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THE

RELATIONSHIP OF ANATOMY

TO

THE FINE ARTS.

A LECTURE,

DELIVERED IN THE ROYAL INSTITUTION MANCHESTER

BY

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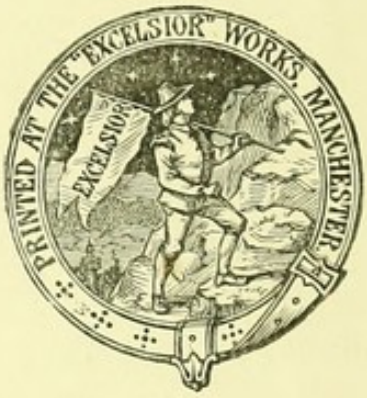
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PREFACE.

My chief object in publishing this lecture, which was delivered in the Royal Institution, at the invitation of the Council of the Manchester Academy of Fine Arts, is to direct attention to the want felt by many students of a more thorough training in artistic anatomy.

Perhaps the most complete course of artistic anatomy is the one given in the Art Schools of Philadelphia. Certainly the plan there adopted would serve us for a model. There is an excellent description of these Philadelphia schools in "Scribner's Illustrated Monthly," for September, 1879, from which it appears that a course of thirty lectures is delivered every year by Dr. Keen, on artistic anatomy. These are divided in the following way: One is introductory; eight are on the skeleton; twelve on the muscles, especial care being taken to demonstrate the muscles of the face, for which purpose electricity is employed to throw individual muscles into action; four are given on the features of the face, with an analysis of their forms and their exaggeration in caricature; two are occupied with the skin and its appendages, including a careful study of the creases and wrinkles of the face and hands; and the remaining four are devoted to postural expression, the proportions of the body, and the influence of sex upon physical development.

In addition to this course of lectures, dissections of dogs, cats, horses, as well as human subjects, are provided for, and every day, during the progress of the dissections, the life classes are admitted to the dissecting-room to study the parts aleady dissected and lectured on, and then and there make drawings of these parts for reference and future guidance. If we may judge by the vigorous character of the illustrations which accompany the article, and which are executed by the students themselves, this school of Philadelphia is turning out very excellent work.

There is no reason why Manchester should be behindhand in this matter. Perhaps it may not be necessary to establish dissecting classes. I for one do not think it is, but let plaster and papier-mache models be procured in abundance. These would sufficiently illustrate the arrangements of the various muscles, &c., while arrangements might easily be made for the delivery of a yearly course of lectures on artistic anatomy. It would be well for the progress of art in Manchester if, besides such changes as these, it were decided to secure the services of a teacher from some Continental school, such as Munich, who would, in a workmanlike style, teach the drawing of the figure. He would be sure of good classes, and the effect of such teaching would ere-long be evident in the better work turned out from year to year by the Manchester school of artists.

THE RELATIONSHIP OF ANATOMY TO THE FINE ARTS.

ANATOMY and the Fine Arts are intimately associated, and, like brother and sister, should be mutually helpful. So much of anatomy that would be dark and difficult is made clear and simple by the pencil, that anatomists are ever ready to gratefully acknowledge the debt they owe to art; but art, at least in England, is a little prone to look coldly on her scientific sister, although every high and successful artistic achievement testifies to the value of such relationship. Were it not for this strange indifference, perhaps the most marked and unfortunate characteristic of the English school, it would seem scarcely more necessary to dwell upon the value of anatomical knowledge to an artist than to urge that a literary critic should be acquainted with grammar. At the London Academy, Professor Marshall delivers a yearly course of lectures on artistic anatomy; but in the provinces such courses are rarely given, and, with the exception of an occasional model for the life class, little of anything anatomical is taught beyond what may be learnt in studying the casts of classic statues.

The result of this neglect is evident. The number of English artists who can accurately draw the figure are few. If we mention Burne Jones, Rossetti, Poynter, Madox Brown, Millais, Watts, Leighton, Calderon, Shields, most of whom were educated abroad, we go far towards exhausting the number, and some even of this small band are not free from the reproach of ignorance or carelessness.

Take the present collection of pictures in the Royal Institution, there are not more than a dozen in which any serious attempt is made to draw the human figure, and of these few there are but one or two which are not anatomically faulty—*e.g.*, the most ambitious of all, Watts's

"Orpheus and Eurydice," is not free from this reproach, for, passing by the fact that the female figure is apparently in a state of decomposition, and admitting that thus depicting her is a legitimate way of conveying the idea of fading and falling away to corrupted clay, I should affirm that in the mahogany-coloured male figure we have a preternatural development and incorrect origin of the *serratus magnus* muscle, a sub-glenoid dislocation of the humerus, and an incorrect representation of the *triceps cubiti*, inasmuch as one head of this important muscle is represented as passing to the front of the arm instead of keeping to the back. "Venus's Looking Glass," by Burne Jones, arouses another vein of criticism, which is germane to a large class of pictures at the present day. It is that, without being anatomically quite incorrect, they are highly strained and conventional. In this picture, as in so many others of the school, we have a type of face which is in a great measure evolved out of the artist's inner consciousness without being conformable to any standard of real beauty. We find in these serious and powerfully-jawed ladies but one type of face, each with an abnormally short upper lip, with a broad low brow, with eyes unnaturally large and wide apart, and with a line of chin bold and decisive enough for so many lean Bismarcks. This may be taken as the type of æsthetic beauty among a certain school in 1879. Such a type would hardly have arisen if anatomy were more strictly cultivated or we were content to humbly copy nature even if we ignored anatomical knowledge.

Among the few remaining pictures of the figure a very common fault prevails in the unnatural length given to the lower limbs—*e.g.*, this is the case in Armstrong's pictures (290 in 255), and in the otherwise pretty picture of a child lolling in a swing.

