

The works of the late Professor Camper, on the connexion between the science of anatomy and the arts of drawing, painting, statuary, etc. ... / Illustrated with seventeen plates.

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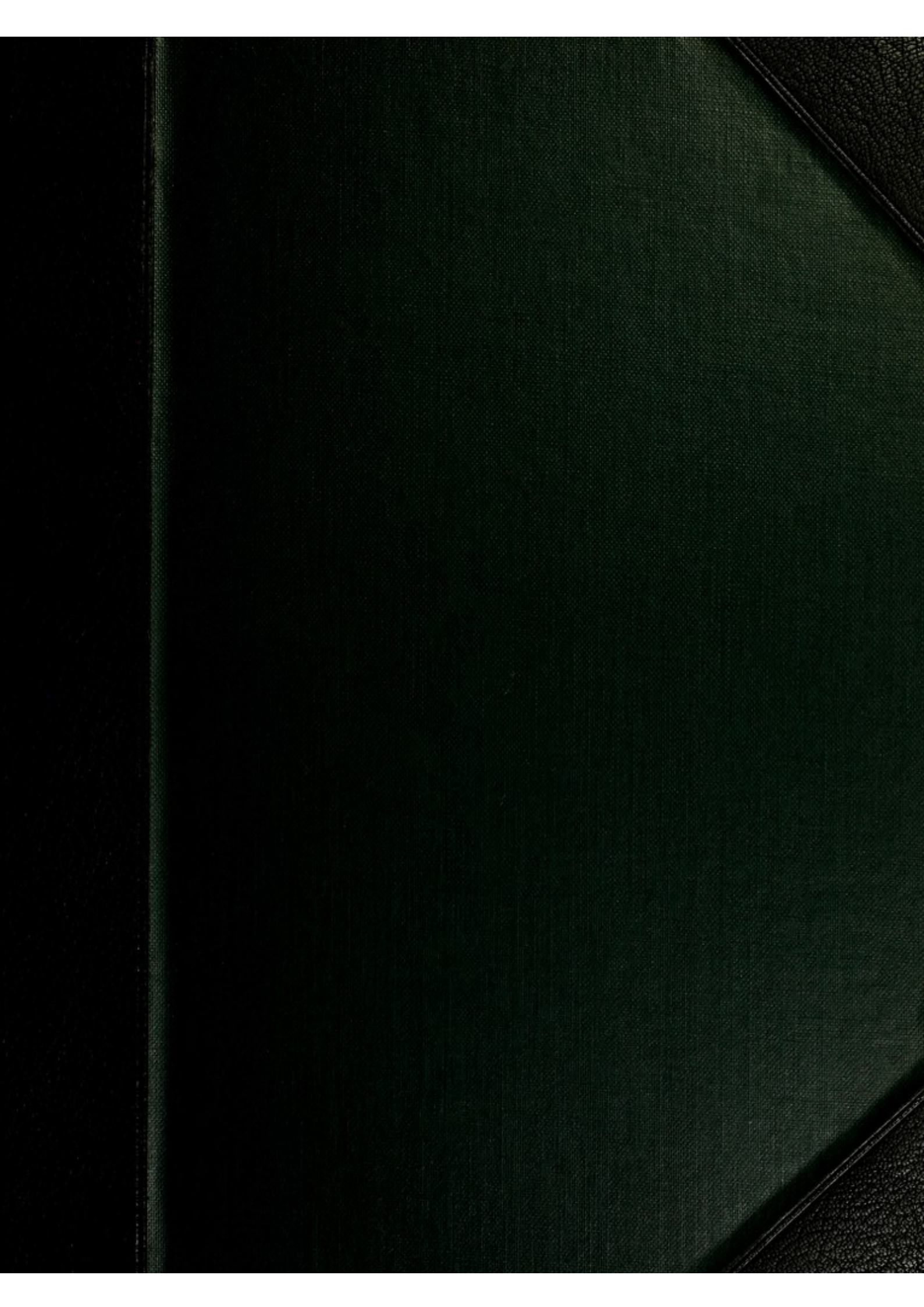
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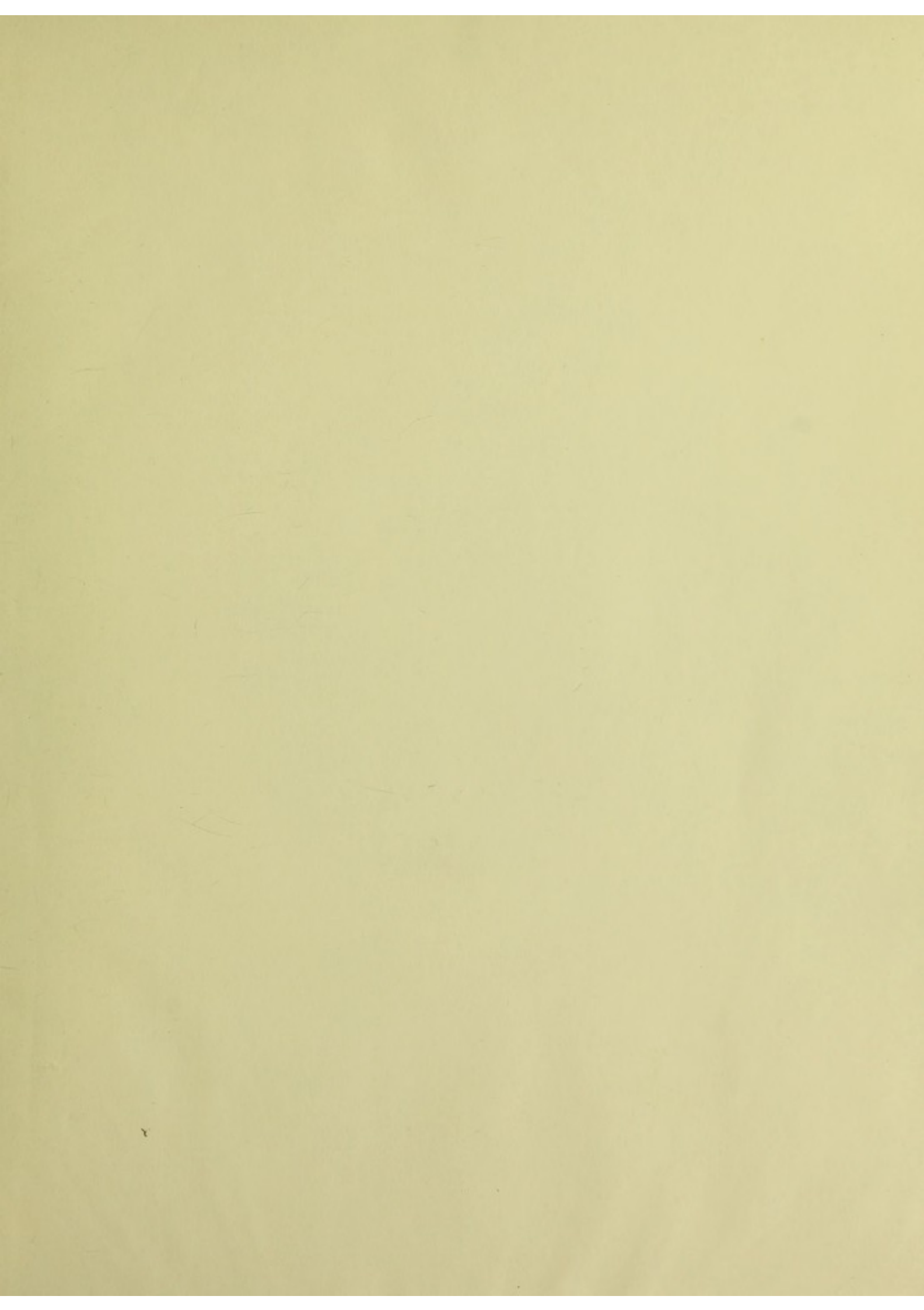
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PETRUS CAMPER.

THE
WORKS
OF THE LATE
PROFESSOR CAMPER,

ON THE CONNEXION BETWEEN

The Science of Anatomy

AND

THE ARTS OF DRAWING, PAINTING, STATUARY,
&c. &c.

IN TWO BOOKS.

CONTAINING

A TREATISE ON THE NATURAL DIFFERENCE OF FEATURES IN PERSONS OF
DIFFERENT COUNTRIES AND PERIODS OF LIFE; AND ON BEAUTY,

AS EXHIBITED IN ANCIENT SCULPTURE;

WITH A NEW METHOD OF SKETCHING HEADS, NATIONAL FEATURES, AND PORTRAITS OF
INDIVIDUALS, WITH ACCURACY, &c. &c.

ILLUSTRATED WITH

SEVENTEEN PLATES,

EXPLANATORY OF THE PROFESSOR'S LEADING PRINCIPLES.

A NEW EDITION.—BY T. COGAN, M. D.

LONDON:

SOLD BY J. HEARNE, 218, TOTTENHAM-COURT ROAD;
PRIESTLEY AND WEALE, 5, HIGH-STREET, BLOOMSBURY; E. BUTLER, BRUTON-STREET, BOND-STREET;
W. MASON, PICKETT-STREET, NEAR TEMPLE-BAR.

1821.

W. O. B. B. B.

THE STATE OF NEW YORK

IN SENATE

JANUARY 18, 1888

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P R E F A C E,

By the Translator.

THAT an intimate connexion subsists between the different branches of the Arts and Sciences, by virtue of which the one elucidates or reflects a lustre upon the other, is a truth that has never been litigated. The Artist, whose attention is solely confined to one particular object, and whose knowledge is as circumscribed as his employment, may become expert in the mechanic, or operative part of his occupation, but we are not to expect from him any considerable improvements, or peculiar indications of taste; nor will he be qualified to propose rules, by which others might be taught to excel.

To none of the fine arts are those observations more applicable than to those of Painting and Sculpture; for

none require a larger compass of knowledge, or a deeper insight into Nature, if the Artist means to carry the profession farther than the mechanic delineation of an object that is immediately before him.

As the Painter or Statuary, who has made the human figure the peculiar object of his study, has doubtless given the preference to the most interesting and the most sublime department; so it must be confessed, that he has chosen the most difficult and comprehensive. This branch demands great extent of historical knowledge, an intimate acquaintance with national characteristics, great attention to the diversities occasioned by progressive years and peculiarities of sex, observance of the effects produced by the passions upon the human frame, in their various combinations and different degrees of force; superadded to such a knowledge of Anatomy as shall enable him to delineate the general situation of the muscles in a placid and inert state, their action in varied positions, and their influence in describing every emotion or passion of the mind. It is also the branch most exposed to the severity of criticism; as grosser faults in the representation of the human form are readily detected, and as numbers, presuming that they have a complete model

in their own persons, or competent knowledge from their intercourse with their species, affect the refined connoisseur, and attempt to support the character by searching for minuter blemishes.

The delineation of different animals does not require an equal extent and variety of knowledge; and those who have made this branch their principal study, have in general confined themselves to close imitation; yet the ill success of many painters in this department, the few masters comparatively who have acquired celebrity, and the very few whose works are exempt from gross imperfections, too clearly indicate that there are latent difficulties, which it is not in the power of mere imitation to surmount; and also that the address acquired simply by attention and practice in the delineation of one particular species, has rather been an impediment than an aid, in attempts to delineate animals of any other species.

Much pains have been taken to remove those various difficulties. Men of study and of genius have attempted to introduce certain principles, and to propose invariable rules,

which they deemed conducive to the improvement of taste in the higher branches of painting, and precision in all. Some of the principles advanced, and methods recommended, have been of considerable service; while others, as they were built upon false dogmas, are more calculated to mislead than to direct into the right path.

The Work, which is now introduced to the English reader, professes to remove several remaining difficulties of no small moment; and to propose rules more conducive to facility, grace, and accuracy, than any hitherto offered. These professions are founded upon the discovery of a much more immediate and intimate connexion between the sciences of human and comparative anatomy, and of the natural history of animals, with the art of delineation, than could have been supposed to exist. Every idea in it, that is peculiar to the Author, exemplifies in a very striking manner the truth of our remark concerning the connexion that subsists between different branches of the arts and sciences; by means of which the one may be rendered, in various respects, subservient to the other. The happy union, in the same person, of profound knowledge in Anatomy, with a taste for Draw-

ing, has demonstrated that the *minutiæ* of anatomical knowledge are much more conducive to elegance, character, expression, and precision, than could possibly have been imagined by any one totally ignorant of, or but superficially acquainted with, the science. Whenever the attention of artists has been directed to anatomical instructions, it has hitherto been confined to the first series of muscles, or their operation in the different actions or positions of the body, as marked through the integuments; but we now perceive the great importance of *Osteology*, particularly an intimate knowledge of the bones constituting the cranium, and of their relative situations in the delineation of national characters, and in the changes made by advancing age; and also its uses in the production of ideal beauty, or in marking the peculiarities which characterise individuals. *Neurology* also, which has not been considered as having the most distant relation to the subject, is proved to be of high utility in the representation of the emotions of the mind: an attainment confessedly the most difficult, as well as the most interesting and sublime.

The *acumen* with which professor Camper has criticised

the labours of the most distinguished painters and delineators of animals; the detection of their errors, and the causes of them; the rules given to avoid these errors, and acquire greater precision in delineating animals of different species, founded upon comparative anatomy, and the natural history of the animal, indicate no less forcibly the great advantages to be derived by these two sciences, which, united, promise to point out an unerring road to excellence.

The Introductory Discourse will acquaint the reader with the methods by which these discoveries were made. It will also make him acquainted, in a pleasing and satisfactory manner, with the progressive history of an inquisitive mind, from early years up to manhood; the dissatisfaction that accompanied increased penetration and an improved taste, at the imperfections with which some modern productions of celebrated masters were chargeable; the means pursued to avoid similar imperfections, and to imitate those excellencies in the works of the ancients which are the subjects of universal admiration, though the causes of this admiration had never been investigated. The reader will further notice, that the principles advanced are not the premature fruits of

a warm imagination; but that they were gradually formed by the observations and experience of a series of years, until they became the basis of sound criticism, and furnished rules for accurate execution. It may not be impertinent to add, that the Professor's remarkable proficiency in drawing, though it was simply the amusement of his leisure moments, corroborates all that has been advanced concerning the superiority of his methods to those in common use. Of this proficiency the connoisseur may form some judgment from the specimens before him, which are faithful as well as elegant copies of engravings from original drawings; the greater part of which were executed under the inspection of the Professor, and all of them by the first artist in the Seven Provinces. By this application of his professional knowledge to his favourite amusement, he had acquired such a facility and firmness in delineation, as astonished every attendant on his public Lectures; and artists themselves have acknowledged, that his occasional and extemporaneous sketches, exceeded in taste and accuracy their laboured productions.

The First Book of this Work contains the substance of several Lectures, which were read at different times, and

distant periods, before the Academy of Drawing, established at Amsterdam. These were afterwards revised and digested into a regular Essay, and carefully prepared for publication by professor Camper himself. It may, perhaps, be thought by those who admit the truth and importance of his leading principles, that the distinctions given in the first chapter concerning the characteristic differences of different nations, are too general, and not sufficiently adapted to assist the painter in describing that vast variety of national distinctions observable in the different inhabitants of our globe. But we are to recollect, that those are proposed simply as specimens of a new study, the prosecution of which would promise the greatest advantages to the national and historical Painter. The grand object was to shew, that national differences may be reduced to rules; of which the different directions of the facial line form a fundamental norma or canon;—that these directions and inclinations are always accompanied by correspondent form, size, and position of other parts of the cranium, the knowledge of which will prevent the Artist from blending the features of different nations in the same individual, and enable him to give that true character to national figures introduced into a composition, which has always been felt

as a beauty, and the want of it as a defect, though the cause has lain concealed. This subject may justly be considered as a new and interesting study in the natural history of man, which requires the joint labours of physiologists to surmount all the difficulties attending it. It is alone by forming a very large collection of the craniums of different people, that a discrimination can be made between what is general, from what is merely accidental; what is personal and to be ascribed to the diversities observable in individuals, from that which is national and characteristic of a particular people*.

The other articles, minutely treated in this Book, relative to a new manner of drawing portraits in profile, according to certain rules deduced from the conformation of the cranium, and the changes made by age, being founded upon indubitable

* Professor Blumenbach of Gottingen, is pursuing this study with great assiduity. He has already published two *Decades* of differences in the craniums of different people. The translator has only been able to procure the first; from which he learns, that the specimens in the possession of this Professor, led him, in some few instances, to differ from professor Camper, respecting characteristic marks. As each has formed his opinion from the specimens in his possession, those differences manifest the difficulties hinted above, and prove that further investigations alone will enable us to distinguish between accidental forms and *national* marks.

principles, cannot be subject to similar incertitude; so that respecting these, every Student has the means of making great improvement completely in his power. The great utility of the remarks concerning the beauties of the antients will be self-apparent.

The Contents of our Second Book are the small remains of Lectures upon other subjects relative to drawing; the ideas of which suggested themselves, while the Professor was engaged in the pursuit of his first object. They were collected from imperfect manuscripts and detached hints, found among the Professor's papers after his decease, and published by his Son in as complete a manner as circumstances would allow. Of consequence they are merely to be considered as Notes and Heads of Lectures, the substance of which was given extempore. This will sufficiently explain the reason why the scientific introductions appear so disproportionate to the explanatory parts. It must also be noticed, that at the time these Lectures were delivered, the audience enjoyed the great advantage of seeing every part of the subject explained, by a great variety of extemporaneous sketches, which were successively effaced from the board to make room for others.

Those communicated to the Public, are the only ones to which the Professor had given permanency; and of these the sketches, illustrative of the passions, were too imperfect to be given as they were found; the engraver was obliged to supply some strokes that had been omitted. All the other drawings were sufficiently accurate not to require additions or alterations. We are informed that professor Camper had it in contemplation to extend the subjects much farther, arrange his ideas with more accuracy, form each Lecture into a distinct treatise, and illustrate the positions advanced by a regular series of drawings. But upon recess from the academy at *Franiker*, public affairs engaged his immediate attention during the political troubles in Holland, until death terminated every sublunary pursuit*.

Although, from the above causes, the Lectures on the manner of delineating the different passions, and on the points of similarity between Quadrupeds, Birds, and Fishes, founded upon this similarity, are necessarily imperfect, and have a claim to the indulgence due to fragments and rough sketches; yet they may be deemed a valuable acquisition to

* Professor Camper died at the Hague, in the year 1789.

the Painter. They abound with sound criticism, and furnish hints which promise peculiar advantage to the delineator of the human passions, or of objects in the animal kingdom; and they will greatly assist the connoisseur in judging of the accuracy and merits of a performance in this department of Painting. In a word, the principles and hints advanced, contain valuable germs, the development of which promises an abundance of rich fruit to the intelligent Artist.

It was the celebrity of these Lectures in Holland that made them attract the Translator's notice; and a conviction of the truth and great utility of the principles advanced in them, made him wish that the artists and connoisseurs in Great Britain should enjoy the advantages to be derived from them. But he had every reason to apprehend, that they would remain deprived of these, unless the Work was undertaken by himself. To a competent acquaintance with both languages, the knowledge of anatomy was also necessary for the translation of a Treatise of this kind; and through the presumption that every other person in the Seven Provinces, possessing these requisites, might be engaged in more important employments, or be destitute of leisure, he has imposed

the task upon himself. He has been induced by these considerations to submit to a labour which has not been very agreeable. To *translate* has always appeared to him like treading, with slow and tedious pace, over another man's ground, after the eye has been satisfied with the prospect, and with looking at every object composing it. But in this business he had to work his way through a very intricate subject, an involved stile (for the Professor's pen is by no means equal to his pencil) and through the still greater difficulty of an erroneous edition, where the very numerous faults in the references presented perpetual embarrassments. He claims to himself some degree of merit, from this instance of self-denial, and urges it as a plea for indulgence to any incidental errors, from which it is scarcely possible for a work of this kind to be totally exempt.

