves, and class them among the inferior species of irrational animals.”—Revd. Horton, 1823.

“The Tasmanian race presents numerous simian similarities in the length of foot, smallness of legs, thin calves, broad nose and mouth, and the elongated arms.”  
—Dr. Weisbach.



moved from predecessors who were not wholly erect, but sagged at the hip and knee, nor these latter from predecessors, who, in the words of Winwood Reade, "rose to the upright posture now and then in order to see some object at a distance, but supported that posture with difficulty, holding on to a branch with one hand."<sup>2</sup> Physical and not mental education should have been the keynote of the aboriginal youth's training. If as the result of the erect posture, new functions of intelligence arise necessitating brain enlargement, so, also, are there correlated alterations in other parts of the human body. The abdominal organs must be hitched to the dorsal wall to prevent torsion and strangulation, and it is interesting to note in connection with the hitching of the intestine, that there is a definite gradation from the lowest primate, the lemur, to the platyrrhine monkeys, to the catarrhines, then through the anthropoid apes up to the highest primate, man himself. The heart must accommodate itself to the altered posture, having to pump blood, not horizontally, but upwards against gravity. In fact, there is no part of the body but must react. The study of disease must be primarily a study of the mode of acquisition of the functions of a part, for func-

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2.—"The Martyrdom of Man."



tions acquired last are most vulnerable to attack, and a disease need not necessarily attack all the entities of which "function" is composed. Seeing then that the vulnerable or latest functions are those that depend for their existence on the erect posture, which is itself an acquisition of comparatively recent times, is it not rational to suppose that the basis of what we call well-being is a sound muscular system, and to keep our muscles fit demands, not only rational exercise, but rational rest as well. Such exercising after the day's work is over as golfing, tennis, or long walks, may, to the city man engaged in mental activities, act as an irritant, since more often muscular rest and repose are indicated. The cause of dulness in the school child may be the result of faulty seating accommodation. The child is compelled to sit erect on seats without backs, is forbidden to rest the head on the hands, with the result that mental effort is spent, not only on lessons, but on balance as well.

The cause of irritability in the "neurotic" child should be primarily sought for in the muscular system, since it may be result of worries over muscular balance. Physical culture should follow the lines along which the erect posture has been acquired, and be directed towards helping those



muscles on which it particularly depends. Probably no game in the world, not even excepting tennis, exercises the erect posture functions more than the Australian game of football, for which we are indebted to H. C. Harrison, of Melbourne. It has been no small factor in the development of our nation. In conclusion, the writer wishes to refer to the following remarks taken from the introduction to his work dealing with the action of muscles\* :—"as the muscles of the human body are adaptive or survival results of struggles which have gone on during the past ages, it follows that some appreciation of their comparative anatomy is essential for the clinician. It is inconceivable that anyone should attempt to handle a paralyzed deltoid or quadriceps without some knowledge of its ancestral history, or of the entities of which its function is composed. Muscle fibre is delicate, sensitive, and responsive. It can be coaxed, but not driven. It should be conserved, and not indiscriminately torn or cut through at surgical operations, as though of no account. In any 'orthopædic' condition the muscle should be looked on as a friend, ready to do on bidding, if placed under proper control. It should not be asked to do 80 units of work, when it is capable

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\*—The Action of Muscles. (H. K. Lewis & Co., London, 1918.)



of performing only 40 units. When we read in the works of H. O. Thomas, such an expression as 'which the muscles appear to know,' we instinctively feel that when Thomas treated hip disease the muscular sentinels of the joint were all personalities to him. In this way, also, were muscles regarded by John Hunter, Charles Bell, Haller and Cowper, who all devoted a large part of their scientific life to the study of motion." Furthermore, T. H. Pear, of Manchester, in his work, "Remembering and Forgetting,"<sup>1</sup> points out that bodily skill or the ability to deal with the world by means of one's muscles carries with it a knowledge that can obviously be called "intellectual," although at the present stage it is incapable of perfect translation into the terms of another sense, since it possesses scarcely any words of interpretation. The average man is apt to think that sight and hearing are the foundation of his intellectual advancement; but "it is not a biological necessity that man should be endowed with these two senses. One can conceive him as existing without them, and in consequence attributing more importance, and paying greater attention to kinæsthesis," since Helen Keller, that distin-

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1.—Remembering and Forgetting. (Methuen & Co., London, 1922.)



guished American woman, who was deaf from birth, and had only vision for a year, derived her whole knowledge of the world, and the people in it, through her muscular sense or intellect.



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