As types, on the other hand, of accurate and careful anatomy, may be mentioned Browning's picture (276) of a hermit regarding a skull, and, I think I should add, Clausen's charming work (172), of some Breton peasant girls towing a boat along a river in the evening glow; for, although in this last picture the figures are

fully draped, the idea of movement is so accurately given, so natural the play of limb, that it shows as clearly as the nude that the artist's knowledge of form is correct. In connection with this part of my subject, I would also mention Mrs. Allingham's two beautiful little drawings as affording similar evidence of an accurate, and, for such purposes, sufficient knowledge of the construction of the human figure. It is manifest that the draped figure demands less exactness or fulness of such knowledge than the nude, and this is fortunate in two ways—first, because faults or want of knowledge are less painfully apparent; and, secondly, because there is really less requirement among us now, even in the highest walks of art, for depicting the nude. As Sala remarks, in his pleasant book on Paris, "What should we now say to a naked Brougham, a naked William Pitt, an undraped Peel, a disrobed Gladstone, a Beaconsfield 'mid noddings on.'" For all this, fully draped as most figures are now represented, artists cannot afford to entirely dispense with anatomy, as some of them appear to be trying to do; for however fully clothed the figure may be, it reveals the characteristic make of the individual. This fact should give those artists pause who deny the need of anatomy; for not only do the fashions of to-day reveal almost as much of the female figure as the Grecian style of yore, but however fashions change, we may always count upon the hands and face, and at times the shoulders and arms, being seen.

Now, as specimens of correct anatomical drawing (they are much more than this, but it is for this quality alone that I here introduce them), I beg to draw attention to these figures, by Poynter, for the loan of which I am indebted to my friend, Mr. William Brockbank. In this youth, although the surfaces are rounded, and few muscular impressions are seen, it is all in keeping with his age, and all entirely natural; the relative proportions of the figure at the same time are observed with strict fidelity, and the whole figure is exquisitely drawn.*

* The figure was that of Milanion in the Temple of Venus, drawn from, I believe, the same model as served for Milanion as seen contending in the picture of Atalanta's Race by Poynter.

Let me also point out the beautiful execution of the hands, in this drawing, by the same artist of Poetry—hands instinct with musical feeling, eminently artistic hands, which, I venture to affirm, could only have been drawn by an artist understanding their construction.

In like manner, this figure of La Baigneuse, by Professor Talbacchi, which has attracted so much attention, is admirable—admirable in the perfect modelling of the symmetrical and accurately drawn limbs. In no other respect, however, would I compare the realistic and somewhat common-place production of the Italian with the idealized and poetical work of the English artist.

This plea for anatomy would have been needless in former times, for the old masters readily admitted its value, and made what acquaintance they could with it. It was much their custom, indeed, even dealing with the draped figure, first to sketch in the nude, and, so to speak, build the drapery around it. Such even was Michael Angelo's plan; and, indeed, if we are content to learn from "the greatest man that art ever inspired," we should not be satisfied without acquiring an accurate and comprehensive knowledge of anatomy. Bell, for example, alludes to the fact that numbers of his pen-and-ink drawings exist in which the joints, especially the knee, are drawn with extraordinary care and fidelity, with the bones and ligaments and muscles all *in situ*, and this is the more noteworthy because these anatomical details are wanting in the completed statue. *Ars est celare artem* is very true of this matter—an artist should not learn anatomy to parade it, but to enable him to avoid error. If wisely taught, and properly learnt, anatomy will never become offensively evident or indiscreetly paraded, but rather, as in nature, it will be concealed, though it informs the entire work.*

Is it not evident, indeed, and, therefore, may it not be taken as admitted without further argument, that the

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* "Thus in Michael Angelo we have great feeling and genius of the highest order, anatomical science, ideal beauty, or rather grandeur, combined. We have in this great master a proof of the manner in which genius submits to labour in order to attain perfection."—*Ruskin's Modern Painters.*

artist who understands anatomy is incomparably better off than he who does not? To him the dark places are plain, the truth has made him free—free of the secrets of the body—in the sense that a man is free of a city; to him there is no mystery, and no hesitation is possible in interpreting a *pose* or transferring a fleeting expression. Contrast for a moment, in your minds, two artists at work, one possessing such knowledge, and the other ignorant of all anatomy. With what hesitation, difficulty, and doubt, does the one proceed; how confidently and easily the other. What is the meaning of that swelling? Is that depression unnatural, or caused by some muscular arrangement? Is that a band of *fascia* or a tendon which I see before me? There is all the difference, in the result, that there is in a landscape drawn by a man who knows the country and one who does not. In the first instance, without elaborating detail, he puts in the important features quickly and correctly; in the second, they are either not put in at all or are distorted and unreal.

It may, perhaps, be objected to this view that the ancient Greeks did not dissect the human body, and yet, in spite of that, have left us statues which, take them for all in all, we shall not look upon their like again. The explanation is obvious. True, they did not acquire their anatomical knowledge, which they so abundantly display, by laborious dissection; but, on the other hand, it is quite certain that this sensitive and subtle race took advantage of all the accidents which chance or war threw in their way; and far more than this, were ever surrounded by types of unparalleled physical beauty. Their dances, in which the movements were never abrupt or violent, but gliding, and emotional, and their gymnastic exercises, afforded them an unique field for studying the human figure in action and repose. It would not be difficult, indeed, to show that this inspired people would have gained by a more accurate knowledge of true anatomy—*e.g.*, we may very generally note, in even the greatest statues of antiquity, that they have altered the relative position of the sub-clavian *fossæ*, that they have given the digitations of the *serratus*

magnus incorrectly, and altered the plane of the lower ribs, that the deltoid triangle is generally made too square, and that the muscles of the forearm are often wrongly represented. Depend upon it, if these favoured children of the sun could not afford to ignore anatomy, still less can we; for there is now the added evil of trusting almost entirely to casts, often imperfect and poor, of their masterpieces, and to the academy model, as guides to the study of the human figure. Nothing, I should say, could be more adapted to develop a wooden style, a more conventional rendering of action and emotion. The model, often stiff to begin with, becomes cramped by long assuming a strained position, and almost inevitably conveys a cramped and strained style to the artist's canvas, who paints as if the muscles were in a state of spasm, instead of a condition of healthy contraction.