Great attention has been paid to perspicuity, and every idea peculiar to the Author has been faithfully rendered; but the Translator has thought himself at liberty to make some deviations of a trivial nature, in order to accommodate the work to the English reader; of which the following are the principal:

Paraphractical or explanatory descriptions are sometimes added, particularly in the references to the five first Plates of the First Book. The Professor had uniformly confined himself to the concise algebraic mode; but this conciseness, and a scientific appearance, were frequently purchased by the loss of perspicuity and painful abstractions. Explanations are therefore subjoined, until the reader, familiarized with the subject and with the figures, will no longer require them.

In the Lectures, that complimentary stile which the Dutch literati still retain in all their public harangues, particularly in the exordium and at the close, is considerably retrenched; as it would be displeasing to an English ear accustomed to greater simplicity.

The two first Lectures are, in the translation, comprised in one, since they related to the same subject. As they were delivered, they were of the usual length; but from the causes already mentioned, they were rendered too concise in the publication to require a separation.

In the translation, two publications given at different

periods, are contracted into one volume, not much larger than either of the original volumes. This has been effectuated by the rejection of an Essay on the Principles of Beauty, which contained the substance of three Lectures, which had also been read before the Academy, and which the Editor had subjoined to his second volume. This Essay would not have conveyed the same information to the English reader it might have done to the audience, as Mr. Camper had professedly adopted the theory of Mr. Burke; with which we may suppose every Englishman of taste to be familiar. Although it displays considerable erudition, yet this is mostly employed to exemplify the sentiments advanced in the Chapter on Beauty. The Translator was therefore unwilling to destroy the uniformity of a Work entirely of a Practical Nature, and replete with Important Rules, by subjoining speculations which had no immediate relation to practice, and which would have appeared defective to every one who has read the Treatise of Mr. Burke, or the more recent publication of the Rev. Mr. Alison.

The subject of the Notes will sufficiently shew, whether they were by the Professor or his Editors, excepting the one

in the 169th page. Should the remark it contains be impertinent, the fault is not to be attributed to the Professor.

If the principles advanced and illustrated in the following pages should appear to English Artists and Connoisseurs as important as they did to their Author, and to his Admirers, in the Dutch Netherlands, the Translation cannot be unacceptable in a country so renowned for its Painters as Great Britain. They apparently open new sources of improvement, and point out to younger Artists a new path for generous emulation. It has been acknowledged by those who frequent the many exhibitions of Paintings in the Metropolis, that something of a languor is taking place, from a kind of uniformity that threatens to be prevalent. The eye of the visitor is fatigued with viewing a repetition of the beauties of the preceding year; and the most benevolent critic is wearied of repeating the same accents of praise, in their approbation of excellencies, which, being no longer novel, have lost much of their power to charm. Will it be too sanguine an expectation, if the hope be indulged, that the following Publication will inspire Artists with fresh vigour, by pointing out to them unbeaten tracts, enabling them to

infuse unusual spirit, dignity, and character into some of their performances; and by teaching them to avoid in others those inaccuracies which have been perpetuated by an implicit confidence in the rules and examples of the most celebrated Masters? May we not presume also, that some congenial mind, who unites deep skill in Anatomy with the love of Painting, will be animated to pursue the subject to a greater extent, and complete a study which professor Camper has so happily begun; and thus procure honour and emolument to himself, by multiplying the sources of delight to every man of taste?

TABLE

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Corrections to be made in the Plates.

Dotted lines are wanting from G to S, or from the Fore Teeth to the Chin, in Plate I. Fig. 3. Cranium of the Negro, and also from a to b, over the vertex, in the lower Figure. The Ear of the Negro is too erect; and the Line from r to s, should fall before the Lobe.

Plate V. Fig. 2. Dotted Lines are wanting from M to M, in the Cranium of the Child's Head in Front.

BOOK SECOND.

Let A F be engraved on Plate IV. Fig. 4. in place of A T. See p. 152, bottom line, Camel.

Let r be engraved on Plate V. Fig. 5. instead of γ, *i.e.* the Greek g. See p. 153. l. 10.

Let b, instead of B, be engraved on Plate VI. Fig. VI. See p. 161. l. 13.

Let o, in the Hoof of the Horse, Plate V. Fig. 8. be a Capital Letter.

ERRATA.

Page 35, line	8, for of, read or
36, l.	4 from bottom, for from the bottom of the lower jaw, read from the occiput
41, l.	7, for again, read gain
63, l.	2 from bottom, for particulars, read particularities
84, l.	at bottom, for consonant, read in consonant
105, l.	4, for sunt, read sunt
107, l.	for Socicles, read Sofocles
166, l.	in the note, for 12, read 1, 2, &c.

Errors in the References.

39, l.	14, read CD was as 11, : $7\frac{1}{2}$.
46, l.	6, for T T. read T F.
49, l.	9, for from N. to C. read from N. to G.
82, l.	7 from bottom, for E G. or D. read E. G. or D.
98, l.	15, for see Pl. IV. read see Pl. II. Fig. 4.
102, l.	2, read see D B, and X E B, in the lower sketch of Fig. 4.
109, l.	8, for E F, read F B.
116, l.	9 from bottom, for N Q, read L Q.
117, l.	3 from bottom, for K. read H.
136, l.	9 from bottom, for Fig. 2. read Fig. 11.
150, l.	14, for E to S, read F to S.

INTRODUCTION.

PAINTING, and whatever is relative to the Art, have been my favourite amusements from my earliest years: and as the characteristic differences in men and animals appeared to me the most interesting objects in nature, I was disposed to pay more than ordinary attention to these. — To draw, and to model in clay, were the recreations of my childish hours. As I grew older, I was particularly struck with the figure and colour of the Moors; and with the difference in features and complexion between the East Indian-blacks and the natives of Africa.

Whenever I copied after the best models of the ancient Greeks, — drew the head of a Pythian Apollo, a Venus de Medicis, a Hercules of Farnese; or placed before me the beautiful figures of Michael Angelo, Quesnoi, and other celebrated masters of later date, I observed a very great difference between the faces of these and our own. I perceived also

that they were much more pleasing than any of the figures of the Flemish schools, without being able to ascertain in what this preference might consist.

I had learned to make use of ovals and triangles, according to the principles laid down in every treatise on the art of Drawing; and yet when I copied from models in plaster, from paintings, or from life, I always experienced not only a difficulty, but an absolute impossibility of sketching heads to advantage; nor was I satisfied with the proportions recommended.

At sixteen years of age I began to paint in oil-colours, chiefly after the Flemish masters: but as I was already captivated with the superior dignity observable in the antique models, the style of these masters was not agreeable to me. At the age of eighteen, my instructor, Charles Moor the Younger, to whose attention and care I am indebted for any subsequent progress I may have made in this art, set me to paint one of the beautiful pieces of Van Tempel; in which there was the figure of a Moor, that by no means pleased me. In his colour he was a Black; but his features were European. As I could neither please myself nor gain any proper directions, I desisted from the undertaking. By critically examining the prints taken from Guido Reni, C. Marat, Seb. Ricci, and P. P. Rubens, I observed that they, in painting the countenances of the Eastern Magi, had, like Van Tempel, painted black men; but they were not Moors. The celebrated Engraver, Cornelius Visscher, was the only

one who appeared to me to have followed nature, and to have properly characterized Moors.

As I advanced in years, my attention and penetration increased; and I imagined that, by a single glance of the eye, I was able to distinguish antiques, and to mark, from the style, the very period in which they were executed. The majority of prints taken from the most beautiful engravings on precious stones, of antiquity, were dissatisfactory: something of a Gothic taste was intermixed. This is the case with the representations of the Roman Emperors, by Hub. Goltz, published in the year 1645, which is otherwise a fine piece; and in his *Græciæ ejusque Insularum and Asiæ Min. Numismata*; although in some few of them the Greek style is more or less preserved. In the work of J. Tristan, *Comment. Hist. contenant en abrégé les vies, éloges, &c. des Empereurs, &c. jusques à Pertinax*, the antique is entirely lost, through the unskilfulness of designers and engravers. This observation is applicable to L. Beger, Bonannus, &c. But the *Numismata* in the *Thesaurus Græc. Antiq.* of Gronovius, and those of Sicily, Naples, &c. of Grævius and Burmann, are the most intolerable of all.

In the works of Mountfaucon, J. Spon, &c. the designs were made by artists of very moderate talents; and are accordingly very imperfect. This could not offend the editors, as their attention was totally confined to the historical branch, and they could neither perceive nor relish transcendent beauty; which, however, did not escape the notice of Baron

Stofch, notwithstanding that Picart has generally spoiled it by his vicious taste. Count Caylus, though a good designer, has failed in this respect. Barbault has, in a few instances, succeeded incomparably well.

It was not before I had formed the plan of this Treatise, in the year 1768, that I enjoyed the opportunity of consulting the excellent observations of Winkelman on the * Imitation of the Greeks in Painting and Sculpture; his † Preliminary Discourse concerning the Art of Designing among the Antients, and his § Monuments of Antiquity. I have since studied his works with the utmost advantage, although his notions of ideal beauty have misled numbers. What this penetrating observer terms *ideal*, is in fact founded upon the rules of optics, as I shall fully show when I treat of the beauty of the human countenance. The dissertation of Tenkate upon Ideal Beauty, has great merit; but it does not instruct us in its true nature or principles. Following Lomazzo, he has been misled by him. They are both embarrassed by adopting the rules which constitute the harmony of music, and which are not applicable to painting; as the beauty of the latter does not depend upon certain immutable proportions, but on other circumstances.

The excellent letter of my esteemed friend, the profound Hemsterhuys, teaches us the influence of the Beautiful upon

* Gedanken über die Nachahmung der Griechischen werke in der Mahlereij und Bildhauerkunst.

† Trattato preliminare dell arte dell disegno degli antichi popoli.

§ Monumenti antichi inediti.

the mind; but it does not indicate in what beauty consists; or propose rules by which we may trace or produce it in the figure of objects.

I have examined the works of Natter, Mariette, and the cabinet of the Duke of Orleans; and in all of these I have remarked Manner, and also a deficiency of that *taût* which it is the object of these works to inspire. Even Winkelman is destitute of it in execution. So difficult is it to catch the spirit of the antients, as long as the causes of their excellencies are not investigated, and reduced to principles.

Although Albert Durer was in reality a great master (and when we advert to the age in which he flourished, we must allow him to have possessed extraordinary merit) yet he has laid the foundation of a bad taste, which has diffused itself all over Europe, not excepting Italy; and which continues to exert its pernicious influence; as is manifest from Lomazzo, who follows him implicitly, excepting in the doctrine of musical harmony being applicable to painting. It is also obvious that Lomazzo has consulted *Pomponius Gauricus de Sculptura*, and Dolce, as well as A. Durer. Blind at thirty years of age, this man was obliged to seek a subsistence by his writings. Hence his numerous publications; most of which treat upon the same subjects. With what perspicuity he defines the beautiful! *Il bello per così dire, non è bello, che per la sola sua bellezza* *. “The beautiful, so to express myself,

* Trattato della Pittura. 1584. pag. 196.

“ is merely beautiful by its own beauty.” — How extravagant!

To return. I must further remark, that the excellent prints from the works of Rafael, Pouffin, Titian, and Pietra Testa, pleased me much better than the finest pieces of Rubens or Van Dyck; in both of which, the divisions of Albert Durer, and the imperfections of his oval were very conspicuous. This is particularly the case in the painting of the Holy Virgin and Child, in the celebrated gallery at Dusseldorp; which is in every other respect an excellent performance.

By frequently modelling in clay, after the finest heads of antiquity, I learnt that Albert Durer, by looking at the object with both his eyes, had made them too broad; and I also learnt that a painter, to excel, must be a proficient in modelling as well as in drawing. This will best enable him to form a genuine idea of the real form of all objects. A knowledge of optics is also requisite; as has been fully proved in my Inaugural Dissertation*.

In a separate chapter, on the constituent beauty of forms, I shall hereafter show how much depends upon avoiding a defective manner of viewing the object which is occasioned by the refraction of the rays of light. In order to succeed, it is also necessary to attend to the excellent rule of Lysip-

* Published in the year 1746. It treats of the construction of the eye, and the nature of vision.

pus *; *i. e.* To make the head somewhat less, the body more slender and delicate, than they really are, and they will be represented to greater advantage than by the most scrupulous exactitude.

When I gave lectures in the public college at Amsterdam, as Professor of Anatomy, I found, by comparing bodies of various ages that were brought to me for dissection, that the oval was not calculated for the delineation of the features with any degree of accuracy or expedition. With this idea I sawed several heads, both of men and of animals, perpendicularly through the middle; and I was fully convinced that the ball of the head forming the cavity destined to contain the brains, was in general very uniform; but that the position of the upper and lower jaws was the manifest cause of the most striking differences. The same observation may be extended from quadrupeds down to the finny race: and it has suggested hints sufficiently numerous to form a separate Treatise.

The above examination has also enabled me to discover whence those changes arise which progressively take place in our features, from infancy to the most advanced age. But I still was unable to explain in what manner it was that the Greeks should have acquired, at a very remote period, that

* Capita minora faciendo, quam antiqui: corpora graciliora, siccioraque, per quæ proceritas signorum major videretur: — ab illis factos quales essent homines, a se quales viderentur esse. PLIN. Lib. xxxiv. Cap. viii. Sect. 19. Pag. 652. § 6. & 653.

singular and dignified expression which they gave to their figures; and which I have never seen perfectly equalled. I perceived, moreover, that in the copies taken from these, the facial line did not differ from our own. This will appear by comparing the 5th figure of Plate X. (which is the head of Augustus Cæsar, engraved by Dioscorides) with the first figure of the second Plate.

Having contemplated the inhabitants of various nations with greater attention, I conceived that a striking difference was occasioned, not merely by the position of the inferior maxilla, but by the breadth of the face, and the quadrangular form of this maxilla. This idea was confirmed by contemplating a considerable collection which I afterwards made of heads, that acknowledged various countries for their parents; or of exact copies from them. Exclusive of several skulls of my countrymen, and of the adjacent nations, I possess two of English negroes (the one was a young person, the other advanced in years) — the head of a female Hottentot, — of an inhabitant of Mogul, — a Chinese, — a youth of Madagascar, — a Celebean, — and finally, the cranium of a Calmuck; that is, of eight different nations.

When I was at Oxford, in the year 1786, I also took a sketch of the lower jaw of a native of Otaheite, that had been brought over by Captain King. I have never been able to obtain possession of the cranium of a native American, nor even of an Anglo-American, which has, however, some peculiarities that were pointed out to me by that celebrated artist

Mr. West ; of which, as he was born in Pennsylvania, he was the best qualified to judge. Their face is long and narrow ; and the socket of the eye furrounds the ball in so close a manner, that no space is allowed for a large upper eye-lid ; which is so graceful to the countenance of most Europeans.

When in addition to the skull of a negro, I had procured one of a Calmuck, and had placed that of an ape contiguous to them both, I observed that a line, drawn along the forehead and the upper lip, indicated this difference in national physiognomy ; and also pointed out the degree of similarity between a negroe and the ape. By sketching some of these features upon a horizontal plane, I obtained the lines which mark the countenance, with their different angles. When I made these lines to incline forwards, I obtained the face of an antique ; backwards, of a negroe ; still more backwards, the lines which mark an ape, a dog, a snipe, &c. — This discovery formed the basis of my edifice.

The large and populous city of Amsterdam, moreover, afforded me various opportunities of collecting the skulls and other bones of the deceased, in a regular progression, from earliest infancy up to decrepit age. By comparing these with each other, my thoughts were directed to the natural difference occasioned by the gradual growth of the parts in youth, and their decay in advanced age ; and also to the manner by which this discrepancy of years might be most accurately delineated. Hence arose the first stage of my edifice : the second was formed by a critical investigation of the line which

ancient masters preferred, in their best productions. Finally : While I was scrutinizing the utility of the oval and triangle, which are proposed as the surest direction for designing a human head, the examination and comparison of the skulls and maxillæ which had been sawn through, discovered to me a new and more simple manner of portraying any form of head I pleased, either of men or of animals, with a much greater degree of precision.

As I met with few connoisseurs in painting, and still fewer who enjoyed speculations of this kind, my pursuits were totally neglected until the year 1767; when, being in company with my much esteemed friend Mr. F. Van Hemsterhuys, at the house of his Excellency the Count of Bentinck, Lord of Rhoon, &c. we examined together a number of beautiful Intaglios and Cameos; and I was able to distinguish immediately the originals from the counterfeits, the Grecian from the Roman artists. This induced them to enquire into the principles of my knowledge; which I explained, with the addition of the leading observations I had formerly made. The Count, who was a distinguished judge and sound critic in every branch of the polite arts, was struck with the simplicity of my discoveries, and urged me, with his usual politeness, to arrange and more fully explain my ideas, as they appeared of utility.

Upon retiring to my country residence, in order to enjoy a relaxation from my academical labours, I undertook this arduous task. But numberless difficulties presented themselves.

It was not only necessary to make drawings of the different bones of the face, but to do this with accuracy. This was finally surmounted. The drawings were to be reduced to the same scale, and properly arranged. The best antiques, and also the prints taken from them, were to be examined and studied. Ancient and modern writers on the Natural History of Man, and on the Principles of Drawing, were to be perused with attention, digested, &c. &c.

The Work swelling under my hands, not only became more extensive, but promised to be more extensively useful. I flattered myself that it would prove acceptable, not only to those who admire the masterly performances of ancient artists, but also to those who are engaged in the study of natural history, and to all young pupils in the arts of drawing and of sculpture. Employing every hour of leisure from other occupations, I finished the sketch of the present Treatise, towards the end of August in the year 1768.

Delighted with my discoveries, as is generally the case, I communicated them to several admirers of the fine arts. They imagined that considerable service might be rendered to the science of Painting, and particularly to the Academy of Drawing, established at Amsterdam, were I to deliver some public lectures upon the subject, before the members of that society. These I delivered on the first and second days of August, in the year 1770, before a numerous and respectable audience. The president and chief patron of the institution,

Burgo-master Huygens, and the other directors, were pleased to express their approbation of my endeavours, by presenting me with a golden medal*.

Not less than sixteen years elapsed before a convenient opportunity of publishing this Treatise presented itself. Various engagements prevented me from revising it with attention, in order to enlarge or abridge, as might be judged necessary. The difficulty I had to find out an intelligent and skilful engraver, was another obstacle. At length, the celebrated Mr. Vinkeles was prevailed upon to engrave the sketches: but the various occupations of this distinguished artist were the causes of further procrastination. At length it appears, accompanied with the wishes of its Author, that it may meet with indulgence, and give satisfaction.

* The Medal was presented after the Author had delivered some other lectures which completed his plan. They treated of the subjects contained in the Second Book of this Work. It was the usual medal of the academy; on the reverse of which was the following inscription, in the Dutch language: — “ Presented to the learned
“ PETER CAMPER by the Directors of this Academy, as a grateful Acknowledg-
“ ment for the useful Lectures delivered before the General Assembly in the years
“ 1770 and 1774.”

BOOK I.

PART THE FIRST.

CHAPTER I.

CONCERNING THE CHARACTERISTIC DIFFERENCE OF FEATURES IN THE
MOST DISTINGUISHED PEOPLE ON THE GLOBE.

WHEN we observe a concourse of people assembled together in a large commercial city, from the different quarters of the globe, we are able to distinguish, by a single glance of the eye, not merely negroes from white men,—but among the latter we discriminate Jews from Christians, Spaniards from Frenchmen or Germans, and these from the English. It is also possible to distinguish natives of the southern parts of France from those of the more northern, unless they have been blended by intermarriages. The Scots are also known from the English; and both from the Irish. In the cities of Holland national physiognomy is lost; but islanders retain the original features. The inhabitants of

Hindelopen, Molkwerum, and Koudum *, have still the small face and long chin of their ancestors. Those also of the Bildt * are easily distinguishable from their nearest continental neighbours, by their short and compressed features.