They do things better abroad, and our best artists have to seek in foreign countries what we ought to be able to supply them with at home.

I trust that our Academy will free herself of this reproach, and add a short course on artistic anatomy. This should comprise demonstrations of the bones, the joints, the ligaments, and the muscles; and, certainly, to be complete, should include a careful description of the landmarks and external markings of the body, so explaining them that the artist, in depicting the figure, should, as it were, see through the covering of the body to the parts which move and repose beneath. It must not be supposed that such a course would be superfluous to the artist who confines himself to the draped figure; for, as I have already hinted, however little the completed picture may exhibit traces of anatomy, the sketch should, even to exaggeration, reveal the frame and its muscles. However thoroughly—and it should be thoroughly—removed this is, in the course of completion it will not be wasted time or labour, but will give a truth and character to the figure that never would have been attained by the most assiduous use of the measuring tape or other means. Of course, too much trust must not be placed upon a single subject or a single model; but, on the contrary, the

lecturer should contrast infancy with youth, and youth with age; the male with the female; the negro with the European; health with disease, and so on. The pupil, meanwhile, should be drawing the skeleton, which is probably as good a study of the round as he could have, after which he should at once advance to the study of the muscles, the joints, and the mechanism of the various movements of man. I do not say he need dissect, but he should see dissections, and to the real artist no difficulty would be met with in this part of the programme. Then he should patiently study from the living model, with the light of his anatomical learning, making his model go through every gymnastic exercise, carefully noting the difference between the parts in action and the parts in repose. At first he will find it difficult to catch the exact muscular expression in quickly performed movements, but practice will give him facility, every failure will lead to future success; and it is not too much to say that he who thus makes anatomy the basis of his art, with good gifts, will attain to the highest excellence in depicting, with simplicity and truth, the most involved and complex movements of the human form. Even if he should fail to attain such supreme excellence, he will assuredly not fail to acquire dexterity and facility of design and invention; his powers of observation will be vastly quickened and improved, and, what is by no means a small pleasure, he will learn enough to criticize with intelligence the works of other artists.

Now, it would be manifestly impossible to do anything more to-night than suggest the method of study, and point out by some illustrations the main characteristics which distinguish the human figure from other animals, and then allude to some of those features which characterize the individual.

One great peculiarity of the human body, as contrasted with his nearest relations, the apes, is the great comparative length of the lower extremities, which artists are prone further to exaggerate, perchance to enhance the humanity of their figures. In the chimpanzee, the orang, and the gorilla, they are relatively much shorter. This causes

the middle point of the body to vary considerably. In man it is at the symphisis pubis, while in the chimpanzee it is three inches, and in the gorilla four inches higher. On the other hand, the upper extremities, which are now entirely liberated for the purpose of ministering to the mandates of man's brain, are much shorter; thus—*e.g.*, man's elbows, when brought to his side, are opposite the umbilicus, while they are opposite the groin in the higher apes. Man's fingers, extended, reach to the middle of his thigh; in the chimpanzee, to below the knee. The thigh-bone of man is to his body in the proportion of 1 to $3\frac{1}{2}$, and to his leg as 17·88 to 14·4. In the chimpanzee, the thigh is to the body as 1 to 4, and to the leg as 12 to 10. Important differences are met with in the hand of man as compared with that of the monkey. In man this wonderful instrument is only less eloquent and beautiful than the face itself; with this we pray, we command, we enforce silence, we expostulate, we reprove, we beg, we deny—it is an instrument of the deepest pathetic expression. In monkeys it is a flea-catcher for the most part.

The anatomical differences, besides important differences in the skin and its covering, the creases, &c., mainly depend on the large size of the thumb of man as compared with the thumb of monkeys. In man, we surgeons, look upon the thumb as half the hand. Albinus spoke of it as *manus parva*, the lesser hand; but in the monkey it is scarcely as valuable as one of the fingers. I think the Grecians occasionally fall into error in not sufficiently accentuating this difference in their statues, but making on the contrary the hypothenar eminence equal in magnitude to the thenar prominence.

A mere glance at the skulls of the chimpanzee, the Australian savage, and the European, show their chief points of difference, and I think a mere glance suffices not merely to convince us of the greater finish and beauty of moulding of the European skull, but also by the comparative study of these skulls serves to show with how much greater ease and certainty we may approach them in pictorial delineation; for after such a study, however brief, the artist will be no longer in doubt as to the

meaning of the lights and shades in the model, as to which are half tones and which are shadows; he will distinguish between the real and the illusory, and his knowledge of what lies beneath the skin will enable him to give the true value of tones with accuracy and force.

In this study he will compare the facial angles of the three, amounting to 90° in the European and 75° in the savage. He will contrast the expansive, almost perpendicular, globular forehead of the European with the receding, narrow, and conical forehead of the Australian, characteristics of inferiority which are still more marked in the skull of the gorilla and chimpanzee; he will note the prognathous character of jaw and immense development of canine teeth in the ape, and the orthognathic or upright jaw and small even teeth in the European; while in the Australian he will observe that the parts mentioned occupy about a midway position between the two.

Continuing his anatomical observations he will note that the entire cranium of the savage is smaller in proportion to the face than that of the European, and that his upper limbs are comparatively longer, in both which peculiarities he approaches nearer to the Simian type, as he does also in the fact that the distal segments of the limbs are nearly as long as the proximal.

He will note the poor arch of foot, and consequently the flat character of that member, as compared with the same parts in the European, and, indeed, *apropos* of this, his studies will show him that the small relative size of hand and foot is a correct sign (as it is commonly taken to be) of a pure or rather high breed of man.

Perhaps that which strikes him most in comparing the child with the adult is the relatively great size of the head in the former—*e.g.*, at birth it is nearly one-fourth of the entire length of the body. This he will perceive is chiefly due to the great size of the skull, and not to the face, which is not only actually but relatively small. During growth it will be found that the head doubles itself, the trunk becomes trebled, the upper limb increases three-and-a-half times, and the lower limb four-and-a-half times.

The female, again, he will perceive is smaller, in every proportion, and approaches somewhat to the infantile type, and, as matters of detail, he may remark that the transverse diameter of her chest is relatively smaller, and of her pelvis broader than the same parts in the male; and, further, that both her upper and lower limbs are proportionately shorter: this difference being due to the shorter *humerus* in the upper, and shorter *foot* in the lower limb.

Having mastered such necessary details, we will suppose our artist student to proceed to the investigation of the relative proportions of the human figure. Here he will at once find himself in the presence of a multiplicity of confusing rules; still he will observe that various as the standards adopted are, the result does not seem to be materially affected, which circumstance would probably suggest to him that underlying them all there is a true natural law of proportion. It matters little, indeed, what the standard is, whether it is the foot, or the hand, or the head, or the spine of a well-proportioned individual, there is readily found to be a definite relation between the chosen standard, whatever it may be, and all other parts, so that at last it would become possible to an artistic Cuvier, or Owen, to form the entire animal (for the fact that there is a relative proportion between the parts is not alone applicable to man but to all animals) from a single bone, nay, let that bone be a tooth, which is not a bone at all but merely a hair, and from this it would become possible to construct in accurate proportion and real dimensions the whole creature as he lived and moved. Now much of the impression of beauty of design is due to these relative proportions of the figure being observed; in other words, as in music so in painting, certain relations produce the best effects, and it is not improbable that the same physiological explanation may be applied to both.

This harmonious proportion is, I say, one chief source of æsthetic pleasure, and has ever been a great object of study, even from earliest times. The Egyptians, Assyrians, and Greeks each had their special rules, which, like the dramatic unities, were sometimes artificial, and often acted rather as oppressive taskmasters.

The Greeks, who chiefly concern us in this matter, took the foot as the unit of measure, the *module* as it was called, making the entire figure seven times as large, or seven feet. They, by the same method, made the head one-eighth of the entire length, and the face one-tenth. The extended arms equalled the height, and the lower extremities were equal to half of this.

Their architecture was subject to much the same rules of proportion—*e. g.*, in their columns the radius of the base being taken as the *module*, or standard of measurement, the Tuscan was 16, the Ionic 18, and the Corinthian 20 modules, the latter (Corinthian) being very similarly proportioned to the human figure. I have here drawn up several tables of proportion, which different masters have observed in dealing with the figure; there are many others in vogue, but these suffice for my purpose.* It will be seen from these tables that what I have said is true, viz., that sometimes one standard was adopted and sometimes another. The question now arises, is there any rule to which these proportions may be submitted for our guidance? and I think it may be answered that there is in the body, as a whole, and in every part, such a rule to be made out, which may thus be given: *If the division of a whole, made up of unequal parts, appear proportional, the smaller part must be in the same relation to the larger that the larger is to the whole; or, in other words, the whole must be to the larger part in the same ratio that the larger is to the lesser.* This law was first discovered and enunciated by Professor Zeising, of Berlin, in a considerable book on the Proportion of the Human Figure.† I have somewhat fully examined the application of this principle, and believe that the professor has made out a very good case. Let us understand the working of this law in mapping out the proportions of the human body. For this purpose we may conveniently note its application

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* For Tables see Appendix.

† Zeising A. Lehre von den Proportionen des Menschlichen Körpers. Leipz, 1854. The book is an octavo volume of nearly 400 pages, containing a vast number of measurements of human figures, and other animals, together with the application of the law to the vegetable kingdom, to architecture, and to music.

to the body as a whole, to the head, to the upper extremity, to the hand, to the lower extremity, and to the foot.

First, take the entire body. The most natural division of the body into two parts is to divide it through the umbilicus or waist, then the larger portion will be found to be the lower part; now, measuring a number of standard statues, and also well-proportioned men, we find that the whole body is to the lower division in exactly the same ratio that this lower is to the upper—*e.g.*, in the Apollo Belvidere, taking the entire body as 1,000, the lower half is 618·033, and the upper part is 381·966.

Next, let us take the head, and divide it through the upper margin of the orbits—the law holds good. The proportions which Zeising gives in the Apollo Belvidere are 145·898 for the entire head (it being always understood that the numbers relate to the standard number of 1,000), 90·169 for the lower, and 55·78 for the upper. Take the upper limb. The law says that the entire arm bears the same proportion to the fore-arm that the fore-arm does to the upper arm; again the law holds good, for the whole limb being 437·694, the fore-arm, with the hand, measures 270·509, and the upper arm 167·184. Now, take the proportions of the hand. Zeising finds that the hand being 63·858, the fingers are 39·466, and the wrist and knuckles 24·391, which is once more exactly in the proportion required by the law. In the lower extremity, the same proportions exist—*e.g.*, the whole limb being 381·966, the upper portion is 236·069, and the lower 145·898. Lastly, the foot being 90·169, the larger portion equals 55·728, and the smaller 34·441.