Each country, therefore, has some peculiarity which is perpetuated, until the accidental blending of different people renders their distinguishing marks dubious, or entirely obliterates them. Wars, colonizations, commerce, navigation, and shipwrecks, have so completely intermixed the inhabitants of the most distant countries, that characteristic distinctions are only to be found among those of central provinces, that are remote from the access of strangers. In countries that lie contiguous to each other, and in islands adjacent to continents, the change is gradual, and scarcely to be perceived but by comparing the different extremes.

People are distinguished according to the grand division of continents, into Europeans, Africans, Asiatics, and Americans. The inhabitants of these principal parts of the earth, including the islanders of the South Seas, inhabitants of New Holland and New Zealand, have never been discriminated from each other by permanent characteristics, or personal indications alone. Some attribute peculiar to the quarter of the world; or the specification of some singular ornament, pecu-

* These are inhabitants of different districts in Friesland, on the borders of the Zuyder Sea. They are remarkable for retaining the original simplicity of manners, singularity of dress, and rejecting matrimonial connections with any of their neighbours.

liarity of dress or custom, have always been added. Thus, an Asiatic is distinguished from an European by colour and dress: the African and American, being somewhat similar in colour and dress, are known by the addition of a crocodile, an elephant, a cargo of tobacco, incision of the skin, tatowing, plumes of feathers, &c.

It is, however, a fact, that the inhabitants of Northern Europe (the Laplanders for example) are of a more tawny complexion than those of Java; nor are many of the Persians, or the subjects of the Mogul empire, of a darker complexion than the Spanish. Even the Caffres, although they are inhabitants of Africa, are remarkably different from the Angolese and the Nubians.

Some of the American tribes seem to derive their origin from the northern countries of Asia. The similarity of their make, mode of living, manners, religion, &c. render this conjecture extremely probable. The many journies also taken from Russia, through Siberia, Kamtschatka, St. Andries, &c. to America; and more particularly the celebrated voyage of the late Capt. Cook, afford additional proofs of the fact.

The possibility of making the passage, will be obvious to every one who consults the excellent chart published by that unfortunate circumnavigator, in his last Works; and he will be convinced that it was not difficult for the Laplanders, Samoiedes, Siberians, Kamtschatkans, and the savage nations

of Asia, to find their way to America through the same passage.

No man who contemplates the whole human race as it is now spread over the face of the earth, without a predilection for hypothesis, can doubt of its having descended from a single pair, that were formed by the immediate hand of God, long after the world itself had been created and had passed through numberless changes. From this pair all the habitable parts of the earth were gradually propagated. The difference of colour is not an objection of moment. This frequently varies, while the contèxture of the skin is uniformly similar in all men. I have demonstrated, upon a former occasion*, that it is immaterial whether the colour of our first parents was black or fair, since a change from white to black is equally great as the reverse.

I have in my collection of natural curiosities, several specimens of the skins of Moors, Italians, and of the fairest Dutch women, in which the *membrana reticularis* is to a greater or less degree of a dusky hue; so that no essential difference exists, whichever of the propositions be advanced. It sometimes happens that this reticular membrane becomes as black in our fairest women, during their pregnancy, as that of the blackest negro or Angolese. Of this a curious instance presented itself in the year 1768. The abdomen and breasts of a woman naturally of a fair complexion, had totally changed

* In a treatise on the colour of negroes.

their colour. The celebrated *Le Cat* † has also mentioned several instances of a similar kind. Darkness of complexion begins also to diminish in process of time: of which I have preserved various specimens in the skins of Moors.

Thus it is evident that the fairest skin may become black, and the darkest become fair, without our being able to ascertain the immediate cause. The influence of the sun is universally acknowledged; but the above-mentioned changes in pregnant women, to which might be added instances of white negroes, and of those who are rendered pale through various indispositions, manifest that other causes operate upon this membrane, as well as the sun's rays. And why not? Does not the blood throw off dark coloured particles to the inward surface, and to the iris, of the eye, while the *tunica albuginea* remains perfectly white? Many other instances might be given, where different parts of the body acquire such a surface that they do not reflect the rays of light: that is, they appear dark. Every Tyro in philosophy knows, that objects have no colour in themselves; and that the idea of colour is excited in us according to the manner in which the rays of light are refracted.

Since we are totally ignorant at what period after the formation of the globe man was created, and the human race began to spread over the earth, we shall confine ourselves to the differences in the human species that now exist. The

* *Traité de la couleur de la peau humaine. Edit. Amsterd. Art. IV. p. 130.*

great Buffon has anticipated and exhausted this subject, in his excellent dissertation "On Man, and the Varieties in the "Human Species *." I shall merely select the peculiarities that refer more immediately to our purpose, and take the Calmucks as a specimen.

The Calmucks, compared with ourselves, and more particularly with the most celebrated figures of antiquity, are deemed the ugliest of all the inhabitants of the earth. Their faces are flat, and very broad from one cheek-bone to the other; the nose is so flat, that the sight penetrates into the nostrils; the eyes are near to each other; the lips are thick, and the uppermost lip is long. They resemble the inhabitants of Siam, as described by Loubiere, whose faces are broad across the cheeks, while their foreheads and chins terminate in a point; so that their form is more rhomboidal than oval. Compare Plate I. Fig. 4. with Plate III. Fig. 3. which represent the profile and front face of a Calmuck.

According to Buffon, the face of the Chinese is broad and round. They have small eyes and large eye-brows. The only Chinese I have ever seen was at London, in the year 1785. The smallness of the nose did not strike me. Upon examining the cranium of a Chinese, in my possession, I observe that the cavities or sockets of the eyes, are situated near together, but that they are placed obliquely; nor are they high in the forehead. The *os jugale*, or cheek-bone, is not

* See Nat. Hist. Part III. pag. 371.

broad, but prominent. The superior maxilla, from the bottom of the nose to the teeth, is narrow; as in the Otaheites, and contrary to that of the Calmuck. Consequently they cannot have a broad upper lip.

The greatest singularity that strikes me equally in a Celebese, a Chinese, and an Otaheite, consists in the rectangular form of the inferior maxilla. See Plate I. Fig. 4. * V. S. I have also remarked the same in all the women born in Asia of Dutch or English parents. This renders the lower part of the face much broader than it is in other nations.

The whole form of the cranium of an Otaheite and a Chinese is so very similar, that I might venture to conclude that the inhabitants of Otaheite and the Friendly Isles were a colony from China, notwithstanding the greatness of the distance. On examining the cranium of a Moluccan that is in my possession, I observe that the angle of the lower jaw is not so large, but that the upper jaw projects more; as in the negro and the Calmuck.

I readily agree with Buffon, that the inhabitants of the northern parts of the Mogul empire and of Persia, the Armenians, the Turks, Georgians, Mingrelians, Circassians, and the inhabitants of Europe in general, are not only the fairest, but possess greater elegance of form than any other people. I have, however, seen many Armenians whose countenances were not pleasing. The natives of the more southern parts of France, particularly the females, still retain the semicircular

form of the upper maxilla, and that smoothness of countenance which is so striking in the Pythian Apollo and the Grecian Venus. Most of the northern French have very small heads and sharp faces, like the Scots and many among us: that is, the *os jugale* recedes, and does not spread as in the Calmuck. Compare Plate II. Fig 1. Q. with Plate I. Fig. 4. Q. This difference is not easily discerned by one that is not accustomed to modelling.

But there is no nation so distinguishable as the Jews. Men, women, and children, from their births, bear the characteristic marks of their race. Mr. West, the distinguished painter, with whom I have frequently conversed upon the subject, confessing my inability to discover in what this national mark consists, places it chiefly in the crooked form of the nose. I acknowledge that this contributes much, and that it gives them a resemblance to the Lascars, of whom I have seen numbers in London; and have even taken the model of a face in Paris-plaster. But there is still a somewhat unexplained. It is upon this account that the famous De Wit has so ill succeeded in the council-chamber at the Stadt-house of Amsterdam. He has exhibited in his paintings several men with beards, but they are not Israelites.

It would be impracticable to delineate all the characteristic varieties that exist in nature. To avoid an expensive multitude of plates, I shall consider the Calmuck as the representative of all Asia (from Siberia to New Zealand) and also of North America; as it is more than probable that this

people are descended from the Northern Asiatics. We can determine nothing concerning the Mexicans or Patagonians, as they are not aborigines; and are most probably descended from Europeans.

2. The head of an European shall be considered as a specimen of all Europe, Turkey, Persia, and the largest part of Arabia, as far as Indostan.

3. The head of an Angolese negro shall be substituted for all Africa; also for the Hottentots (who do not materially differ from the negroes); for the Caffres, and for the natives of Madagascar. The Moluccans seem to have blended together the characteristics of the Asiatic and the African.

4. I have prefixed the cranium of the *simia caudata*, or tailed ape, and of a small orang-outang, in order to demonstrate the importance of the facial line, which is applicable to all animals.

CHAPTER II.

THE OPINIONS OF ANCIENT AND MODERN WRITERS CONCERNING THE DIFFERENT SHAPES OF THE HUMAN HEAD, STATED AND REFUTED.

HERODOTUS, Hippocrates, Suidas, Aristotle, Pliny, P. Mela, and many other writers of antiquity, have uniformly maintained that the variety of forms observable in different nations, do not altogether arise from the climate and other natural causes, but also from some original artifice, which finally gives birth to a determined form. This opinion has been adopted by some of the most eminent writers among the moderns; as Cardan, Vesalius, Schenck, and more recently Haller and the Count de Buffon; and it seems to be confirmed by the remarks of numberless travellers. I have controverted the sentiment upon a former occasion*. The whole of the present Treatise will manifest its absurdity.

I did not venture to oppose an opinion uniformly supported by such respectable authorities, until, about thirty years ago, the fœtus of a female negro came into my possession. In this fœtus, which was of about six months, all the features were so strongly marked, that every person could immediately distinguish the negro child, although the colour of the skin was not changed into black.

* See *Prijfverhandeling over de natuurlijke opvoeding des Kinderen. Haarl. Verband. tom. VII. Deel I. p. 374.*

In the year 1758, I dissected publicly at the anatomical theatre at Amsterdam, the body of a negro lad, about eleven years of age. This afforded me an opportunity of demonstrating all those diversities in the cranium, which nature had effectuated. By nature, I mean the influence of country, nutrition, air, &c.

I do not affirm that artifice has never been productive of changes. When I was at London, in the year 1785, Mr. Cline, Surgeon of St. Thomas's Hospital, allowed me to take a draught of the cranium of an aged man from St. Vincent (one of the Carribean Islands) of which the whole forehead was flattened, the crown peaked, while the parietal bones remained convex; which gave a very oblong form to the head. Hunauld has described and delineated one of the same kind: and Winslow mentions another instance of a similar nature. On my visit to Oxford in the same year, I made a drawing of the cranium of a young man that was brought from Nootka Sound, by Captain King, which was also compressed into nearly the same form. This is deposited in the collection belonging to the anatomical theatre of Christ's College.*

If this be a national custom, it is a subject of wonder how so strange a practice could have been introduced into three countries, so very remote from each other; and it is a still

* Mr. Forster has observed, that the inhabitants of Malicolo have the forehead very much flattened, without deciding whether this proceeded from art, or was natural. — See *Observ. faites pendant le 2d Voyage de Monsf. Cook, Paris, Tom. VIII.*

greater wonder that it does not prove injurious to their mental faculties. It is most probable that these were singular instances; for Captain Cook, speaking of the inhabitants of Nootka Sound, in his last voyage*, simply observes, that they have the forehead rather low; without making any other remarks. Mr. Hughes also, who describes the inhabitants of Barbadoes, which is contiguous to St. Vincent, makes no mention of such a custom; and extols the vivacity of the Caribees. But to return to the antients.

Hippocrates † seems disposed to attribute the particular form of the head to the conduct of midwives and nurses. He observes that many persons, considering the oblong form of the head as the most graceful, press them flat during infancy, and that they thus acquired naturally the particular shape which nations considered as the most pleasing.

Vesalius supports this idea, and also asserts that some midwives have been bribed by mothers, to shape the heads of their children into the form of a ball. He conjectures that the flatness and breadth of the occiput in the Germans, proceeds from the manner in which infants are bound in a portable cradle, which the mothers carry on their backs when they travel; and that the more oblong form observable in the heads of Dutch children, arises from their being perpetually placed on the side in the cradle. Neither of these eminent men has

* Vol. II. Chap. 2. pages 288 and 301.

† De Aere & Locis, p. 289

taken into consideration the natural form of the pelvis; which in this country particularly, is frequently so narrow, that the head of the infant cannot pass, until the throes of the mother have moulded it into an oblong form, by which the diameter is lessened.

It is therefore not surprizing that the learned should have acknowledged the influence of art, or that Scaliger* should have confidently asserted that the Genoese, having derived the custom from their ancestors the Moors, should press the heads of their sleeping children until art became nature, and the whole race was born with heads and minds of a Thersites. Cardanus † expressly says, that among the provincials of Portus Vetus, in the West Indies, the people have no necks, but heads of a quadrangular shape; that this originated from art, it having been customary to compress the head between planks; but that nature finally succeeded to art.

Count de Buffon ‡ relates from Raleigh, that there are nations in Guiana whose necks are so extremely short, and shoulders so elevated, that their eyes seem to be placed upon their shoulders, and their mouths upon their breasts. The Count properly compares these to the Scythians, and to the Acephali of the antients. It is very probable that the antients considered apes and the orang-outang as belonging to the

* Comm. in Theophrast. Lib. V. p. 287.

† De Varietate, Lib. V. Cap. 43.

‡ Nat. Hist. page 505.

human race ; and also the modern travellers, seeing them at a distance, have mistaken them for men.

Pliny, when he treats of *Æthiopia**, observes that the Blemmyi have no heads, — that their eyes, and mouths are placed upon their breasts; and that some who are destitute of heads, have their eyes placed upon their shoulders. He also advances †, upon the authority of Eudoxus, that in some parts of India the men have feet an ell long, while those of the women are so small that they have the name of Struthopodes, sparrow-feet; and also, that the ears of some are so long and broad, that they can hide themselves behind them.

Strabo ‡ relates, upon the testimony of Onesicritus, that the ears of some men in India hung down to their heels, so that they could snugly sleep upon them. However, he allows the account to be fabulous. Pomp. Mela § asserts with confidence, that the Otomegalos had such large ears that they could entirely envelop themselves in them.

C. J. Solinus says ¶ that there are men in India, meaning the Panotes, who cover themselves with their own ears.

In the voyages of Captain Cook ** mention is made of the inhabitants of Easter Islands, whose ears are slit through the middle, and hang down almost to their shoulders.

* Lib. V. Chap. viii. page 252. † Lib. VII. chap. ii. page 373. ‡ Lib. V. page 1038. § Lib. III. chap. vi. page 270. ¶ Chap. xix. page 28.
** See Paris edition, 1778, Tom. ii. Pl. 26 and 27.

Count de Buffon enlarges very judiciously upon the causes of the national differences that take place in different people. He reduces these to three: — 1st, The influence of climate; 2d, Of food; 3d, Of manners and customs.

Respecting the first cause, that the colour depends upon it, does not admit of a doubt; and yet it is a fact, that, in the coldest climates, such as Greenland and Kamtschatka, the natives are nearly as black as in Madagascar. However, the hottest climates yield men of the deepest jet, unless they intermix with the inhabitants of other nations.

The peculiar forms of the eyes, cheeks, maxillary bones, and particularly of the nose, may safely be attributed to the influence of climate.

As we are upon the subject, it will not be improper to observe, that no great dependence can be placed upon the portraits of different nations given in the voyages of Captain Cook. The painter, Mr Webber, has in most of them, indicated too much of the mannerist: For example, In the women of Otaheite, represented in the 27th, 28th, and 29th plates. However, he appears to have been more exact in delineating the upper eye-lids in the women of New Holland and Diemen's Land, in plates the 6th and 7th. The women of Oonalaska have the same physiognomy and the same small eye-lids as those of Kamtschatka. Mr. West informs me that this is a peculiarity observable also in the English that are born in North America.

The object of the painter seems to have been to represent the heads and countenances of well-proportioned men and pleasing women. This is remarkably the case in the young females of Otaheite, particularly in the 28th and 29th plates; to whom he has given the features of Frenchwomen. On the other hand, those animals which have nothing pleasing in their figures, are always represented as monsters: as will appear from the 52d plate.

The influence of food may be learned from our own animals, the horse, cow, and sheep; although there is no great diversity of climate in the different provinces of Holland. A rich or a meagre pasturage changes the form, the horns, and the wool of animals.

Under the article of Nutrition, I comprehend fluids and peculiarities of atmosphere as well as food. But how these operate, and why the upper maxilla of a negro, and the cheek-bone of a Calmuck projects; and why the socket of the eye is lower and more oblique in a Chinese and a Moluccan, cannot be fully explained. To observe and point out particularities is the principal business of the naturalist. Food and climate frequently co-operate; but we cannot suppose them productive of a different race. Black, tawny, and white men are simply varieties; they do not constitute essential differences. Our skin is precisely of the same contexture with that of the negro; but it is not of so deep a dye.

It is probable that the hair becomes long and straight, or curled or frizzled, according to the nature of the food,

chiefly. It is remarkable that the natives of Drent, and of the bishopric of Munster, have naturally sleek hair; but after they have resided some years in Amsterdam, it begins to curl. Of this we have many instances.

Manners and customs indubitably operate with great force upon the form and posture of the body. A polished education renders the whole figure elegant. Of this we have daily instances in polished nations.

A particular manner of sitting, of lying, of standing, and walking; various corporeal defects, and other circumstances of the like nature, give a particular cast to the whole body. This is so obviously the case, that the countenance of a deformed person will become deformed; that is, it sinks gradually by the pressure of the brain, which has now lost its equipoise. Thus the socket of the one eye sinks lower than that of the other. Of this I have a very remarkable instance in my cabinet. In a person that is lame, the whole knee turns inwards by the twist given to the femoral bone. In those who are formed awry, or are very round-shouldered, the clavicle is straighter and longer. I shall not mention the pernicious effect of stays, with which so many of our females spoil the shapes of their children, without being admonished by their own. We ridicule the Chinese for maiming the feet of their females in so forcible a manner, and yet we are guilty of a similar folly, as I have demonstrated upon another occasion*. Nay,

* In a treatise concerning the best form of a shoe.

we exceed them; for we not only incapacitate the female sex from walking, but we disable ourselves. The fillets that bind up the hair of our ordinary women, leaves an impression in their heads. Garters make a deep furrow under the knee, as effectually with us as with the inhabitants of Brasil, who consider it as an ornament.

Education, employments, and a suitable mode of living, add a beauty both to the features and to the limbs. They render the whole body more elegant. Such is the difference between persons genteelly educated and those who have been totally neglected, that it is scarcely credible that manners and habits should be able to effectuate such changes in the same being.

Various endemic diseases are not less influential. The rachites, or rickets, may occasion numberless deformities of body. By the way, it appears from the writings of Hippocrates, that the inhabitants of the most salubrious climate in the universe were subject to this disease, as well as those of the more northern or southern regions, otherwise he would not have been able to describe the diseases which are derived from this source in so masterly a manner.