By this law it is evident we have a method of measurement which gives a precision to harmonious proportions as definite as the law which determines the harmony of musical numbers. Here, in a great degree, is to be found the explanation, it seems to me, of the impression of beauty. It fulfils a natural law. The concord of sweet sounds is pleasant, because it fulfils the law of harmonious proportions in music; in discord there is an absence of these proportions. In the inner ear there is an intricate

little organ, called the organ of Corti, which is made very like a microscopic piano, with a vast number of keys each tuned to a certain pitch, and, therefore, vibrating in response to a certain note. A certain proportional number of notes (*i.e.*, of vibrations) produces no sensation of confusion or discord, but all are easily analysed by this instrument, and conveyed as a simple lesson in harmony to the brain. So we may conceive the delicate retina of the eye to play a very similar part, and to leave the general impression of beauty on the brain, by conveying the relative proportions of a figure harmoniously balanced, along, too, with all the subtle harmonies of colours contained in the solar spectrum. Thus the human body conforms to certain laws of proportions, and, therefore, I say, it may fairly be considered that we have a real stable basis for the definition of beauty.

In a word, beauty does not depend on mere fitness of parts and adaptation of means to ends, as Socrates maintained, nor yet does it depend upon the mere verdict of fashion and custom; in other words, it is not purely conventional, as Reynolds and Alison, among others, have insisted upon; but is really in a large measure dependent upon the carrying out of an actual natural law of relative harmonious proportions, so that we may rather agree with Plato, who held that those natural objects were the most beautiful which approached most closely to an ideal beauty; for we may easily conceive an ideally perfect form in which these proportions should be exactly preserved. Thus it would appear that Hogarth, who argued for a special beauty in a certain form of lines, and Ruskin, who is eloquent on the subject of intrinsic beauty, and insists on the possession of an instinctive appreciation of this beauty, have good physiological grounds for the faith that is in them.

Of course, in the contemplation of a fine work of art this harmony of proportion is only one element in the pleasure we feel. The emotions are complex: there is the pleasure derived from the harmony of colour and of form; there are also the associations suggested—and how largely these contribute to the result I need not say. Recall, for

a moment, the emotions you experienced on first seeing Landseer's "Random Shot," and you will readily understand how important a part is played by such associations. They, in a word, form the story, the *motive*, and inspire the very spirit of the work.

It is not enough, however, to understand the law of proportion as existing in the human figure; it is also incumbent on the artist to understand the forces which move the figure, that is to say, he must have a knowledge of the disposition of the muscles, especially the superficial muscles, and the shapes which they assume in contraction and extension, as well as of the structure and character of the various articulations of the body. I cannot, perhaps, do better than illustrate what I have to say on this head by referring to the statue of the Fighting Gladiator, which is, taken altogether, perhaps the most perfect statue we possess. In spite, however, of its really wonderful anatomical accuracy, critics have been much exercised in deciding the exact character of the figure and meaning of the *pose*. Winckelmann may be said to have once for all disproved its being the statue of a Discobolus, from the fact that the body bends forward instead of backwards, and from the eyes looking upwards. He, indeed, was one of the first to argue what is now generally received as probable, that it is not the statue of a gladiator at all, but a warrior, guarding himself from some threatened blow, while he himself prepares to strike. Everything tends to prove the correctness of this view. In walking, the hinder leg, pressing against the ground, pushes the body upwards and forwards, and from left to right in a line composed of these three movements. This is evidently the mode of advance in this figure of the gladiator. The right leg is flexed and strongly contracted to serve as a fixed point to the body, the centre of gravity falling upon the ankle joint of this foot. The pelvic muscles support the body firmly on the thighs, while those of the back counteract the tendency to fall forwards. The abdominal muscles are, it may be observed, *en passant*, only slightly contracted. The left limb is fully extended backwards, and so presses the ground as to pivot the body towards the

right, and to carry the left arm forwards so as to balance the right leg. The shield, on the left arm, protects the body to some extent, and in the original statue this buckler was probably balanced by a short sword held in the right hand. The right arm is thrown back by the action of the *latissimus dorsi:* it corresponds with the position taken in rapid walking, and exactly balances the attitude of the left lower limb.

I will now throw on to the screen photographs of this statue, from careful drawings, which represent the figure in different positions. I will first show the skeleton in each *pose* assumed, and then the muscles which place and retain it in this *pose*, comparing the living model with the figures.

FIG. 1.—*Front view of the Fighting Gladiator, showing the superficial muscles.*

The *pose* of the statue is a difficult one to assume, being one of unstable equilibrium; but the model will copy the positions as closely as he can.

[A demonstration here followed of the muscular system of the Gladiator, which was compared with the figures of the model placed in a similar position.]

Brief as is this glance at the muscular, articular, and osseous system of man, it must suffice us for the present; but I must crave permission to still say a few words upon the need there is for our artist student to carry his

investigations a little further; he must not, in a word, rest content when he has mastered the mere anatomical arrangements of the muscles and shapes of the various bones and joints, but must pass to examine, as far as is practicable, into their physiology—into, that is to say, the meaning and cause of the various expressions which characterize the emotions. Each emotion has its appropriate muscular expression, which it is absolutely necessary that the artist should closely observe and faithfully copy; he will approach this most interesting branch of his art with far greater pleasure and profit if he understands something of the physiology of such expression. Sir Charles Bell gives a most interesting account of many of the expressions, and demonstrates the close *rapport* which exists between the physical and the psychical in man—*e.g.*, taking the *pose* of the Dying Gladiator, he observes: "He is not resting, he is not falling, but in the position of one wounded in the chest and seeking relief in that anxious and oppressed breathing, which attends a mortal wound with loss of blood—he seeks support to his arms, not to rest them, or to sustain the body, but to fix them, that their action may be transferred to the chest, and thus assist the labouring respiration; the nature of his sufferings leads to this attitude. In a man, expiring from loss of blood, as the vital stream flows, the heart and lungs have the same painful feeling of want which is produced by obstruction to the breathing. As the blood is draining from him he pants and looks wild, and the chest heaves convulsively; and so the ancient artist has placed this statue in the posture of one who suffers the extremity of difficult respiration. The fixed condition of the shoulders, as he sustains his sinking body, shows that the powerful muscles, common to the ribs and arms, have their action concentrated to the struggling chest." Interesting as the entire work of Sir Charles Bell is, there is still more value and interest in Darwin's work on the expressions of the emotions, which gives a physiological explanation of most of them, and is, indeed, a book which I think should be studied by every artist who intends to depict the emotions of the human face.

Time will not permit me to do more than barely allude to this fascinating subject; but I will, with your permission, venture to analyse a single expression and trace out its anatomical cause.

I may as well select laughter.

In laughing, the corners of the mouth are drawn up, chiefly by the great zygomatic muscles, assisted by the elevators of the upper lip; at the same time the orbicular muscles of the eye contract, and cause a slight lowering of the eyebrow. The object of this contraction of the sphincter muscle of the eye is to press upon and protect the delicate retinal vessels at the back of the eyeball, which, in pleasurable emotions, are surcharged with blood, in consequence of the general excitation, and would be in danger of being ruptured were it not for this provision. At the same time the eye brightens, partly in consequence of the ball being suffused by slight stimulation of the lachrymal gland, and partly in consequence of the tension of the globe being increased. Synchronously with their muscular actions, there is a rapid spasmodic contraction of the diaphragm.

By the contraction of the zygomatici, and neighbouring facial muscles, the naso-labial fold is deepened, and transverse wrinkles appear upon the nose and beneath the outer angles of the eyes.

The violent contraction of the orbicular muscles of the eyes necessarily involves the sympathetic action of the elevators of the upper lip; on the other hand, the muscles which raise the upper lip may, and often do, act without sympathetic contraction on part of the *orbicularis palpebrarum*. Try the experiment for yourselves—violently close your eyes, and you will feel the upper lip is raised at the same time; now raise the upper lip and you will find the muscles which close the eyes are unaffected.

The *rôle* which the muscles play in laughter may be advantageously studied in idiots, many of whom are always laughing. In one great class of insanity one of the earliest symptoms is a trembling at the corners of the mouth and the outer angles of the eyes. The coming event casts this shadow before. "Constant tremulous

agitation of the inferior palpetral and great zygomatic muscles," observes Dr. Crichton Browne, "is pathognomic of the earlier stages of general paralysis."

These photographs, taken from Darwin's work on the Expression of the Emotions, represent the same old man laughing naturally in Fig. 3, and made to mimic laughter in Fig. 4, by the application of electricity to the zygomatic muscles. In Fig. 3 we may observe the contracted orbiculars, the lowered eyebrows, the absence of vertical wrinkles at the root of the nose, owing to the relaxation of the corrugator supercilii, the deep naso-labial fold, and the elevation of the upper lip.

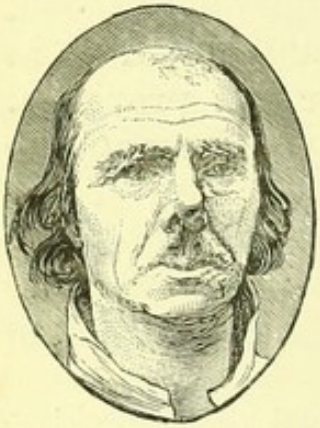

FIG. 2.—*Old man. Natural expression.*

FIG. 3.—*Old man. Laughing naturally.*

FIG. 4.—*Old man. Laughter mimicked by electricity.*

In Fig. 4 it is easy to see that despite the broad grin he is not laughing; and now let us see if we explain this difference in expression on anatomical grounds. Clearly we can. You will observe that the corrugator supercilii is now in strong contraction, producing the well-defined vertical wrinkles at the root of the nose, while the *orbiculares palpebrarum* are scarcely acting at all. This causes all the difference.

I may mention that the reason of the elevation of the upper lip in laughter is to permit the mouth to be widely opened, so that no impediment shall be offered to the emission of the characteristic sound; also to facilitate the rapid respiratory actions which accompany laughter. The whole phenomena are explained by Darwin, in accordance with his second principle, in which he affirms that, since (according to his first principle) there are certain states of mind which lead to habitual actions, which are of service,

therefore, when a directly opposite state of mind is induced, there is a strong and involuntary tendency to the performance of movements of a directly opposite nature, though these are of no use.* "We can thus see," says Darwin, "that the sounds of laughter would be naturally as different as possible from the screams or cries of distress; and as in the production of the latter the expirations are prolonged and continuous, with the inspirations short and interrupted, so it would be expected that with the sounds uttered from joy the expirations would have been short and broken, with the inspirations prolonged; and this is the case."

What I have to say, then, in favour of the study of anatomy amounts to this—it is a sort of artistic conscience, which tells the painter when, and where, and how, he errs, and also enables him easily and faithfully to copy nature.

Doubtless, such imitation, be it ever so faithful, does not constitute true art, else photography would be perfect art; nevertheless, such knowledge is essential, for before an artist can depict any object, even if it be, for example, a steam engine, in new and previously unheard of positions, he must make himself thoroughly conversant with its actual form and construction.