In proportion as the indispositions arising from deformity are subjects for commiseration, ought the cruel and inhuman taste of the contemporaries of Longinus to be held in contempt. He tells us*, that they took pleasure in keeping dwarfs locked

* Longinus de Sublimitate. § xiii. page 233.

up in confined chests, and in swathing them with bandages, on purpose to give them some ludicrous deformity. This conduct appeared to him so cruel, that he inclined to doubt the fact; but we learn from Suetonius, that such deformed persons were kept in all the houses of the great. Tiberius prohibited these *ludibria naturæ*; but Alexander Severus, on the contrary, amused the populace with them. In Russia they are still exhibited in the palaces of the nobility.

CHAPTER III.

PHYSIOLOGICAL OBSERVATIONS CONCERNING THE DIFFERENCE OF FACES IN PROFILE; FROM APES, OURANGS, NEGROES, AND OTHER CLASSES OF PEOPLE, UP TO THE ANTIQUE.

THE assemblage of craniums, and profiles of two apes, a negro and a Calmuck, in the first plate, may perhaps excite surprife. The striking resemblance between the race of Monkeys and of Blacks, particularly upon a superficial view, has induced some philosophers to conjecture that the race of blacks originated from the commerce of the whites with ourangs and pongos; or that these monsters, by gradual improvements, finally become men.

This is not the place to attempt a full confutation of so extravagant a notion. I must refer the reader to a physiological dissertation concerning the ourang-outang, published in the year 1782. I shall simply observe at present, that the whole generation of apes, from the largest to the smallest, are quadrupeds, not formed to walk erect; and that from the very construction of the larynx, they are incapable of speech. Further: They have a great similarity with the canine species, particularly respecting the organs of generation. The diversities observable in these parts, seem to mark the boundaries which the Creator has placed between the various classes of animals.

The proximity of the eyes to each other, the smallness and apparent flatness of the nose, and the projection of the upper lip, constitute the principal points of resemblance; and these are much exaggerated by our modern naturalists, by their heightened descriptions, and embellished plates; but they will immediately diminish in our estimation, if we give attention to the whole body, or minutely examine every part of the head. This will evidently appear by comparing together the different figures of the first plate.

All the figures in the first, second, and fourth plates are sketched in profile*. In this manner the differences may be more easily and accurately investigated. The bones of the cranium may also be the better contemplated as the basis of the features, which are immediately placed upon and under them.

In each of these figures the greatest accuracy and precision have been diligently studied. For example: An horizontal line has been drawn through the lower part of the nose (see Plate 1. N.) and the orifice of the ear C.; and the four skulls were arranged with care on the line A. B.; attention being also paid to the direction of the *jugale*, or cheekbone Q. Fig. 3 and 4.

In order to preserve the true form and relative situations of the parts, I did not view them from one fixed point, but

* Pliny calls these side-drawings *catagrapha*, and *imagines obliquas*. He attributes the invention to the celebrated Cimon Cleonæus. — See Lib. XXXV. Cap. viii. p. 690.

my eye was always directed, in a right line, to the central point of the object, in the manner practised by masons and architects; avoiding the rules of perspective, by which particular parts are always distorted and misplaced. I viewed the object with only one eye.

To facilitate this business, I invented a machine sufficiently large to receive the largest skull. It consisted of an horizontal quadrangular table, upon which was placed a perpendicular frame, that was also quadrangular. In the laths which completed this frame a number of holes were bored parallel to each other; so that threads could be drawn through them, and be fastened in every direction required. By these I was able to make horizontal, perpendicular, or oblique lines at any convenient distance from each other.

The fore part of the square table is also divided into equal portions, by means of brass pegs, correspondent to the holes made in the upper part of the frame, that lines may also be drawn by means of threads obliquely downwards: thus may the true point of vision be obtained, by placing the eye in such a direction, that the oblique thread may perfectly coincide with the perpendicular one.

The table before me being elevated to such a height that my eye became parallel with the horizontal line A. B. I placed the skulls, by the side of each other, on the table behind the perpendicular threads of the frame. By extending the oblique threads in such a manner as to make them pass over

the principal parts, and by means of the perpendicular lines, I was secure of all the points requisite to afford me an accurate drawing.

It was in this manner I discovered in all the figures, that the lines N D. and E F. intersect each other in C. before the aperture of the ear; and also the point of contact of the front teeth was at N. and of the occiput at D; by which the size of proportion of N C. to C D. that is, the relative distances from the extremity of the fore teeth to the aperture of the ear, and from thence to the extreme part of the occiput, became manifest.

The great utility of this method will fully appear hereafter. I shall only remark at present, that the point C. generally coincides in the human species with the line of gravity of the whole body (see Plate Second, E F. or E F, e.) and thus in the centre of the head's motion: which is in the place of union of the condyles of the occiput with the first vertebræ of the neck. See P W. in the third and fourth figure of Plate I. or W. in Plate II.

By means of the same instrument, the exact height of the heads could also be ascertained (see E F. in all the upper figures of Plates I. and II.) and also the proportionate size of E C. that is, of the head from the vertex or crown, to the aperture of the ear, compared with C F. or the distance from this aperture to the lower edge of the maxilla: likewise the proportions between H N. and N I. or the relative dif-

tances from the line of the vertex to that which passes under the nose; and from this to the lower edge of the maxilla. It also marks the squares H, I, L, K, in which these heads were delineated.

Further: As the closing of the teeth marks the mouth at G. I was able to draw an oblique line from G. to M. along the nasal bone ^A, and the forehead T. This, upon account of its great use in discriminating the difference of faces, may properly be termed the *linea facialis*, or the facial line.

The first figure of the first plate represents the exact profile of a *simia caudata*, or tailed ape. I do not recollect the particular species. It had a flat forehead, which was somewhat elevated above the rim of the eye-sockets: It had five double teeth, and facculi; so that it was a native of Africa. The facial line M G. makes with A D. the angle M N D.; which is equal to 42 degrees.

NC was to CD :: 8 : 2½ or :: 16 : 5.

EC : CF :: 7 : 7. that is, EC = CF.

Or, in more familiar terms,

The distance from the mouth to the orifice of the ear, was, compared with the distance of this orifice from the bottom of the lower jaw, as 8 is to 2½, or 16 to 5: and the distance from the vertex to the orifice of the ear, was precisely equal to the distance of this, from the basis of the lower jaw.

The second figure is drawn from a small orang-outang, reduced to one fourth of its natural size. It is the same that I had delineated and described in a former Treatise*. It was very young, and had not more than two double teeth.

The facial line M G. made with A B. or N D. an angle of 58 degrees: N C. compared with C D. was as 7 to 4.; and E C. compared with C F. nearly as six to four.

The high forehead of this animal gives it a greater resemblance to the human species; and the sockets of the eyes are more elevated; which communicates a more animated appearance to the eyes themselves.

Edwards, who has but imperfectly delineated this species of ape †, gives to the facial line an angle of 55 degrees. This small difference may be overlooked, as much greater are perceived in the human species.

The real pongo has been lately discovered in the Island of Borneo; and a description of it is given in the Batavian Transactions ‡. This animal is, upon the whole, of a similar figure to the other; but it is about twice the size. I have in my possession the skull of one that was four feet five inches

* Natuurkundige Verhandeling over den orang-outang. Amst. printed for Erven and Meyer. Plate II. Fig. 1 and 2.

† Gleanings of Nat. Hist. 1758. Tab. 213.

‡ Vol. II. p. 245.

in height; whereas the smaller species seldom exceed two feet and a half. This however has less of the human form, as its forehead is flatter, the cheek-bones are broader, and the jaw-bone projects farther. The facial line makes with the horizon an angle of 47 degrees.

The cranium of the young negro, represented in the third figure of the first plate, immediately indicates the human countenance. He was changing his teeth; as may be known by the second grinder and a lower incisive tooth that were fallen out; and the succeeding teeth were advancing. He had only four teeth on each side. I dissected the body of this youth publicly at Amsterdam, in the year 1758.

The facial line M G. made an angle of 70 degrees with the horizontal line N D.

N C compared with C D was as $7\frac{1}{2}$ to 8, or as 31 to 32.

EC : CF :: $8\frac{1}{2}$: 5, or as 17 : 10.

The projecting point of the jugal, or cheek-bone, Q. was in the centre between the mouth and the orifice of the ear; that is, N Q : Q C :: 4 : 4. or N Q = Q C. It is the projecting part Q. which gives the degree of flatness to the face. This is strongly marked on the medal of Bocchus, King of Mauritania. See Plate X. Fig. 1. and 2.

Albert Durer, having occasionally delineated a Moor, in his treatise on the changes of the facial line in different

countenances, has made the facial line correspond with that of ours: its inclination being about 69 or 70 degrees.

The antients seem to have paid great attention to the facial line. This is particularly observable in the *Recueil d'Antiq.* of Count Cæylus*. In some of the plates, the head of a negro is represented upon an ornamental lamp, with singular accuracy.

The fourth figure of our first plate represents the head of a Calmuck. As the teeth and under jaw were wanting, I have been obliged to supply the deficiency from the cranium of an aged negro, the size of which was nearly similar.

The facial line M G. made also an angle of 70 degrees with the horizontal line N D. $NC : CD.$ was as $11 :: 7\frac{1}{4}$ or as $44 : 29.$ and $EC : CF :: 10\frac{1}{2} : 6.$ or $21 : 12.$ $QC = 15.$ And thus $NQ : QC :: 7 : 15.$ That is,

The distance from the extreme projection of the teeth to the orifice of the ear, compared with the distance of this from the extremity of the occiput, was as 11 to $7\frac{1}{4},$ or as 44 to 29. The distance from the vertex to the orifice of the ear, compared with the distance of this orifice from the

* See Tom. VII. Pl. li. Fig. 1 and 2. and Pl. lxxxi. Fig. 5. also Part V. Pl. xc. Fig. 2.

lower edge of the inferior maxilla, was as $10\frac{1}{2}$ to 6, or 21 to 12. The most projecting part of the jugal bone, from the orifice of the ear, was equal to 15; that is, the distance of the mouth from the process of the jugal bone, compared with the distance of this from the orifice of the ear, was as 7 to 15.

From a large collection of European heads in my cabinet, I have selected the one represented in the second Plate, figure the first. In this, as well as many other which I measured with care, the facial line M G. made an angle of 80 degrees with the horizontal line N D. or A B. The proportions were as follow :

N C was : C D :: $7\frac{1}{2}$: $7\frac{1}{4}$, or as 30 : 31. E C : C F :: 9 : $5\frac{1}{2}$.
or as 18 : 11. N Q : Q C :: $3\frac{1}{2}$: 4. or as 7 : 8.

It follows from hence, that the angle of the facial line has in nature a *maximum* and a *minimum* from 70 to 80 degrees; which describe its greatest or smallest degree of elevation. When the *maximum* of 80 degrees is exceeded by the facial line, it is formed by the rules of art alone: and when it does not rise to 70 degrees, the face begins to resemble some species of monkeys. This will be fully explained hereafter.*

To proceed with as much perspicuity as possible, I shall place the facial line M G. erect in the perpendicular line

* See Part III. Chap. ii. of this Treatise.

H I. See Plate II. Fig. 2. The angle is now become 10 degrees larger, and the cavities of the eyes, cheek-bones, &c. are brought forwards and nearer to N M.

Imagine a cranium of a pliable consistence, and that the occiput could be pressed forwards and upwards; then must E C. or the distance from the aperture of the ear to the vertex increase, and again the space E Y.; although the cavities of the eyes, and the eyes themselves, will still remain in the line T U.

The line S V. which marks the oblique direction of the lower jaw, rises also in the same proportion, until it approaches to D.; until it coincides with D. as in Figure 3. or rises above it, as in Fig. 4. of the same plate. On the other hand, the distance between T X.; that is, between the facial line and the perpendicular line that passes from the vertex by the orifice of the ear, gains as much as X U. has lost. The head becomes gradually narrower also in proportion as the facial line rises and inclines forwards into the 100th degree; which is the *maximum*, or utmost that the artificial line will permit. In this case the eyes, placed in the centre of their cavities, are exactly in the middle of the head, or at an equal distance from the vertex and the bottom of the chin. See Figure 4. of the same plate.

If the projecting part of the forehead be made to exceed the 100th degree, the head becomes mishapen, and assumes

the appearance of the hydrocephalus, or watery head. It is very surprising that the artists of ancient Greece should have chosen precisely the *maximum*, while the best Roman artists have limited themselves to the 95th degree, which is not so pleasing; as the comparison of the 3d and 4th Figures of this Plate will evince.

The two extremities therefore of the facial line are from 70 to 100 degrees, from the negro to the Grecian antique; make it under 70, and you describe an ourang or an ape: lessen it still more, and you have the head of a dog. Increase the *minimum* and you form a fowl, a snipe, for example, the facial line of which is nearly parallel with the horizon; that is, both the maxillæ will be lengthened, and the lower maxilla will gradually lose its angle C V S. No space is now left for teeth; which explains the reason why fowls are destitute of teeth.

I have sometimes amused myself with making these gradations upon a smaller scale, by sketching them on a long slip of paper; which exhibits a singular appearance. It is not necessary to give a specimen, as they can be easily made by every one skilled in drawing.

If attention be given to the angle M G S. which describes the angle formed by the facial line and the lower extremity of the chin (see the four Figures of the First Plate) it will be immediately perceived that this becomes larger, *i. e.* more rectangular, in proportion as the facial line M G. ascends; it is

therefore the largest in a European (as in Fig. 1. Plate II. G I.); and that it projects forwards with the facial line, which it always follows, as in Fig. 2, 3, 4. of Plate II. In this situation the angle of the lower jaw becomes more erect, the distance from I. to F. becomes less, and V. is rounder. It is this which makes the maxillæ of the antique heads rounder and more graceful; as will appear in the 4th Fig. of the second Plate.

The eyes, which are placed nearly in a line with the upper edge of their sockets, gradually recede in an European and the antique; that is, S r. or the distance from the eye to the ridge of the nose, gradually becomes greater. See the 2, 3, and 4th lower Fig. of Plate II. This gives a certain elegance and dignity to the countenance of the antique, which cannot be otherwise acquired.

It is plain, if the cavity of the eye remains at the same distance from the perpendicular line I H. and the forehead be made to project forwards, that this depth or distance will increase according to the degree of projection. See the same Plate and Figures.

If I am not deceived, the size of the mouth is in proportion to the distance of the *dentes canini*, or eye-teeth, in men and animals, with only a few exceptions. Or, to speak more properly, the angles terminate at the commencement of the first double tooth, or grinder. Many animals have not the eye-teeth.

In apes therefore, in the orang, and in the negro, the rim or angle of the mouth must be more distended than in an European, as the projection of the upper jaw enlarges the distance. For the same reason, the mouth of the antique will be the smallest.

The central line of the ear is, in all persons, somewhat inclined, as I have represented it in Figures 3. and 4. of the sixth Plate. It is never parallel with the facial line in white men. It is, however, in the negro; as is apparent from the third figure of the first Plate.

I have placed the central line of the ear perpendicularly in the second Plate, that the true distance of the eye from the ear may be more accurately ascertained.

CHAPTER IV.

REMARKS CONCERNING DIFFERENCES IN THE FACIAL LINE, AND THE CHANGES WHICH NECESSARILY ARISE FROM THENCE.

IN the preceding chapter, I have simply shewn the kind of angle which the oblique line M G. makes in all the figures of the first and second Plate. Let us now pay attention to the triangle T G S. of Plate I. Fig. 3. and 4. and it will appear that this triangle is not remarkably large in the European, represented in Plate II. Fig. 1. In the second figure of this second Plate it is totally effaced: in the third the angle becomes *minus*; and in the fourth the *minus* is increased.

Let us now suppose that all these heads were of an equal size, and that the nose of each projected to an equal distance from the line or surface T S. (Plate I. Fig. 3. and 4.) it is manifest that the nose of the negro and Calmuck will seem to be less, and, as it were, pressed inwards.

The nose of the European (Plate II. Fig. 1.) will appear somewhat bent, and also to project farther than the upper lip. In the face of the antique (Fig. 4.) the nose will be nearly in a perpendicular line with the forehead, and project but a little from the lip.

The lower jaw, as well as the upper, is also much forwarder in the negro, Caffre, and Calmuck; and therefore it is that these people approach nearer to the figure of an ape

than either the European or the antique. The lines *m g s.* are nearly the same with the lines *M G S.* Compare the lower sketches with the upper, in Plate I. Fig. 2. and 3.

In a Calmuck, the upper jaw is very flat before, because the cheek-bone *Q.* (Plate I. Fig. 4.) being very large, nearly advances to the perpendicular line *T T.* that is, directly over the middle molaris or grinder. In the Chinese, Otaheites, and other orientals, the cheek - bone *Q.* corresponds with the division between the third and fourth grinder hindwards.

In the negro, *C Q.* is obviously shorter, and the line falls behind the third grinder. In the European, *Q.* is behind the fourth grinder; and in the antique head, it comes yet more forwards. Hence it follows that the features of antiques, those of Apollo, for example, must be flatter than ours; and, on the other hand, those of Asiatics and Africans still flatter; and those of the Calmucks the flattest of all.

The distance from *N* to *G.* *i. e.* from the undermost part of the nose to the union of the upper and lower teeth, is greater in a Calmuck than in a negro; and in him greater than in us. On the contrary, *N G.* is very short in an Asiatic. The lips must necessarily be longer and thicker in proportion to this distance; and therefore is the upper lip the longest and thickest in a Calmuck, and the smallest in the antique.

If attention be paid to what may be called the Suspension of the face, *i. e.* the distance of *P F.* (Fig. 1, 3, and 4. Plate I.)

or the axis upon which the head moves from the line of the lower maxilla I L. in a negro or Calmuck (Plate I. Fig. 3. and 4.) or the European (Plate II. Fig. 1. W.) it will appear that the maxilla and the chin are deeper or lower in the two former than in the latter. The condyle also, or prominence on which the head turns, is in the same line, as the union of the teeth of the upper and lower jaw. See Plate I. Fig. 3. W G. Hence it follows that the neck of a Calmuck is shorter than that of an European: or rather, that it appears to be shorter, because the lower jaw, or chin, sinks so much lower. In proportion as the chin is lower, the condyle of the neck shorter, and the shoulders raised in consequence of the length of the clavicle (as is the case with the orang, and with all deformed persons) will the head sink more upon the breast; and the stronger will be the resemblance to the people who are denominated Acephali; and who are said to exist in Guinea.

Again: As the *foramen magnum* of the occiput is not always placed at an equal distance from the perpendicular line K L. and as the condyles are placed in an oblique direction before and on each side of the *foramen*, it follows, that the centre of motion of the head will vary considerably in different people. The line N D. extended from the extreme point of the mouth to that of the occiput, may be compared to a lever, of which the centre of motion is in C. Now, in proportion as the distance from N to C. is increased, will the face project forwards, and the neck will appear shorter.

The following appear to be the different proportions. In the Calmuck is N C. or the distance from the extremity of the teeth to the orifice of the ear, compared with C D. or the distance from this orifice to the extreme part of the occiput, as $12\frac{1}{2}$ to 6 : or nearly as 2 to 1.

In the negro is N C : C D :: $7\frac{1}{2}$: $8\frac{1}{2}$:: 15 : 17

In the European is N C : C D :: $7\frac{1}{2}$: $7\frac{1}{2}$:: 1 : 1

In the antique is N C : C D :: $7\frac{1}{2}$: $5\frac{1}{2}$:: 15 : 11

The heads of the Calmucks must of consequence incline forwards, and sink upon the shoulders.

The heads of negroes incline backwards, as the heaviest part is behind the centre of motion.

The head of the orang-outang must be more forwards than that of the Calmuck, for the reasons given; and the head of the ape, the dog, horse, &c. still more than either of these.

The heads of the Europeans remain in an equipoise; which gives them something of an haughty mien.

In the antiques the gentle inclination of the head, particularly in the statues, communicates the most state and dignity to the countenance.