This being done, he may give the reins to his fancy, and set to work to paint æsthetic steam engines as they were never painted before. In landscape painting the same argument holds good. To accurately repeat the shape and true character of a tree or a flower, he must understand their construction; he must study the mode in which the calyx supports the corolla; he must know how the trunk supports the branches, and how the branches are given off from the trunk, before he can realistically and artistically depict the supported foliage.

Of course, mere imitation is but journeyman's work at best, and, unless it be inspired by something deeper, will

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* Darwin's three principles may be briefiy described as expressions derived from "serviceable associated habit," "the principle of antithesis," "and the principle of actions due to the nervous system, independently of the will." More recently, Professor Cleland, of Glasgow, has (in the "Journal of Anatomy and Physiology" for 1879) added a fourth, by arguing that "the principal key to a great part of expression is the correlation of movements and positions with ideas."

ever lack the significance of true art, the power of genius which "catches ere she falls the Cynthia of the minute," and arrests, as it were, the spirit of the spot, retaining for ever the momentary effect of light, the subtle charm of shade, the quiver of movement in the leaves.

In this sense I am ready to admit how small a part anatomical knowledge must ever play in making a good artist—nay more, I am ready to admit that a complete ignorance of anatomy is not incompatible with the graceful depictment of the human figure. Blake's wonderful creations are enough in themselves to prove the possibility of absolute anatomical ignorance and artistic drawing of the figure being united. If we take—*e.g.*, his illustrations to Job or to Young's Night Thoughts, we find numerous drawings of the nude, and every one of them full of grace and charm of outline, and instinct, as it were, with the spirit of movement. To him, as has been said by a recent critic, aerial beings were among the realities of life; he saw these forms floating on the bosom of the air as distinctly as he saw his fellow-man, and he has endowed them in consequence with a verisimilitude which, together with the careful balance of his masses, gives a charm to his works of quite a unique kind. But beautiful as those shadowy forms often are, they would be none the less but all the more beautiful if they were anatomically correct. Blake was a great, if eccentric, genius, and has left (perhaps) enduring works, but he has certainly not demonstrated the wisdom of artists ignoring anatomy.

The human figure is made by art to express more than itself—qualities of an abstract nature—mercy and malice, love and hatred, death and immortality, power and weakness, even the Deity himself, are portrayed by types of manhood and childhood.

How infinitely more facile, and more free, as well as more searching and satisfactory, will his work be who is well grounded in a knowledge of the human frame, than his who brings to such work no light but his own farthing candle of a mind whereby he tries to read all the mysterious meaning of the figure, and depict it for our instruction.

I am but a humble worshipper at the shrine of art—but none the less, nay, perhaps, all the more, I hold art to be a high and noble thing.

In England, art is not taken sufficiently seriously—it is looked upon too much as a pastime, as a matter perchance of mere decoration, on a par with an æsthetic upholstery or a refined millinery, or at best as pandering to the proud possession of an ignorant plutocracy.

We are said to take our pleasures sadly; it is equally true that we are inclined to regard our noblest work frivolously. Art should be as much to a nation as science. The man who invented the fiddle did as much for his fellow-man as he who applied the properties of steam to the locomotive, or of electricity to the telegraph—for after all the highest good lies in increasing the sum of happiness in the masses, and raising the mental possibilities of the individual. And do not the concord of sweet sounds and the finest works of art contribute to such ends equally with the rapid rush of the express, or the flash along the electric wire?

What a rogue and peasant slave is he to whom art is nothing! Like the heathen idol, he has ears, but he hears not; eyes has he, but he sees not. To lightly esteem commercial matters would be more pardonable, and I confess to always having admired Rubens's remark that "*Il s'amusait à être-ambassadeur.*"

Let art be multiplied until art education becomes the proper possession of the people. Some may cherish a fond and foolish fear that if all understood and practised art, were it ever so humbly, if it went no further than drawing the village pump correctly, there would be none left to admire the works of the elect. Not so. There would be fewer tricksters and triflers—there would be less parade of egotistic affectations; but the brightest and best of the sons of the morning would acquire fresh lustre, braver laurels, not only in the ready purchase of appreciative patrons, but in the admiring love and proud remembrance of a grateful people.

APPENDIX.

IDEAL PROPORTIONS OF HUMAN FIGURE AT DIFFERENT PERIODS OF LIFE, &c. (*Carus.*)

	At Birth Module = 9 Centimeters, or 3·53 in.		At 3 years Module = 10 Centimeters, or 3·93 in.		At 6 years Module = 13 Centimeters, or 5·11 in.		At 15 years Module = 16 Centimeters, or 6·29 in.		Full-grown Module = 18 Centimeters, or 7·07 in.		Dwarf at 26 Module = 12 Centimeters, or 4·71 in.		Female.		Negro.	
	Mod.	*Min.	Mod.	Min.	Mod.	Min.	Mod.	Min.	Mod.	Min.	Mod.	Min.	Mod.	Min.	Mod.	Min.
Length of skull from forehead to occiput	2	...	1	10	1	8	1	5	1	...	1	4	...	...	...	...
Circumference of skull	5	12	3	22	3	12	3	6	3	...	...	...	...	...	...	...
Height from lower margin of upper jaw to crown	1	12	1	3	1	3	1	2	1	...	1	2	...	22	...	22
Height from root of nose to crown	1	...	...	17	...	16	...	14	...	12	...	...	...	12½	...	...
Height from root of nose to lower margin of upper jaw	...	12	...	10	...	11	...	12	...	12	...	...	...	10	...	22
Breadth of face between malar bones	1	6	1	...	...	23	...	20	...	18	...	...	...	...	...	...
Each orbital cavity (width of)	...	12	...	9	...	8	...	6½	...	6	...	...	...	...	...	...
Length of nose	...	8	...	8	...	8	...	8	...	8	...	...	...	...	...	...
Height of skull from foramenmagnum to crown	1	6	1	3	1	...	...	20	...	18	...	...	...	...	...	...
Depth of fore-part of lower jaw	...	5	...	6	...	6	...	6	...	6	...	...	...	...	...	...
Length of arch of lower jaw	1	12	...	...	1	6	...	...	1	...	...	...	...	...	...	...
Length of vertebral column	3	...	3	...	3	...	3	...	3	...	...	...	...	...	...	...
Length of neck from chin to upper edge of sternum	...	8	...	8	...	9	...	11	...	12	...	...	...	...	...	...
From upper edge of sternum to pit of stomach	1	...	1	...	1	...	1	...	1	...	1	...	...	...	...	...
From pit of stomach to umbilicus	1	...	1	...	1	...	1	2	1	...	1	...	...	...	...	...
From umbilicus to upper edge of pubes	1	...	1	...	1	...	1	...	1	...	1	...	...	...	...	...
Middle of upper edge of breast-bone to top of shoulder	1	...	...	22	1	...	1	...	1	...	...	...	...	20	...	22
Between iliac crests	1	6	1	12	1	14	1	15	1	16	1	16	...	...	...	21
Between anterior inferior iliac spines	1	...	...	...	...	...	...	...	1	...	...	...	1	4	...	...
Height of os-innominatum	...	18	...	...	...	...	...	22	1	...	...	...	...	...	...	...
Length of head	...	18	...	...	...	...	...	22	1	...	...	...	...	...	...	...
Height of scapula	...	18	...	20	...	22	...	23	1	...	...	...	...	...	...	...
Length of arm	2	12	2	16	2	18	3	2	3	...	3	5	...	...	...	...
Length of upper arm	1	7	1	10	1	11	1	16	1	15	1	20	...	...	1	18
Length of fore-arm	1	5	1	6	1	7	1	10	1	9	...	...	...	...	1	11
Length of hand	...	20	...	20	...	22	1	...	1	...	...	23	...	21½	1	2
From last lumbar vertebra to acetabulum	...	14	...	14	...	14	...	15	...	18	...	...	...	...	...	...
Length of thigh	1	12	1	18	2	1	2	13	2	12	2	14	2	7	2	11
Length of leg	1	6	1	18	1	23	2	2	2	...	2	1	...	...	2	2
Height of foot from sole to ankle	...	8	...	8	...	8	...	8	...	10	...	...	...	...	...	7
Length of foot from heel to point of toes	1	...	1	4	1	8	1	13	1	12	...	...	1	9	1	13
Length of foot from ankle to point of toes	...	17	...	20	...	22	1	...	1	...	...	...	...	...	...	...
Height of figure from crown to sole	8	...	8	12	9	...	9	12	9	12	10	...	9	...	9	6

* A Minute is the 24th part of a Module.

PROPORTIONS OF HUMAN FIGURE. *(Jean Cousin.)*

The height of entire body = eight heads.

LENGTH.

From the vertex to the chin	1 head.
From the chin to the mammæ	1 head.
From the mammæ to the umbilicus	1 head.
From the umbilicus to the pubes	1 head.
From the pubes to the middle part of thigh	1 head.
From middle thigh to knee...	1 head.
From knee to lower part of calf	1 head.
From calf to heel	1 head.

THE HEAD THUS DIVIDED.

From vertex to commencement of hair	1 part.
From hair to root of nose	1 part.
Length of nose	1 part.
From tip of nose to chin	1 part.
Upper extremity from shoulder joint to thumb	2 heads.
Thumb to end of middle finger	1 head.
Lower extremity from pubes to heel	4 heads.
Hands the same length as face.	
Foot	1 head.

BREADTH.

Line through the eyes divided into five parts.
Eyes occupy the 2nd and 4th, nose the 3rd.
Eyes into three parts, aperture of pupils = one part.
Shoulder to shoulder five parts.

PROPORTIONS OF HUMAN FIGURE. *(Alberti.)*

LENGTH.	Feet.	Grad.	Min.
To the instep (from the ground)	...	3	0
To the external malleolus	...	2	2
To the internal malleolus	...	3	1
To the knee joint	1	4	3
To the thigh bone	3	0	0
To the umbilicus	3	6	...
To the waist	3	7	9
To the pit of the stomach	4	3	5
To the root of the neck	5	0	0
To the chin	5	2	0
To the ear	5	5	...
To the wrist	3	0	0
To the elbow	3	8	5
To the top of the shoulder	5	1	8
BREADTH.			
Greatest breadth of foot	...	4	2
Between the knees	...	2	4
Breadth of calf	...	3	5
Knee	...	4	0
Thigh	...	5	5
Pelvis	1	1	1
Breast under armpits	1	1	5
Shoulders	1	5	0

PROPORTIONS OF HUMAN FIGURE. *(Michael Angelo.)*

Divided into eight equal parts.

	7ths of a foot.
Vertex to forehead	1
Vertex to chin	6
Neck to breast-bone	4
Ensiform cartilage to umbilicus	6
Thigh	12
Leg to ankle joint	12
Foot	2
Length of upper arm	10
Fore-arm	8
Hand	6

Besides these, Hay may be mentioned as having introduced a geometrical method of estimating the proportions of the human figure, somewhat similar but very inferior to that of Zeising; and Professor Marshall, who has quite recently added another to the list, in a beautifully executed folio called, "A Rule of Proportion for the Human Figure." (Smith, Elder, and Co. 1879.)

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