Since I began to compose this Treatise, I have been able to procure the entire cranium of a Chinese, who died in the

flower of his age*. The facial line was 75 degrees. The cavities of the eyes were in breadth, compared with their height, as 12-8ths to 9-8ths = $1\frac{1}{2}$ d. In the European they are equal. It is not surprising, therefore, that the countenance of the Chinese should have a melancholy aspect, and that the chinks or fissures formed by the upper and lower eye-lids are naturally so long.

Their superior maxilla is narrow; that is, the space from N. to C. is very small; so that they cannot have a large lip. However, the lower jaw is of a more quadrangular form than in the European or the negro. In the Chinese it makes an angle of 110 degrees; in the European, of 120; and in the negro, 125. See S V W. in Plate II. Fig. 1. and Plate I. Fig. 3. The lower jaw of the Chinese has, upon this account, something of the ape, and particularly of the orang, in its form.

I took a sketch of the entire cranium of an Otaheite, who was brought into Europe by Captain King, when I was at

* In the Chinese, the length of the head, from N. to D. is equal to its height E F. The difference between N C and C D, is as 4 to 3. The line E F passes through the condyles of the occiput; so that N W is equal to W D.

Although the cranium of the Chinese is not delineated in these plates, yet the letters have similar references, as in the first and second Plates. However, it must be remarked, that N C in this place denotes the distance from N to the orifice of the ear C, and N W the distance of C from the middle of the condyles of the occiput.

M. D'Aubenton, *Mem. sur les differences de la situation du grand trou occipital dans l'homme & dans les animaux*, has many curious and just observations upon this subject. — See *Mem. de l'Acad. Roy. des Sciences de l'Annee 1764, imprime 1768.* 8vo. p. 935.

Oxford, in the year 1785, which has a very great resemblance with that of the Chinese. The facial line was, however, perpendicular; which may have been incidental. In the cranium of an islander of the Celebese, are the same peculiarities as in that of the Chinese.

In the cranium of a man of the Celebese, and one of a Macassar, which I possess, there is a complete similarity; more than with that of a Moguller; which has, notwithstanding, much of the Asiatic in its form.

It is amusing to contemplate an arrangement of these, placed in a regular succession: apes, oranges, negroes, the skull of an Hottentot, Madagascar, Celebese, Chinese, Moguller, Calmuck, and divers Europeans. It was in this manner that I arranged them upon a shelf in my cabinet, in order that those differences might become the more obvious which I have described in the preceding chapter.

To perceive at once the great utility of these principles, let any person sketch the profile of a negro, as in Plate VI. Fig. 1. resembling the one delineated in the third figure of the first plate; the outlines of which are marked in the sixth plate by the letters K A, B, H, I, L, M, then draw the facial line of an European along the forehead F E, of 85 degrees; which will direct him to sketch from A to N E and O, and to terminate in I, and he will immediately have the face of an European.

Or let the face of an European be first sketched; and by inverting the mode, the physiognomy of a negro will be obtained.

By covering the dotted line A B H, with the tips of the fingers, the European face becomes more conspicuous: on the contrary, by covering N E O, the negro will more perfectly appear.

CHAP. V.

PHYSIOLOGICAL EXAMINATION OF THE DIFFERENCE IN THE FEATURES, WHEN VIEWED IN FRONT.

THE third plate exhibits, at first glance, the principal differences between the Negro, Calmuck, and European, as copied from Nature; and also the head of a Pythian Apollo, drawn according to the principles advanced, and which will be more fully considered hereafter.

The orang-outang that was represented in profile, in the second figure of the first plate, is now placed in front, that the breadth of the jugal or cheek-bones *M N.* may be more accurately compared with the breadth of the head at *P O.* and that the small space between the eyes *Y Z.* may be compared with that in the Calmuck.

In the orang, the length of the head *I H.* compared with its greatest breadth, at *P O.* is in the proportion of $19\frac{1}{2}$ to 14 : and *P O.* compared with the breadth of the cheek-bones *M N.* as 14 to 14 , that is, equal. *M N.* compared with the breadth of the temporal bones *X W.* is as 14 to $10\frac{1}{2}$.

The reader will perceive that all the correspondent parts are placed upon the horizontal line *A B.* and that the height of each is also adapted to the scale of its profile.

Let us now examine the negro, Plate III. Fig. 2. This head, in length, compared with its breadth, is as 27 to 20: that is, $I H : O P :: 27 : 20$. But $O P : M N :: 20 : 18$. and $M N : X W :: 18 : 16$. The lower jaw $U V$. is as 12. Thus does the whole face gradually diminish from P . in the direction of $M V$. to H . and $O N U H$, retaining much of the oval form. The apertures of the nose are very wide, compared with the length of the nose: so that $E F$. is to $D C$. as 2 to 3. It necessarily follows, that the pinnæ which are formed to cover these apertures, will be expanded on each side, and the nose will be very broad.

The distance of the cavities of the eye $Y Z$. is as 3; so that the eyes exceed in nearness to each other the breadth of the nose: and the pinnæ, which are placed at the side of $E F$. will be at least as 4 in breadth.

In this negro, the diameter of the eye-socket from the forehead downwards, was very large: that is, $K L$. was equal to 6: so that the eye might have been large. In others I have found the cavities smaller; as also in the Chinese. There is also a great difference among Europeans in this respect.

When I drew lines from the upper edge of the small nasal-bones at C . over the broadest parts of the nose at $E F$. down to Q and R . the four *dentes incisorii*, and the two *dentes canini*, or eye-teeth, were inclosed between them. Now as the mouth always covers the eye-teeth, $Q R$. will necessarily limit the breadth of the mouth. In proportion as the distance

from Q to R. is great, compared with the breadth of the maxilla at V U. will the mouth appear ugly and disproportioned; Q R. is nearly as 8, and V U. as 12.

Negroes have small ears; but as the mammillary processes are the breadth of the cheek-bones M N. they stand off from the head. This is observable in all negroes.

The Calmuck is very differently formed. (Plate III. Fig. 3.) The proportions are as follow:

The height of the head I H. compared with its breadth at O P. is as 16 to 10, or 32 to 20.

O P. compared with M N. the projection of the jugal-bones, is as 20 to 24.

M N. compared with X W. the temples, is as 24 to 19.

U V. the lower jaw, is as 8 or 16.

This face has also something of a lozenge or rhomboidal form. It is narrow and pointed towards the crown; becomes broad at O P. is the broadest at N M. and becomes suddenly small at U V. This has been already remarked by La Loubiere.

The apertures of the nose E F. are as 24; so that the pinnæ cannot be very broad; but the openings in the nostrils

are very conspicuous; as will be obvious by comparing the cranium with the face, in Plate I. Fig. 3.

The distance of the eye-sockets Y Z. is very small; so that the eyes stand much closer together than in the negro.

The diameter of these cavities at K L. compared with I H. or M N. is also very small; and as the *musculi rotundi* always lie upon the jugal-bone, the fissure must be oblong; at least must appear so, as the pleats or wrinkles in the smaller canthus or angle seem to lengthen it. In the Chinese the eye-sockets are broader than they are high: hence they have long eyes.

The triangle C Q R. drawn in the same manner as in the negro, describes $QR = 3\frac{1}{4}$; that is, includes the four *dentes incisorii*, and the half of the eye-teeth. The other portions being added, the mouth will become $= 4$ and seven-eighths, or nearly 5.

Since the cheek-bones are remarkably broader than the head; that is, $MN : OP :: 12 : 10$. the ears are almost hid behind them; as in apes, and particularly in that described in Fig. 1. of this plate, which has also a striking resemblance to the Calmuck, in the narrow space between the eyes, breadth of the jaw-bones, and flatness of the face.

Very different from those in the Calmuck are the proportions

observable in modern Europeans; particularly in our own countrymen: for

$$I H : P O :: 29 : 23.$$

$$P O : M N :: 23 : 20.$$

$$M N : W X :: 20 : 17.$$

$$M N : U V :: 20 : 13.$$

our faces therefore have the form of an oval, which is shorter in proportion to its breadth than that of the negro.

The distance between the edges of the eye-sockets $Y Z$. being equal to the breadth of the nasal apertures $E F$. our eyes are placed at a greater distance from each other: and as the diameter of these sockets $K L$. are = 3, there is space for large eyes. But the pinnæ of the nose are broader than the space between the eyes.

The ears are closer to the head, in consequence of $O P$. the parietal-bones being so much broader than the jugal-bones $M N$. This will be clearly understood from what has been advanced concerning the negro and Calmuck.

The triangle $C Q R$. being longer, and the distance from the upper part of the nasal-bone C . to the junction of the teeth at G . being greater; thus is the mouth $Q R$. obviously smaller; $E F$. in the European being equal to $E F$. in the negro; that is, 3. The mouth $Q R$. moreover is to $U V$. equal to 6, compared with 13.

In antiques, the facial line M G. being made to project (see Plate II. Fig. 4.)—the crown becomes more elevated, and rises from Y to E. which is equal to the degree of projection at M H. Hence it is that in the fifth figure of this third plate, the head of the antique is made so high, although it is formed after the same model. Artists have also made M N. (the jugal-bones) equal to P O. (the parietal-bones) in breadth: the occiput is narrower, the maxillæ smaller, and the eyes are placed at a greater distance from each other. In the antique the following proportions are observed:

$$I H : P O :: 33 : 20.$$

$$M N : W X :: 20 : 17.$$

$$M N : V U :: 20 : 16.$$

consequently the face is in the form of a more oblong oval.

The ancients divided P O. into four equal parts; one for each eye, and one for the distance between the eyes; $P O = 3 = Y Z$: whereas it was only 2 in the modern head.

The nose also inclining forwards, as represented in the lower sketch (Plate II. Fig. 4.) it is proportionably longer (see T h.); and the upper lip becomes proportionably shorter.

The nasal apertures remaining of the same width as in us, the pinnae are equal to Y Z. or the space between the eyes; and also to the size of the mouth Q R.

Through the projection of the facial line, the eyes are deeper seated; and the middle line which runs across the angles of the eyes OP . divides IH . into two equal parts at d ; but this takes place alone when MG . the facial line, makes an angle of 100 degrees with AB . which is the *maximum* of its inclination. See Plate II. Fig. 4.

CHAPTER VI.

DIVERSITY OF FEATURES IN THE COUNTENANCES OF DIFFERENT PEOPLE, NATURALLY EXPLAINED.

WE have already enumerated, in the second chapter, all the causes alledged by ancient and modern writers of the diversities of make observable in the human countenance, and we have added our opinion to that of the acute naturalist Count de Buffon, that the climate, under which we include the influence of air, of food, and customs, is of itself sufficient to give some particular and appropriated form to the bones; and consequently to the softer parts. When we add the different diseases peculiar to some countries, which cooperate with the above causes, we shall not be surpris'd that a similar diversity should be found in the human species dispersed over different parts of the globe; as may be observed in plants, fowls, quadrupeds, &c.

It has, we hope, been fully demonstrated, that in the negro, the upper maxilla naturally projects remarkably forwards; and that in consequence of that formation, the line M G. inclining backwards, makes an angle of 70 degrees; as represented in Plate I. Fig. 3 and 4. Hence it necessarily follows, that the fore-teeth must also project; and that, to cover these, the lips, particularly the upper lip, must be long, thick, and broad; and the under lip must also be conformable to the

other. The nose advancing farther than the line T S. in a similar proportion (see Plate I. Fig. 3) must appear, from the jutting out of the upper lip, to be pressed inwards. No art is required to produce this appearance; nor was it requisite for mothers or midwives to squeeze in the one, or stretch out the other.

The width of the nasal aperture in the cranium, requires the nose to be broad; and that the pinnæ, which are placed externally, should be proportionate to the apertures in the bony parts. Why have not philosophers and travellers, who suffer themselves to be deceived by idle tales, informed us that the negroes made the sides of their nose spread, by means of some compress? Their accidentally striking them against the backs of their mothers might, perhaps, flatten the cartilaginous part, but could not enlarge the nostrils on each side with such perfect symmetry.

The flatness of the face depends upon the extension of the jugal-bone, from C to Q. Plate I. and II. Hence it is clear to a demonstration, that the faces of the easterns were not rendered flat by artificial compression, but that they are so from natural causes; at least they appear flat when compared with our own.

It has also been shewn, that in the negro, the back part of the head is heavier than the fore part; that is, C D E. is heavier than E. T. G. S. P. C. Plate I. Fig. 3. The negro, therefore, naturally throws his head backwards, particularly

young persons; while the neck is protruded forwards, and the loins bent inwards, in order to maintain an equilibrium.

It is from this cause that they have small hips, and that the pelvis is generally narrow. Its breadth, compared with its depth, is in the proportion of 9 to 7; while in most other men, who are well formed, it is as 11 to 7. As the negroes with whom we are best acquainted have been slaves, and been compelled to hard labour from their tender years, their knees become bent in an inward or outward direction; and hence it is that so many of them have crooked and misformed legs.

Many other causes might be added, upon which I shall not enlarge, as it is not my plan to give a minute description of the whole body.

What has been advanced will sufficiently demonstrate, that art has no more influence in changing the features than in changing the colour, or in crisping the hair; and that to Nature alone these differences must be ascribed.

For similar reasons is the face of a Calmuck, Chinese, and Siamese, flat, the nose small, the nostrils open and exposed. Their lips will be larger or smaller, according to the size of the upper maxilla.

Let us admit for a moment, that the sides of their heads were pressed between planks, according to the narratives of

ancient authors, whence is it that the jugal-bones spread out so much? They also must have been compressed. From what cause is the distance between their eyes so small? If this proceeded from their being pressed closer together, the upper jaw, instead of being much broader than with other people, must also have become flatter at the sides.

As C Q. is so long (see Plate I. Fig. 4.) and the back part of the head C D E. so small, compared with its opposite E T G S C. the head must necessarily hang over, and the subject become round shouldered; that is, directly opposite to the form of the negro. The head will also sink between the shoulders, as in the orang, and other species of apes.

The head of the Calmuck is decidedly greater than ours, while their body is small. Besides, they cannot walk perfectly upright, and their knees are somewhat extended in the manner of our porters when they carry a heavy load on their heads. This must render their figure disagreeable in our eyes, who are accustomed to see tall persons 7 or 8 times the length of their heads; whereas this people, the inhabitants of Lapland, of Brazil, and some other countries, are scarcely the length of six heads in their stature. Most of these people sit upon the ground, without using chairs, whence they naturally stoop more; and not only appear shorter, but, according to our ideas, more deformed.

In an European, the inclination of the superior maxilla being the same with that of the facial line, which forms an

angle of 80 degrees (see Plate II. Fig. 1.) the nose becomes larger. Should we not deem it very ridiculous, if a travelling or philosophic negro, or Calmuck, in describing the particular forms of our features, were gravely to assert, that our midwives, mothers, or nurses, pulled us by the nose during our infant days, in order to give it the requisite length?

It is observable, that the inhabitants of these Dutch provinces have very broad heads; that is, broad from O to P. Plate III. Fig. 4. This proceeds from the weak state of the bones during infancy and childhood. Hence it is that our foreheads are frequently high, flat, and broad, while the lower part of the face is small and delicate. Both the upper and lower maxilla are with us extremely small. The hips are broad in both sexes, which occasions a waddling motion, and renders our countrymen less agile than those who have smaller hips. Ancient artists followed in this respect the character of their statue. In the Farnese Hercules, the breadth compared with the depth, is made as 12 to $8\frac{1}{2}$. In the Pythian Apollo, it is as 9 to 7. In the Antinous, as $11\frac{1}{2}$ to $8\frac{1}{2}$. The proportions of Alb. Durer are as 9 to 5. In our females the proportion is as 12 to 7. The Greeks have made it, in the *Venus de Medicis*, as 11 to $8\frac{1}{2}$; that is, they have made the body smaller, thicker, and more rotund.

In a word, it would be absurd to acknowledge the influence of art in making the hair straight or curled, the legs thick or thin, the head large or small, among us; and surely it is equally absurd to ascribe the particulars in the form of other nations to the same cause.

If any doubt should remain, the following experiment will demonstrate the truth of my assertions. Sketch the figure of a negro (as in Plate VI. Fig. 1.); draw the parallel lines A C. and B D. and the vertical line C. K.; from the extremity of the line D E. make the line E F. forming the triangle F E D. of 85 degrees; delineate a mouth at E a, and it will immediately appear that the nose of the negro has not been pressed inwards, but that the maxilla projects too far. By a similar process may an European be transformed into a negro; and the figure will fully evince, that the negroes no more compress the noses of their children, to make them smaller and flatter, than we lengthen the noses of ours by perpetually pulling them.

PART THE SECOND.

CHAPTER I.

CONCERNING THE FORM OF CHILDRENS HEADS, VIEWED IN PROFILE.

THE manner in which all the profiles in the first plate were taken, has been already explained. I shall merely observe, that the profiles in the fourth plate were drawn by means of the same instrument, and with equal accuracy.

The great difference which exists between the head of an infant just born, and of one that is a year old, has determined me to make choice of the first and second figures. The third figure is delineated after the cranium of a well-formed adult. It is the same that was given in the first figure of the second plate. The fourth is drawn from a toothless old woman, that the essential differences may become more conspicuous.

In the head of a new-born child, the skull *O G U P.* (see Plate IV. Fig. 1.) may be considered as an oval placed horizontally; to the fore and under part of which the maxilla are affixed. This shape is not so uniform as to exclude all variations; but these are not very great. The lower part

of the chin and forehead are placed parallel to the perpendicular line A D.

In a child one year old, the forehead projects beyond the line A D. and the back part of the head is much enlarged downwards. The upper and lower maxilla are also enlarged. Q D. was, in the new-born infant, equal to one-fourth; but in this it is much more. See Fig. 2.

The diameter of the eye-socket G H, in the first figure, is one-fifth compared with A D. and something more in a child of one year. It is also as one-fifth in the head of an adult; but this proceeds from the enlargement of the nose W. and of the maxilla D. These cavities are in reality much larger in the adult than in the child; which manifests that a certain rule is observed, although they are much larger in children, in proportion to the difference of age.

As infants are born without teeth, the upper jaw Q R. is very narrow. In the space of a year, it grows nearly as broad again. In the adult, the upper jaw is about three times as large; and, if we include the teeth, it is four times. But there are diversities in this respect, according to the natural strength of the person, or national peculiarities.

The upper jaw also gradually projects forwards; and the *dentes molares* are completely formed at about the age of twenty years. Q D. or the length of the lower part of the face, is now to A D. as $1\frac{1}{2}$ or $\frac{3}{8}$ ths. In a child it is only

one-fifth, as in figure the first; and three-tenths, in figure the second.

The lower jaw undergoes a similar change. T K. is not only larger, but the point of the angle K shoots backwards; so that it becomes nearly quadrangular with the condyle T. particularly in the Chinese and other easterns.

The chin at the same time shoots forwards, as will best appear by comparing the third with the two preceding figures. It projects about one-twelfth before the facial line in W. whereas it was about equal with the perpendicular line in the infant (see Fig. 1, 2, 3. of Plate IV.); the upper and lower teeth spreading, and growing out of both the maxillæ at the same time, are regularly opposed to each other; yet in the best formed heads, the lower teeth are placed within the upper ones.

In children, the small distance from Q to H. that is, of the maxilla, and the nasal-bones, from the jugal, gives them a flatness of countenance, which is well observed by Flamingo. The ancients always made the lower maxilla of children too long, and therefore they did not succeed in the pleasing, when they delineated children of a tender age.

The nose may be distinguished into two parts: the one, which has its basis at W. and which forms the cavity under the forehead O G. and the nose itself, from W to Q. Fig. 2 and 3.

Infants just born have no cavity above the nose and the eye-sockets (see W G.) and therefore they have a flat forehead; that is, the forehead O projects farther than W; whereas in adult persons the part W projects farther than O; and in aged persons still more, as in figure the fourth. It is for this reason that the nose of a negro appears to sink so deep, and also that it appears to have been much more compressed in an aged than in a young negro.

The nose itself is small in children, making about one-fifth of the line A D. In adults it is one-fourth, and broad in proportion.

The head of an infant is longer than it is high: compare D C. with D F. which is equal to A D. In some this difference is very great. In figure the second, D C. is about one-fifth longer than D F. but this length seems peculiar to the children of these provinces, as has been noticed by Vesalius*. We have already observed, that the occiput is smaller in antiques, from the great projection of the facial line. J. de Wit, however, although he is justly celebrated for his painting of children, has not attended to this difference; of these he has also shortened the occiput, and raised the vertex. The real form of the head has not escaped the notice of Quesnoy; as shall be fully exemplified when we explain the fourth figure of the fifth plate.

* Lib. I. Chap. 5.

The centre of motion U, is not in the centre of the head; but it is placed more forwards. Hence it is that the heads of our children cannot maintain an equipoise, are prone to incline forwards, and yet more to fall backwards. As soon as the line A D. is exceeded, the middle point is changed; and this inclination of the head, somewhat forwards, gives it a certain grace.

Alb. Durer has made the facial line of his children to incline forwards, having placed it at 95 degrees; the same as in the third figure of our second plate. Quesnoy and J. de Wit have mostly placed it at 100. In this position the head must be raised, until U W. become equal to S T. See Plate V. Fig. 3.

The *meatus auditorius* enlarges also very considerably as the infant advances, as well as the mammillary process behind the ear. See Fig. II. Y. While the infant is very young, it is seated about the condyle at U. and is scarcely visible; but in adults the mammillary process is very much enlarged, and it descends much lower; as in the third and fourth figures of this fourth plate. This is much more obviously the case in men than in females, in whom none of the processes are so strongly marked.

CHAP. II.

THE FORM OF THE HEAD IN AN ADULT PERSON.

THE form of the head in adult persons has already been fully explained in the third chapter of the first part of this Treatise; we shall only observe at present, that the growth of the nasal-bone L. (Plate IV. Fig. 3.) gradually communicates a pleasing form to the nose, and in some persons renders the whole countenance graceful. Negroes and Asiatics are destitute of this grace; and the Greeks have omitted it. Indeed they were compelled to omit it; for as they make the direction of the nose nearly perpendicular, they could not give this elevation without producing a degree of deformity.

The distance from the fore part of the nose to the jugal-bone H V. being greater in us than in any other people, the nose appears longer than it is in reality, particularly in thin persons; and this prevents our countenances from having a very flat appearance. Our nostrils are just visible, as the bottom of the nose h i. (see the lower sketches of Fig. 3 and 4.) is placed horizontally, or parallel to the ground.

The projection of our teeth usually occasions a projection of the lips, and the chin seems to recede. Every other particular may be collected from what has been already remarked, and from contemplating the figures.

CHAP. III.

THE FORM OF THE FACE IN PERSONS FAR ADVANCED IN YEARS.

OBSERVATION induces me to believe, that, in this country, the women generally lose all their teeth earlier than the men; but as the men lose them also, the fourth figure of the fourth plate is equally applicable to both sexes.

Aged persons not only lose their teeth, but their gums; that is, the thick margin containing the *alveolæ* or sockets, in which the roots of the teeth are placed. The roof of the mouth, which was arched in younger years, becomes entirely flat. The lower maxilla also having lost both teeth and gums, is no longer so broad. From these causes is the space within the mouth so remarkably diminished, that sufficient place is not left for the tongue. As it can no longer be drawn up and adjusted to the arched roof of the mouth, and not having its usual space, through the failure of the teeth and gums, it is apt to protrude out of the mouth upon the slightest attempts to move it forwards. The tongue appears, therefore, to be longer than it was (as it is in reality) from its being forced out of a curved line.

The nose having lost its support, Q R. (Plate IV. Fig. 4.) bends downwards, and hangs over the mouth: the fall under the forehead W. becomes deeper, while the projecting part is fuller; this renders the furrows, or wrinkles, deeper and

more visible. The whole of the upper maxilla becomes more concave, and the fore part Q R, which in younger years projected outwards, now contracts inwardly; so that the upper lip falls within the margin of the mouth, and the nose appears much larger than it did in more youthful days.

The lower jaw, which had in its external circuit the form described by T K D. of the third figure, is now, by the loss of the teeth, with their *alveolæ*, drawn upwards through the action of the muscles, until the gums nearly meet. The tip of the chin D. now shoots beyond the line Q D. to X. Compare figure the third with figure the fourth of this fourth plate.

The distance of the chin from the nose is shorter, by one-sixth part of the length of the head: the nose and chin seem almost to touch each other. This circumstance is totally neglected by Rubens, De Wit*, and other celebrated painters. Blœmaert aims at following Nature, but he has not just ideas of her operations. Laireffe, P. Testa, and the immortal Raphael, have followed her with the greatest attention. J. B. Greuze, the famous French artist, seems to have totally disregarded the peculiarity. This is obvious from the plate *Retour sur soi meme*, representing an old woman reading; which has, in other respects, very great merit.

When the lower jaw rises to one-sixth, as we have already observed, the angle of the mouth is drawn downwards, the

* See his Book of Drawings, Plate XI. Fig. 3.

muscular fibres of the neck become visible, and are distended like cords.

The wrinkles of the face always manifest themselves in a direction contrary to that of the muscular fibres; hence they are transverse on the forehead, are radiated round the eyes and mouth, and run across the neck parallel to the course of the lower jaw X K T. By comparing the cranium with the face (Plate IV. Fig. 4.) it will be obvious that the distinguishing marks of age are placed in the bony parts, and not in the wrinkles.

To be convinced of the importance of these remarks, let the reader delineate a head, according to the first figure of the second plate, forming the profile G, H, D, C, L, K. together with the ear, as represented in the second figure of the sixth plate.

Let the projection G, g, h. form the cavity h. above the nose. By omitting the teeth, the mouth D E. will rise to d, e. Draw from N. the facial line along g, h, O, P. Place a limb of the compass at the point A. and describe from A C. the line C c. till it intersects the facial line at O. Describe in like manner from the point A. the line B b. complete the chin, and let the under lip press upon the upper at d, e. Thus will the head of a young man be changed into the form of an aged person. The ear M. must also be raised to m. It is, however, to be observed, that as the skin of the ear in aged persons becomes relaxed, the ear

itself seems longer. This singularity could not be noted in the figure.

The experiment may also be inverted, and the head of a young person be formed out of an aged one. By alternately covering the dotted and complete lines with the fingers, these different faces will more conspicuously manifest themselves.

CHAPTER IV.

FORM OF CHILDRENS HEADS IN FRONT.

THE same heads of children that were represented in profile in the fourth plate, are in the fifth plate represented in front. Their proportions were taken into consideration in the first chapter of the second part.

The eyes of new-born children are very large, which proceeds from the size of the cavities; and they stand at a considerable distance from each other; but this distance is not quite the measure of an eye. The nose and mouth sufficiently indicate themselves. The head is very flat, because the back part of the head M M. is extremely broad; which is the usual form of most children in this country. The different parts of the face correspond with the general proportions remarked in the heads of children.

In a child one year old (see Fig. 2. of this fifth plate) the eyes are still very large; the lower part of the face is longer, and the forehead is higher. M M. through the weakness of the bones, continues to increase in breadth. That neither of these countenances are very pleasing, will easily be perceived.

The following proportions are observable in a child one year old. See Fig. 2. of this plate.

The height of the head A B. compared with the breadth at the external canthus of the eye K K. is as 20 to 12.

$$A B : M M :: 20 : 19.$$

$$A B : R R :: 40 : 19.$$

the breadth M M : K K :: 19 : 12. P O = $5\frac{1}{4}$ ths; so that four times P O = 5, or one less than K K. supposing the eye to be made larger than P O. that is as $1\frac{1}{2}$, that is $4 \times P O = 6$.

In the third and fourth figures I have placed the facial line as in adults, in the 95th and 100th degree of inclination. See S Z. Plate V. To find the angle of the chin, I have made Z. B. equal to U W. Thus the head gains in the height U W. which is equal to S T.

According to these limitations, I have also sketched the face, in figure the fifth, in front. A B. is thus equal to 11; and A G. divided into two parts. A D. D G. gives twice D F. in breadth; which is the medium proportion between M M. and K K. of figure the second*.

The head is therefore only four eyes in breadth, which is the true proportion, and not five, as De Wit has represented

* The fifth figure is not perfectly accurate: A C. is too high; and D F. rather too small.

the heads of his children in his tenth plate. Alb. Durer, his predecessor, has done the same; and others have followed their examples. A. Van Dyk has also given the proportion of five eyes to the figure of an Infant Jesus.

The heads of Quesnoy's children perfectly correspond with the above rules; but the eye-sockets should have been within the perpendicular line A E. (Fig. 3.) as they project too much; which is not graceful.

PART THE THIRD.

CHAPTER I.

ON BEAUTY, PARTICULARLY BEAUTY OF COUNTENANCE.

NO definition is more difficult than the definition of beauty. Horace, who has treated the subject in so masterly a manner, as far as it relates to poetry, considers it in a comparative view, and not immediately and absolutely. Boileau and Pope have also some excellent observations; but these are confined to the elucidation of the style of poetry, by comparing it with painting; or of the latter, by its affinity with the former. Roman, and more modern writers, advise us to take the ancients for our models; but I recollect none who have explained in what beauty, in itself or abstractedly, consists. Longinus has afforded me the most satisfaction, as he has treated the beautiful and the sublime in a more systematic manner, and has illustrated his doctrine by pertinent examples.

Croufas, Hutcheson, and Father Andre, have made occasional observations concerning the beautiful. The remarks of Hutcheson manifest taste and judgment; those of Andre indi-

cate much learning. Formey has prefixed an excellent preface to the works of Andre. Each of these authors has made just distinctions, and sensible observations, concerning the beautiful; but none of them have informed us what it is that constitutes the beauty of a painting, of a statue, or of a building. Like the preceding, they have merely treated the subject in a cursory manner, or by way of allusion.

In every representation, not merely of historical scenes, landscapes, and sea-prospects, but of simple groupes, even of single figures, it is necessary to distinguish between poetry or inventive, physical or natural, and mechanic or operative beauty. The first species is subject to laws which are applicable to poetry in general: the second respects the forms of things, the beauty of which it is not easy to reduce to any particular rules. Just ideas of operative beauty, or the beauty of execution, can only be acquired by practice.

Philosophers have proceeded farther: they have enquired, What is it that renders us susceptible of the impression of beauty? What is it that renders beauty the decided object of our choice? But although their investigations have manifested much depth of thought, the result has not been completely satisfactory. The celebrated Mr. Burke has clearly demonstrated, in his excellent Treatise on the Sublime, that whatever, both in nature and art, excites apprehension or wonder, may partake of its nature. In this species no rules of proportion can be proposed as the cause of beauty.

The starry heavens, the rising of the sun, or a calm sea, are pleasing to all. Every one feels a pleasurable sensation at the sight of these objects, and he calls them beautiful. A tempestuous ocean, a gloomy forest, or even the darkness of the night, impress us with pleasing ideas of the grand and sublime, as Mr. Burke has demonstrated in a striking manner.

The beautiful in works of art is not always distinguished with equal facility. The more they are complicated, the less are their beauties discernible by the vulgar. Poetic, natural, operative beauty must be felt by every one who lays any claim to taste; and he must be able to discriminate what is excellent in works of art, from every mixture of imperfection.

It is alone by study, by contemplating the best productions of artists, and by forming comparisons, that a genuine knowledge of these three species of beauty is to be obtained. In academies of painting, skilful masters should instruct their pupils to contemplate, separately, the poetic or inventive part, the sketch or design, and the execution; and also in the manner of correcting any defects that may be conspicuous.

This subject is much too copious to be enlarged upon in the present Treatise. Our principal object is to contemplate the beautiful, as manifested in the human figure, and particularly in the head. I shall confine myself to the enquiry, Why is a person whose height is equal to eight heads, deemed a finer figure than one who is only six or less than six heads in height? A Laplander is universally considered as a less

pleasing figure than a Persian or a Georgian. Is it because the stature of the one will measure eight heads, and of the other merely six?

It must be acknowledged that this difference cannot be ascribed to any determinate proportion of the parts, simply and abstractedly considered; for a child whose height is merely equal to four or five heads, is thought as beautiful as an adult equal to eight.

It is, however, acknowledged that the pleasing is often confounded with the beautiful. We are pleased with the playful vivacity, the perfect simplicity, the affectionate attachment of a child; we also possess an instinctive fondness for children; and it is possible that we blend all these circumstances in our ideas with the beauty of person. It often happens that the figure of a child, abstracted from these considerations, has nothing pleasing in it.

The idea of beauty is sometimes excited by a certain conformity or proportion of component parts with each other. For example: We see with pleasure that the lower extremities, measuring from the pubis to the feet, are precisely the half of our bodies in length; that the head is one-eighth, the face one-tenth, and the foot one-sixth.

The head of an Apollo, a Venus, a Laocoon, is universally allowed to be finer, or more beautiful, than the heads of our best proportioned men and women. Whence does this pro-

ceed? Perhaps it is because, in antiques, the eyes are placed exactly in the centre of the head; which is never the case with us. When the breadth of the cheek, from the nose to the ear, is exactly equal to the breadth of two noses (which proportion was observed by the ancients) it is the most pleasing to us; and we prefer those models to others which make the distance greater.

To whatever is beautiful in itself, and does not depend upon external circumstances, or mere opinion (and of the existence of this species of beauty there can be no doubt) some relation and proportion between different parts of the subject seems absolutely requisite.

The proportions given by the ancients to their figures are not beautiful in our eyes, merely from a weak prepossession in favour of all that they have handed down to us, but because they have corrected the defects which arise from the laws of vision. For example:

When the object AB . (see Plate IX.) is viewed, so that the observer shall always be at an equal distance in E G . or D . whereby $EC = GH = DB = AB$. (the height of its surface) the angle of vision will always be larger in E . than in G . or in D .

As objects are measured according to the angle of vision, they will appear the highest or most extended at the point where the line of vision EC . forms a right angle with it;

that is, when EAC . and ECB . are equal, or rectangular. In this case the angle of vision AEB . is the largest angle.

Suppose the eye to be placed at G . then is the angle AGB . smaller in proportion as the radius AC , AH , AB , is larger; ADB . being equal to one-half of a right angle of 45 degrees.

Thus, as the secant becomes greater, the angle of vision becomes smaller in an inverse proportion, and diminishes the apparent length; that is, EAB . GAB . compared with DAB . must become proportionably less, until AD . the line of section, being infinite, the angle DAB . becomes $= 0$, or is annihilated; that is, until AD . falls into AB .

Moreover, there is only one point from which an object can appear perfectly quadrangular. For whether the eye ascends along the line DF . above E . or descends towards D . AEB . become smaller, and therefore will the perpendicular side of the object, though perfectly quadrangular, appear broader than it is high.

Hence it follows, that to make the height appear equal to the breadth, the angle ADB . or aDB . must be made equal to AEB . I mean, that AB . must be extended to, or acquire the length of aB .; or, in other words, that the surface AB . which was, we will say, eight feet in height, and equal to its breadth DB . must be enlarged to 10 feet and three-fifths.

Now, as we may suppose a head, or a complete figure, to be formed of quadrangles, it follows, that a similar imperfection in vision will take place, that must be remedied in a similar manner. For example :

Let A. B. divided into eight equal parts, be made to represent a stature standing upon a pedestal at such an height, that the eye of the beholder at D. shall be in a line with the upper edge of the pedestal ; these eight equal parts will appear to the eye under the following angles of vision :

	D.	M.	S.
A 1. The upper part of the head, under an angle of	3	48	50
1, 2. The second portion from above, under an angle of	4	18	58
2, 3. The third portion - - - - -	4	51	52
3, 4. The fourth - - - - -	5	26	27
4, 5. The fifth - - - - -	6	0	31
5, 6. The sixth - - - - -	6	31	12
6, 7. The seventh - - - - -	6	54	40
7, 8. The eighth, or lowest - - - - -	7	7	30

Hence it is manifest, that the head in the highest division appears to be of about half the size of that portion of the lower extremities that is contained in the lowest division.

This will explain the reason why the antients sometimes gave more than eight heads to their figures. The Pythean Apollo has eight heads and an half: a proportion which in itself is consonant with all our ideas of beauty.

Were the figures always to be viewed standing upon the ground, it is easy to perceive that the apparent shortening of the lower extremities must be remedied in a correspondent manner, that the object may appear to be not more than eight feet in height, although in reality it is longer; but when it is placed upon a pedestal, or in a niche, the visual shortenings of the upper part absolutely demand the attention of the artist.

Vitruvius seems to think the proportions of the human form to be so perfect, that he deemed no building beautiful that was not constructed after the model of a well-proportioned man*. He also limited the proportions of the human body, and its various parts. These proportions are adopted by A. Durer, P. Lomazzo, C. Van Mauder, and others. Hoogstraaten seems to have allowed only seven heads and an half; which differs a whole head from the proportions observed in the figure of Apollo.

De Wit gave the proportion of eight heads to all the figures of his own composition, to the Pythean Apollo, to the Hercules of Farnese, and to the *Venus de Medicis*, with a very small variation. If I am not deceived, there is something of a melancholy in all these figures, which is not apparent in his own original paintings or drawings. The figure of a female on the title-page of his book of drawings, is nearly nine heads in length. He seems in this simply to have studied effect.

* Lib. I. Chap. i. p. 79.

Rubens has sometimes eight, but mostly seven heads in the proportions of his figures; which is the cause of that heaviness that is so conspicuous in most of his works.

P. Testa has given the proportions of eight heads, and eight and an half to his figures. Bloemaert, whose designs are mostly put into the hands of our youth, is so irregular, that he sometimes gives seven, at others ten heads to his figures. C. Van Mauder has proved, that in some of the figures of Michael Angelo, the size is equal to nine, ten, nay twelve heads; in order to communicate more grace to a stooping attitude.

Most of the Italians seem to have made their figures, particularly those of females, too short. Modern French masters render their females more graceful, by giving them the length of eight heads. Watteau began this style. Probably our ladies wear high heels to their shoes, and high head-dresses, to produce a similar effect.

The proportion of eight heads pleases us, because this is twice the length of the trunk. A door is not pleasing unless it be twice as high as it is broad. The French make the doors of their houses more lofty; which adds dignity, without destroying the effects of symmetry. For a similar reason it is that we hold the Corinthian column to be more graceful than the Ionic. Considering the capital, as in the place of a head, the whole length of a Corinthian pillar is eight heads and an half.

Laplanders, Tartars, Hottentots, and Brasilians, whose heads are very large in proportion to their bodies, cannot please us or be deemed beautiful, no more than the Doric column could be called beautiful upon the revival of architecture. Whoever reads De Roy's Description of the Progress of Architecture with attention, will learn that the columns were gradually rendered more graceful. The base, on which they were placed, and afterwards the capital, were raised until the column, with capital and base, had acquired the proportions of the human body.

But to return. It was not my design to enlarge upon the subject; we must restrict ourselves to the dimensions and forms of heads; and I shall now enquire what are the proportions observable in the heads of European and other nations.

CHAP. II.

PROPORTIONS OBSERVABLE IN THE HEADS OF EUROPEAN AND OTHER
NATIONS, &c. COMPARED WITH THE ANTIQUE IN PROFILE.

IN order to judge with more perspicuity concerning comparative beauty, in the form of the head, I shall give a table of the proportions, as I have found them in the best formed heads. I have divided the height of each into four parts, that the length may be ascertained with greater precision. The same letters are placed by each figure, that the differences may be the more obvious.

See the sketches of all the profiles placed under the bones of the cranium.

T A B L E

Of the Proportions of all the Heads in Profile.

	Height a d	Length a b	Distance of the eye from the crown. a m	Breadth h k	Nose.	Upper Lip.	Chin.	Neck.	Ear.
Calmuck - -	4	$4\frac{7}{8}$	$1\frac{7}{8}$	$2\frac{1}{2}$	1	$\frac{6}{8}$	$\frac{9}{10}$		$1\frac{1}{10}$
Negro - -	4	$4\frac{6}{8}$	$1\frac{7}{8}$	$2\frac{1}{4}$	$\frac{6}{8}$	$\frac{5}{8}$	$\frac{7}{8}$		1
European - -	4	$3\frac{6}{8}$	$1\frac{6}{8}$	$2\frac{3}{8}$	$1\frac{1}{8}$	$\frac{5}{8}$	1	$1\frac{1}{2}$	$1\frac{1}{8}$
Antique - - -	4	$3\frac{4}{8}$	2	2	1	$\frac{1}{3}$	$\frac{2}{3}$	$1\frac{3}{4}$	1
Child just born -	4	$4\frac{1}{6}$	$2\frac{1}{2}$	$2\frac{1}{4}$	$\frac{5}{8}$	$\frac{5}{8}$	$\frac{1}{2}$		1
Child one year old -	4	$4\frac{6}{8}$	$2\frac{1}{8}$	$2\frac{1}{4}$	$\frac{7}{8}$	$\frac{1}{2}$	$\frac{5}{8}$		1
An aged person -	4	$4\frac{1}{2}$	$1\frac{7}{8}$	3	$1\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{2}$	$1\frac{1}{2}$	$1\frac{1}{8}$
Apollo - - -	4		2	$2\frac{1}{4}$	1	$\frac{1}{3}$	$\frac{2}{3}$	$1\frac{1}{2}$	
De Wit - -	4	$3\frac{1}{2}$	2	$2\frac{1}{4}$	1	$\frac{1}{3}$	$\frac{2}{3}$	$1\frac{1}{2}$	$1\frac{1}{2}$
Alb. Durer - -								$1\frac{1}{2}$ to 2	
Vitruvius - -	4				1				

It appears from the above Table, that the antients observed a medium proportion. For example: From the tip of the nose to the ear, in a Calmuck, is 2 and 4-8ths; in an European, 2 and 1-8th; in the Antique, 2 and 2-8ths. And the chin nine-tenths, eight-eighths, and two-thirds. The beauty of the face depends therefore upon the relative proportions which the parts have to each other; as 1 : 4, or 1 : 3, &c. Thus also, when the face is seen in profile, the breadth ough not to exceed the height, as in the Negro and Calmuck: in us they are nearly equal. The form which approaches to the quadrangular, gives a certain flatness to the countenance. The antients have removed this imperfection, by making the head higher, which proportionally diminishes the breadth.

When the faces are contemplated in front, as they are represented in the third plate, considerable differences will be observable. For example:

The greatest breadth of a Negro's head is equal to three-fourths of its height, and the cheeks M N are as $2\frac{1}{4}$

In a Calmuck, the cheeks M N are = 3

In a European - - - $2\frac{6}{8}$

In the Antique - - - $2\frac{1}{4}$

The breadth of the Negroe's head P O is = 3

Calmuck's - - - 3

European - - - $3\frac{1}{4}$

Antique - - - $2\frac{1}{2}$

Hence it appears that the countenance of the Antique is not only more elevated, but that it is considerably less broad in proportion.

From the form of the eye-sockets, it is obvious that the temples cannot be broader than the bony parts, together with the skin, &c.

Now X W. in the Negro is as	$2\frac{1}{2}$
in the Calmuck	$2\frac{1}{2}$
European	$2\frac{1}{2}$
Antique	2

To judge of the dimensions of the eyes, X W. must be divided into three parts within the rim of the eye-sockets. Thus there remains for X P \times W O, only one-fourth of the whole breadth P O.

All those who have written upon proportions, as Alb. Durer, De Wit, &c. allow the size of five eyes for the breadth of the face. In children, Durer has given six eyes. But I am convinced that the head in no instance can be so broad. The ancients have never exceeded four; which corresponds the nearest with the breadth observable among us.

In children, the distance between the eyes (see Plate V. Fig. 1, 2. P O.) is equal to one-third from K K, or the temples. Although from the disease above mentioned, the head of the child, represented in the second figure, is five eyes in breadth,

by comparing this with figure the fifth of the same plate, it will fully appear that the addition to its breadth is no addition to its beauty. Painters in general seem to be much embarrassed concerning the breadth of the face, as appears from De Wit, Alb. Durer, and Le Brun, who never give less than the measure of five eyes. The celebrated Quefnoy has been much more careful and fortunate in giving not more than four eyes as the breadth of his heads. If I mistake not, Testa has observed the same proportion in his children.

The breadth of the nose is always determined by the distance of the lateral processes of the upper maxilla (see Plate III.) E. F. in proportion to the distance between E and F, will be the width of the nose. It is because the triangle C Q R. forms so large an angle, that the disproportion appears so considerable in the nose of a negro. In us the nose is generally broader than the distance between the eyes. The ancients have observed the same proportion.

The mouth must completely cover the *dentes canini*, as has been already shewn. It must therefore be broader, as these are placed at a greater distance from each other. But suppose the distance to be in reality the same; that is, suppose Q R. (in figures the fourth and fifth) to be perfectly equal, yet the mouth will appear smaller when the two sides of the triangle rise high. Compare Y Z. in each figure. In antiques the mouth appears smaller than with us, from the greater depth of the chin. The ancients have made the mouth but a little wider than the distance between Y Z.; and

the nose to incline downwards. This position of the nose makes the upper lip small. Thus it curls, as it were, upwards, which gives it a more graceful form. The upper lip of the Calmuck and of the Negro is directly the reverse.

The ancients made the neck twice the length of the nose; but in Apollo it is as $1\frac{1}{2}$; this proceeds from the size of the nose; which being longer, the neck has still the usual length.

In children, De Wit has not given more than one-third of a nose for the neck; Quefnoy, somewhat more: about the size of one nose. De Wit has also omitted to give an under or a double chin to his young children; which always takes place, and makes the chin about one-fourth of the nose longer.

CHAPTER III.

TO FIND THE PROPORTIONS OF THE HEAD.

MOST of the painters and drawing-masters, who treat of proportions in their publications, take Vitruvius among the antients, and Albert Durer among the moderns, as their guides; and to establish their own principles, they repose upon the authority of ancient statues, without paying any farther attention to the human body, or measuring any particular parts of it with care and accuracy.

The portrait-painters of the present day, generally describe an oval upon their panel before the person to be painted sits to be drawn; make a cross in the oval, which they divide into the length of four noses, and the breadth of five eyes; and they paint the face according to these divisions to which it must be accommodated, let the proportions themselves be ever so much at variance.

I mean not to insinuate that eyes, nose, and mouth, or the curls of a wig, are to be measured with precision, which I have seen done by a celebrated master, and with very ill success; for it is impossible to adapt this mensuration to the panel, because every part has a distinct surface, and cannot be brought upon a correspondent surface on the panel. It is simply my opinion, that every good painter or designer should commence upon the proper basis; that is, should pay

attention to the varieties which exist in the skeleton, and particularly in the bones of the head, in national characters, and circumstances of the like nature; and then let him sketch his oval, or any other figure, not according to his own fancy, but according to his model.

Perhaps it would not be improper to make use of the ancient method of drawing, which Pliny has ascribed to the daughter of Dibutades of Sicyonia, and which is now practised for amusement by persons of fashion; that is, to trace the shade of any one intended to be painted, by means of a lamp, if the portrait is to be in profile, and then ascertain the precise situation of the principal parts, as eyes, nose, mouth, and chin.

But, in fact, the nicest proportions must in general be obtained by an attention to multitudes, and by imitating the example of Zeuxis, who selected, from a great variety of persons, some minuter graces, which enabled him to compose the proportions that were the most pleasing.

As the skeleton and the cranium served my purpose the best in drawing a head, it has been my practice first to sketch the cranium with as much attention and accuracy as possible; upon which, I afterwards placed the softer parts. This method has been omitted in the present Work, as it would have rendered my principal object more obscure and intricate, although it would have enabled me to render my figures much more graceful and pleasing.

Some of the bony parts are always marked on the countenance; they are never covered so as to be totally effaced. Such as the rim round the cavities of the eyes, the jugal bones, or Q of Plate I. Fig. 3 and 4; and H in Plate V. Fig. 3, 4.—the elevation above the nose, and the depression immediately under it, the ridge of the nose or the termination of the nasal-bone. See Plate IV. Fig. 1, 2, 3, 4.

The lower edge of the inferior maxilla, in the region of the chin, and at its foremost angles, manifest themselves, and point out divisions: the temples approach to the cavities of the eyes, which always limit the breadth of the face. The orifice of the ear also gives a determinate point, and indicates of itself the seat of the lobes, which are to be placed immediately under it; and of the ear itself, to be placed immediately above it.

In a word, the bones of the cranium are simply covered with skin and a dipose membrane; and these are no impediments to our taking the cranium as the truest basis of the intended portrait.

It was in this manner that I obtained the profile of the modern face, in the first figure of the second plate. This was very similar to many other fine heads that have been dissected by me, in my professional character, and were afterwards sawn through the middle perpendicularly, that I might be able to obtain a perfect profile. I have drawn several of these with a pen and thick ink, upon a plate of glass placed

over them, and the sketch has afterwards been taken upon varnished paper. It was by those means that I formed no small collection; which was of considerable service in the course of my Lectures, and of which I have made use in the present Work.

If due care be taken to let the line of vision fall in a right line upon every spot, the above method is much more accurate than the use of a lamp or candle in drawing of profiles; for the rays of light proceeding from one point, diverge in an unequal manner. Yet it must be allowed that a death's head does not accurately resemble the living; and also that by being sawn through, it is less perfect than when intire.

Observing that the *linea facialis* inclined backwards (see Plate II. Fig. 1.) M G. making an angle of eighty degrees with N C. I have preserved in the second figure all the proportions of the under jaw, and placed M G. perpendicularly, forming the angle M N D. equal to ninety degrees; that is, a right angle*.

Every part which touches the facial line in the first figure, as T N G. touches it also in the second. The cranium retains its depth; that is, T D. in the second is equal to T D.

* Albinus makes the line 90 degrees. Alb. Durer has made it in a man 88, in a woman 96, and in a child 94. De Wit has made it in women 100 degrees (see Tab. XI. XII.) in Apollo 94 (see Tab. XII.) in a man 92, and in a child 96 (see Tab. X.)

in the first figure; but the space CD . is diminished in proportion as ME . is increased: CD . is now less than NC . although it was much larger in the first figures; and the height CE . is increased from E to Y .

I afterwards made MG . incline five degrees more forwards (as in Plate II. Fig. 3.) so that MND . formed an angle of 95 degrees. CD . is still more diminished, and CE . becomes larger; that is, EY . is equal to HM . the projection beyond the line HG .

The lower maxilla is smaller, and becomes more under the ear, yet hk , or the distance from the tip of the nose to the ear, remains the length of two noses; and the neck is more graceful. Finally: I let the line MG . fall to 100 degrees, by which the height EY . equal to HM . was gained (see Plate IV. Fig. 4.); by these means the line that crosses the eye at m , passes exactly over the centre, and gains a proportion correspondent to that of the antique: that is, a form of head which is four noses in length, every other part being in proportion. It is to be remarked, that the external rim of the eye-socket m , remains in the three last figures at an equal distance from the perpendicular line HG .

This projection constitutes the *maximum*. Place the facial line more forward, and EY . becomes too elevated; the head is more than the proportion of four noses; the upper lip too small, and the face deformed.

If it be now asked, What is meant by a fine countenance? we may answer, That in which the facial line M G. makes an angle of 100 degrees with the horizon. The ancient Greeks have consequently chosen this angle; but whether they have gained the proportions of the different parts from the principles which I have advanced, I am not able to decide. It is certain that such a form is never to be met with among moderns; and I doubt whether the ancient Greeks themselves had living models of the form; for neither the Egyptians, from whom they were probably descended, nor the Persians, nor even the Greeks, have ever given such a form, when they simply aimed at delineating portraits*.

This antique beauty therefore is not in nature; but to use the term of Winckelman, it is an ideal beauty. Thus, when the Greeks formed medallions of the Roman emperors, although they were obliged to observe a resemblance, yet they added something of the ideal beauty. This characteristic will easily enable a connoisseur to distinguish a Grecian from a Roman medal. I have never found this characteristic so conspicuous as in the *Museum Odescalcum*, where not only the countenances of several women, but even the larvæ, or faces of the masks, manifest the line.

As there is a *maximum* on the one side, so is there a *minimum* on the other. As soon as we recede to 70 degrees,

* See the portrait of Augustus Cæsar, Pharnaces, and others. Plate IX. Fig. 4 and 5.

we give the countenance of a negro (as in the third figure of the first plate). Lower than 70 gives the features of an ape; still lower, the resemblance of a dog, &c.

The utmost extent that can be allowed for the face of an European, is ten degrees behind and ten degrees before the perpendicular line H I. All that exceed in either direction lose their beauty, and even become mishapen. But the negroes have also their *maximum* and *minimum* of comeliness. Of these I cannot speak with precision, as a competent number of heads are not in my possession; nor have I enjoyed sufficient opportunities of comparing them. However, the facial line must not sink much lower than five degrees; that is, to 65; as the countenance would too closely resemble that of an ape. Thus, if the facial line of the ape was too low, it would approach to that of the dog, &c.

I have observed, that in all quadrupeds, both genus and species may be distinguished by the position of the bones of the upper jaw, immediately before, above, or obliquely under the ball of the cranium. I have drawn the heads of many different animals upon the same line; which exhibits an appearance that not only would be of inconceivable service in natural history, but of infinite service to the painter. But this subject is foreign to our present purpose; and to do it justice, would be to write a volume.

What has been remarked concerning adult persons, is also applicable to children.

In the fourth plate I have faithfully copied after the originals before me. In both, the facial line was perpendicular, which has not been favourable to beauty, or to a pleasing countenance. The fourth figure of the fifth plate exhibits a much finer face, although the eyes are not in the centre; the upper rim of the socket of the eye being about the central point, according to the rule observed by J. de Wit, in imitation of Quefnoy and Fiammingo; only the occiput is too long. Respecting this article, I have not been able to find out any determinate rule for infants. When the child arrives to the age of three or four years, the lower maxilla shoots downwards, and the occiput becomes less. It does not appear to me that we are under any obligation fervilely to copy this unpleasing shape in our figures of young children, particularly as in this country it proceeds from weakness; which renders the heads of children larger with us than in any country in Europe.

When the facial line falls more forwards (see S Z. of Plate V. Fig. 3 and 4.) the whole form becomes destitute of regular proportions; and the head assumes an hydrocephalous appearance. Therefore, the utmost extent with children, as well as with adults, is from 100 to 80 degrees.

Respecting the mouth, it is to be observed that children having neither teeth, nor projecting *alveolæ*, in either the upper or lower maxilla, the tongue cannot easily be confined within the mouth; so that they have generally the mouth open; that is, the lower jaw is kept at a distance from the

upper; and this gives something of an oblique direction to the lower part of the face. (See D B. in the second figure, and X E B. Fig. 4.) We may add, that the lower jaw is shorter than the upper; and as it does not make a large angle with the hindmost part (see K. in all the figures of Plate IV.) the mouth opens more easily and wider. But still the orifice of the ear (see I. of Plate V. Fig. 3.) remains the central point, by a line from which to the point B. the inclination of the child is to be limited. Quesnoy has been very attentive to these peculiarities, and he has made the line D B. describing the distance from the tip of the nose to the tip of the chin very long. See Plate V. Fig. 4.

The under or double chin is more strongly marked by this position; the neck is shorter, and the whole is more pleasing. De Wit, on the contrary, has taken his proportions from under the nose to under the chin, as being equal to one-fourth of the height. For this reason has he frequently given a closed mouth to his children; which renders them less pleasing than the children of Quesnoy*.

In most persons the ear is of equal length with the nose; that is, one-fourth of the height of the head. It seldom stands higher than the middle line, and the lobe generally sinks lower than the nasal line. Alb. Durer makes the nose

* Preisler's figures of childrens heads are taken from Alb. Durer, and have the same faults. In Table I. Part III. the chin comes too forward, and is too long; this, connected with the general smallness of the features, makes a mixture of infancy and manhood in the same face.

of an adult about this size. De Wit makes them larger, and seems careless about proportions. In his Twelfth Table, the lower part of the ear is on a line with the nose, and the upper even with the rim of the eye-socket, and thus more than one-fourth. In Fig. 5 and 6, of the same Table, the lobes are not placed so low. In general, he has placed the ear too high, and even the orifice, which never varies, being always parallel with the line of the nose. Alb. Durer, and all his followers, have done the same. The propriety of my remarks is demonstrated by the accurate figures of osteology, in the tables of Eustachius, where the ear is represented parallel to the nasal line.

Attention must also be paid to the breadth of the ear. De Wit generally makes the breadth too small. The artists have avoided representing the ear naked, as much as it was possible; in which they are to be commended, as in itself it is not a pleasing figure. The cavities, the rim, the lobes, and other parts, are too small and insignificant to suffer a comparison with the countenance. It is therefore advisable to cover the ear itself, and to make the lobes alone visible. However, in some cases they must appear totally; as in the representation of a bald head. In this case the breadth should be equal to half of the height. It should be drawn in an oval, the long central line of which should be made to incline a little backwards. But if the facial line be made to project forwards to the 100th degree, then should the central line be perpendicular; as, in this case, the upper part is already at a greater distance from the nose than the lower.

In Negroes, Calmucks, &c. this line must be made to run parallel with the facial line.

Few painters have attended to the real structure of the ear. Almost every treatise on the principles of drawing that I have seen, is defective in this article. The French appear to be the most attentive to it. In the *Dictionnaire Encyclopedique*, the writer of the article upon the principles of drawing, has given a very accurate representation of the ear. In the book of drawing, by Bloemaert, there is not one figure of the ear that is natural: nor even in that by Preisler, notwithstanding he has taken more pains than any of his brethren to ascertain its exact proportions*.

In children the ear is very broad and large, as well as the head. It is therefore best to conceal it, as has been already observed, since the ear cannot add to the beauty of countenance.

In the above disquisitions I have endeavoured to draw from Nature herself the constituent principles of beauty, in the form of the head. I am far from asserting, that a rigid conformity to the rules laid down will always enable us to

* Aug. Carrache disoit que l'oreille etoit la partie du corps la plus difficile a dessiner; il en modela une plus grande que nature, pour en faire connoitre la structure. Il en fit des etudes infinies, et l'on construisit un grand modele en platre appelle L'Orecchione d'Agostino. Bibl. de Peinture, Tom. II. p. 484.

catch the beauties which nature is perpetually presenting to our view.

Horace says,

Non satis est pulchra esse poemata, dulcia sunt.

The pleasing effect, should always be our primary object; and in some cases it is better to deviate a little from the strict rules of proportion, in order to increase the beauty of a piece, than to render it less pleasing by a servile conformity.

APPENDIX to the preceding Chapter.

IT was the original design of Profeffor CAMPER to give an additional chapter concerning the diftinguifhing marks of the antique in ftatues, medals, intaglios, &c. But it appears that the difficulty of free accefs to a competent number of fpecimens in thefe provinces, has prevented him from executing the defign. The few coins and intaglios, represented in the tenth plate, though fo trivial in themfelves, may ferve to corroborate what has been remarked in the Author's Introduction to this Treatife; and alfo what has been advanced concerning the fuperior beauty of an antique head; and the explication of the caufe of this fuperiority given in the preceding chapter.

FIG. I. Represents Bocchus, King of Mauritania, in his youth. This was a copper medal. On the reverfe was the figure of an Elephant.

FIG. II. Bocchus, more advanced in years. On the reverfe, the Elephant. This was of copper.

FIG. III. Alexander the Great. A filver coin, with the Greek infcription ΑΛΕΞΑΝΔΡΟΥ. On the reverfe was a Caftle; above it, the Thunderbolts of Jove.

FIG. IV. Pharnaces, King of Pontus, with the infcription ΒΑΣΙΛΑ... ΦΑΡΝΑΚΟΥ. A filver coin. On the reverfe of which was Peace with the Cornucopia, a Dog, Half Moon, &c.

The above coins are in the cabinet of the Prince of Orange. The two figures of Bocchus are about twice as large as the coins, that the contour may be more confpicuous.

FIG. V. Is the representation of Cæsar Augustus, mentioned in the Introduction as well as in the preceding Chapter, as an example that the antients, in their portraits of distinguished personages, paid attention to the direction of the facial line.

FIG. VI. The Medusa of Soficles.

FIG. VII. The Head of Alexander, engraved by Pyrgoteles. It is obvious that, both in this and in the third figure, attention hath been paid to the facial line; and they serve as instances of the ideal beauty; which, indeed, is also conspicuous in their representations of the Divinities.

FIG. VIII. Theseus, with his Club; by Gnaeus.

The four last figures are taken from the Treatise of the Baron De Stofch, published in the year 1724, at Amsterdam. Plates 23, 25, 45, 55.

The facial line is too obvious to require further enlargement.

PART THE FOURTH.

THE PROPER MANNER OF SKETCHING THE OUTLINES OF A HEAD.

CHAPTER I.

CONCERNING THE OVAL.

ALL writers, on the principles of drawing, propose the oval, as the best method of obtaining a sure hand in sketching heads in every position, and of every age. No one has ventured to deviate from the method, notwithstanding every one must have been convinced, from experience, that this figure is frequently defective, and merely applicable in a few instances. This I shall endeavour to demonstrate :

Plate VII. Fig. 1. Let the height *A B.* be divided into four equal parts, *A H. H I. I F. F B.* Of these take two-thirds, or *A F.* equal to *K L.* for the largest dimensions, and describe the circle *A K F L.* The ears are to be placed between the parallel lines *K L.* and *M N.*

Divide KL . into four equal parts, and take one-fourth for the breadth of the temples OP . extending the compasses from F to I . or to the half of AB . draw from the point F . in the central line AB . the circle $BNIM$. Complete the oval from K to M . and L to N . Thus is the point L obtained, and also the central line of the eyes KL . *

Finally. Divide AB . into four equal parts, of which one is destined for the nose; and EF . into three, of which the uppermost gives the feat of the upper lip QR .

This method corresponds with the proportions given in the second chapter of the third part of this Treatise †. This oval is a good one, and seems well adapted to all those cases where ovals can be applied with advantage.

But when the features are to be delineated in profile, as in the second figure of the same plate, the manner appears to me totally destitute of the least advantage. Let IR . be the length of the head, and AB or UV . the height; form your oval as in the other figure. This oval limits nothing; neither the situation of the ear, nor the direction of the facial line XY . nor the feat of the eye P . All these must be placed according

* C. Van de Pas has formed the oval in this manner. See page 21. The manner which Alb. Durer followed in his first book of Geometry, is more complex and less perfect. See the Latin edition. Paris, 1532. p. 20, 21.

† Page 89.

to fancy, or by guesses. Besides, the cranium itself is not of a circular form †.

Books on drawing recommend the oval also for a face that is placed sideways, between the profile and a front direction, as in Fig. 3. Well, draw the oval as before, and describe the central line A D E B. in the direction of the oval, then divide the oval into four parts, and the lower division into three parts, and you will find the points of incidence in the four divisions, viz. S, D, E, F. in the line A D B. This is the manner laid down by Preisler*.

Most portrait-painters follow this rule, and they always place the mouth on the middle line A D B. which is too near to the ear. It would not be difficult to demonstrate this, or to prove that all the figures formed according to these rules of Preisler are defective. The same error is observable in the fourth of Bloemaart's tables, and in many other of his faces. And, if I recollect rightly, Goltzius has also committed it.

In order to be convinced how much this method is defective, draw the facial line D Q R. upon your oval, according to the third figure of the fourth plate, either inclining or erect, as may be required, then you will find the points of

† It appears from the Author's notes, that he had intended to treat this subject more amply.

* See Part I. Plate V.

incidence to be D, Q, S, R. Let these be considered as the middle points, and the countenance becomes natural.

A. Van Dyk has paid due attention to this, and also many of the Italian masters.

It appears, therefore, from the above example, that in such cases the oval is a deceitful guide. Drawing-masters ought not to sketch these lines upon a slate, or any flat surface, but on a ball of wood or clay, properly modelled.

CHAPTER II.

OF THE USE OF THE TRIANGLE IN SKETCHING A PROFILE.

HOET, A. Carrache, and some others, teach us that to draw the face in profile, an equilateral triangle must first be formed (as A B C. Fig. 4. of Plate VII.); that the foremost line A C. must be divided in three equal parts for the face; that is, the forehead, nose, and chin.

But the point B. is of no use, unless to place the ear within it. Then, indeed, would the space between D and F. be equal to two noses, measuring from the lobe to the line intersecting the nostril. But the lower maxilla would be thrown backwards, as in C and F. which is a disproportion never to be met with in Nature.

However, it is allowed that by this method the facial line A C. is admirably well preserved. Thus far is the triangle preferable to the oval.

Some artists, and particularly Le Clerc, in his copy of Le Brun's figures of the passions*, have used the small equilateral triangle D E C. When one side of the triangle lies on the facial line, the point E. will mark the orifice of the

* Tab. I. Fig. 3.

ear with accuracy; so that the distance from I. to E. or rather I H. shall be equal to two noses. But he has not applied it in this manner, and therefore it neither marks the proper boundaries of the facial line, nor of the ear. Besides, this triangle only gives half of the face, with the ear. For these reasons I think it of no great use.

J. C. Vischer, in his *Fundamentales regulæ artis pictoriæ et sculpturæ*, uses the larger triangle marked by our A B C. Parizet, in his Treatise, entitled *Nouveau Livre des Principes du dessin*, has adopted the triangle of Le Clerc, and with no greater advantage.

The great uncertainty and imperfection of the common methods, made me desirous of inventing some other, which should promise to be more certain, and more generally applicable. This object had long employed my thoughts, and, I think, with success.

CHAPTER III.

A NEW METHOD OF DELINEATING THE HEAD.

BEING perpetually conversant with the skulls and faces of the dead, and having attentively examined them after they were sawn through, for anatomical uses, in the manner already described; and having also diligently traced the growth of the maxilla, and of the nose, in the heads of infants that were but a few weeks old; an idea suggested itself, that in drawing or painting of the head, the best method would be to imitate the process of Nature; first to form the cranium or skull, then mark the facial line in the direction required, and afterwards arrange the other parts according to given proportions.

The skull is an horizontal oval, of which the hindmost parts are the largest, and the fore-part rounded like the section of a ball or globe. I first draw this oval by means of two circles, the one is *S L V E W*. which contains about three parts of the head; the other, *K U Z*. which is in size eight-ninths of the other circle. Draw the horizontal line *S T*. which extends from the centre of the large circle *S*. to *T*. the centre of the smaller; and is one-fourth of the larger circle. From the centre *S*. I let fall the perpendicular line *S Q*; this marks the seat of the orifice of the ear, and of its lobe at *E*.

2. I draw P G. the facial line, in the degree of inclination required: K. marks the place of the forehead; F. the line of the eye; I. the nose; H. and a third of I B. or I G. the mouth.

3. I complete the oval Z V E. which marks with sufficient accuracy the lower edge of the eye-socket.

4. I take G N. which may be equal to the size of the nose, or less, according to the inclination of the facial line, and thus I mark the commencement of the neck.

This manner is perfectly simple, natural, and indicates all the principal parts in the proportions required. Not to observe that it is easier to strike an horizontal oval than a perpendicular one.

To delineate a person advanced in years, I first draw the oval K L V E. and the facial line P K H G. See Plate VIII. Fig. 2.

2. As in every aged person the teeth are wanting, and the *alveolæ* are obliterated, by which the maxillæ have lost about one-third of their size, I pursue the method recommended in describing the second figure of the sixth plate, to ascertain the present place of the chin, &c.

3. Considering G. to be the seat of the chin, in its more perfect state, I place the compasses in E. and draw from G.

the curved line *g G.* and place the tip of the chin at *g.* which is about two-thirds from *I B.*

4. I next divide *G I.* into three equal parts, the upper of which is for the mouth.

5. I also draw the protuberance *K F.* as this generally projects considerably from the facial line, in very aged persons.

6. Finally. I take the length of a nose at *G N.* and sketch the neck *N O.*

Thus I obtain an aged face, with all its characteristics, in the most perfect manner.

In children, the form of the cranium being similar (see Plate VIII. Fig. 4.) the oval must be drawn as before, then the perpendicular line *N Q.* next the facial line *P G.* Since children have not the protuberance on the forehead, as has been remarked*, the *F.* (see Fig. 1 and 2.) must be placed within the perpendicular line; whereas in the first figure it touches, and in the second it projects beyond it.

2. The eyes are two-fifths of the whole height, measuring from under the chin, and three-fifths from the top of the forehead. This agrees with the proportions of De Wit and Alb. Durer.

* See Part II. Chap. I. p. 50.

3. The distance from *i.* to *e.* the place for the nose, is equal to one-fourth of the line *L Q.* but as the upper and lower jaw are, from causes assigned already, one-third narrower in young children, as well as in aged persons, the line *a b.* must be drawn from *A B.* to *L Q.* and the oblique line *c d.* as was explained when we considered the fourth figure of the fifth plate. Thus is the point of incidence *g.* for the tip of the chin, and *G.* for the mouth. *A a.* is now divided into five parts also; three-fifths of which will indicate the line of the eye, and two-fifths are destined for the face.

In drawing the sketch, first strike the oval, then draw the facial line *P G.* let *G g.* be noted upon the line *d c.* and then draw a line from *g.* to *h.* the origin of the neck behind; and all the principal points will be accurately noted. When the mouth is to be represented more open, *G.* must be placed proportionably lower and more backwards.

A sketch drawn in this manner gives the most natural representation of a child's face.

To delineate the negro (see Fig. 3. of the eighth Plate) a similar method must be observed. After the oval is formed, draw the facial line *P G.* inclining backwards, according to the rules laid down in the Third Chapter of Part the First; then draw a line from *B.* to *H.* and you have the point of incidence at *K.* which limits the mouth. Thus you obtain the particular form of countenance. *B N.* being equal to one-fourth of *A B.* points where the neck commences.

The other parts, and their proportions, have already been too fully described, to render a more circumstantial detail necessary.

Thus is the remark of Philostratus verified, that lines simply drawn with chalk, may characterize the Indian, by a flat nose, stiff hair, prominent jaws, &c. *

This manner of sketching is acquired with equal ease with the one in common use. It is also perfectly applicable to the representation of the passions of the mind. In the expression of astonishment, fear, &c. when the mouth is open, the chin must be placed lower and more backwards; the concomitants must be expressed by the action of the muscles; and this action of the different muscles in the excitements of passion, may also be explained in a physiological manner, with as much accuracy as, I flatter myself, has been observed in these delineations of different nations and ages.

The diversity of countenances is made by varying the proportions, and changing the position of the facial line. These give a large scope within the limits of resemblance, and also of beauty.

The rules given by Alb. Durer, in his Treatise concerning the manner of changing statues, and the features of the face,

* Life of Apol. of Thyan. Cap. X. See also Junius, on the Knowledge of the Antients in Painting. Lib. III. Cap. II. p. 259.

are mostly productive of a caricature, which is feldom applicable to the art of drawing, although it is not totally destitute of utility.

It were to be wished that artists would apply themselves to the ascertaining of the true figure of the human body upon the plan here proposed: I am convinced that the progress would at least be equal to these my labours respecting the head and countenance. May I entertain the hopes, That a study begun by myself, will be brought to perfection by some other admirer of the art?

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BOOK II.

LECTURES

ON THE MANNER OF REPRESENTING THE DIFFERENT PASSIONS—

ON THE POINTS OF SIMILARITY BETWEEN THE HUMAN SPECIES, QUADRUPEDS,
BIRDS, AND FISH;

WITH RULES FOR DRAWING, FOUNDED ON THIS SIMILARITY.

BOOK II

LECTURES

ON THE MANNER OF REPRESENTING THE DIFFERENT PARTS
ON THE POINTS OF SIMILARITY BETWEEN THE HUMAN SKELETON
BIRDS AND THE
WITH RULES FOR DRAWING, FOUND ON THE LAMINA

BOOK II.

LECTURE I.

THE MANNER OF DELINEATING THE DIFFERENT PASSIONS.

THE art of painting was, in times the most remote, not only valued as a pleasing, but as a very important art. Aristotle informs us, that the Greeks made it an essential part of their education; and that it was universally expected of the children of richer citizens, that they should be able to criticise the works of their renowned artists with judgment, and be qualified to furnish their own mansions with taste and elegance.

Their laudable example was once imitated with zeal and success by the inhabitants of this country. In almost every town the citizens of distinction were educated in some knowledge of the arts. We must now lament the change that has taken place in most of the towns which were once the residence of celebrated artists. Your city alone shews itself to be the patron of this amiable sister of poetry; and its fostering care not only promises every advantage to rising

youth, but inspires a spirit of emulation in the bosom of artists themselves, that has been productive of works which reflect an honour upon the country at large.

I will not expatiate upon the excellent lessons and judicious dissertations which have been delivered in this place by several members of our society, as I should offend the modesty of those who are present; but the great attention that has been paid to my feeble endeavours, upon former occasions, manifests the zeal of its members, and their predilection for this delightful art. The approbation with which my attempts to shew the intimate connexion subsisting between the science of anatomy and painting were crowned, have encouraged me to pursue a study which has always been my amusement, and the principles of which I have long desired more deeply to investigate.

In the year 1770, I had the satisfaction of demonstrating before you, with what taste, and with how much certainty, the different features in persons of various ages and nations may be delineated. In the present Lecture I shall endeavour to explain to you, in what manner the different passions inscribed upon the countenance may be expressed with the utmost accuracy. But as this science is more refined, so are the principles of it more difficult. They require an accurate knowledge of our make, not merely respecting osteology, or the arrangement of the bones, but also respecting the muscles and nerves, in order to judge with precision concerning the rules I shall propose.

The skilful representation of the passions of the mind, by painting or by statuary, has been admired from the remotest times. Pliny informs us, that one Aristides of Thebes was the first who delineated with success the various emotions of the soul. Although the arms, legs, and different positions of the body co-operate in the expression of certain emotions, yet the face has always been considered as their principal feat. Cicero terms the countenance the mute interpreter of the heart; and Seneca, who had made great progress in the knowledge of the human mind, justly remarks, that violent emotions, of every kind, cannot escape manifesting themselves in the countenance. To these general observations the ancients have also added, that the eyes are most expressive of these emotions. Pliny, that proficient in all the polite arts, says, "the mind dwells in the eye." He also knew, that the motions of the eyebrows contribute a considerable share to the ostentive effects.

I must refer you to the Treatise of Junius, on the knowledge of the ancients in painting, if you wish to be informed concerning the extent of this knowledge. It is true, the principal performances of their renowned masters are lost; but from the Laocoon alone, we may collect how deeply they had investigated the influence of pain. Not merely does the face, but the arms, legs, in short all the muscles of the body, indicate anguish.

The loveliness of the *Venus de Medicis*—the dignity of the Pythian Apollo—the deities, male and female, engraved

on precious stones—the different masks—the sportive fawns, manifest that expression of countenance constituted no small part of the excellency which is so much admired in the statues, paintings, and engravings of the antients.

The fine arts were buried under the bad taste that prevailed during the middle ages, until from the fourteenth century every branch of science began to revive; and in the sixteenth and seventeenth centuries they flourished with such vigour, that Europe seemed to require a pause to rest from the fatigues of producing so many eminent characters.

But to return. Paullo Lomazzo, in his valuable work *Dell' Arte della Pittura*, published so early as in the year 1531, describes the influence of the passions upon the muscles of the face, and still more minutely the different postures and contortions of the body. He relates, that Michelino, a Milanese artist, had painted two peasants, and two country girls, who laughed so heartily, that no one could look at them without laughing. He tells us also, that to draw laughing features was the great amusement of Da Vinci. But I need not inform you, that, at the period referred to, caricatures were so much the mode, that at length they became disgusting. Leonardo also, who flourished at the beginning of the sixteenth century, very naturally describes, in his immortal work on painting, all the various changes of countenance; but, like Lomazzo, he has chiefly studied the different attitudes of the body. Both these great men seemed more attentive to general effect than to particular features.

To the list of great men who have distinguished themselves in this department, may be added the names of Michael Angelo and Raphael, who seem to have made the different expressions of countenance their principal study. I well remember the astonishment I felt, when I first contemplated the Penitence of Peter, painted in one of the cartoons; and who can remain insensible to the anguish of Proserpine, when forced away by Pluto, as it is chiseled out in stone by Buonaroti!

However, no one has arranged the expressions of the different passions upon the countenance more systematically than Le Brun, who flourished about the middle of the seventeenth century. He has executed this work in so masterly a manner, that every nation has followed his lessons, and copied his examples. The great Buffon alone has ventured to deviate from him; but not with the greatest success. I shall leave every connoisseur to decide whether I be to blame in placing a much inferior value upon his drawings than upon those of Le Brun.

All the authors I have mentioned, have either confined themselves to appearances, or, like Le Brun, have reasoned metaphysically concerning the operations of the mind, without attending to the physical causes of the changes produced by these operations. But in my opinion, speculations concerning the manner of the soul's working, or concerning the seat of the soul, are of no use to the artist. These belong to metaphysicians, who by the way lose themselves in a labyrinth of terms, or words with no definitive meaning, without

having in the least explained the action of this immortal principle upon the corporeal and mortal frame.

Pliny, Da Vinci, and Junius, have particularized the principal appearances, but have mentioned little concerning the connexion that there is between the parts affected; and still less have they particularized the changes which necessarily arise from the various affections of the nervous system. Wattelet also has described the passions, and their influence, with much good sense, and in a strain of eloquence. It shall be my object not to speculate concerning the workings of the soul, but to enquire what changes take place in the body, in consequence of its operations. We shall investigate the appearances produced, the uniformity of these appearances, and their influence upon the features of the face.

The first thing requisite, is to acquire an accurate knowledge of the form of the skeleton, and particularly of the cranium; the second, To be well acquainted with the principal muscles of the face, and their action; thirdly, To trace the nerves in their divisions and connexions with these muscles.

A few examples will illustrate my plan, and indicate its importance, however novel it may appear.

An oppressed, sorrowful, and melancholy person, lets his head sink downwards, or he supports it with his hand; the equipoise is no longer maintained by the muscles of the neck; that is, the nerves belonging to those muscles are rendered inert.

A lively contented laughter, on the other hand, raises his head, and his breast is agitated. In the excess of the emotion, he places both his hands to his sides, as it were to support his body. At length his legs begin to refuse their office; and he would fall to the ground if the fit continued.

A person in the impetus of rage, beats with hands and feet, stamps till the ground shakes under him; and his face is convulsed in a thousand forms.

Deep reverence makes the tongue to falter, an inward trembling impedes the motion of the body; the most lively and expressive eyes are abashed, and look downwards; the heart flutters; if shame accompany this emotion, as is frequently the case, the face, neck, and breast are immediately painted of a crimson colour.

It would be endless to particularize every emotion in a similar manner. The observation deducible from these effects is, that in every emotion of the mind particular nerves are affected; consequently every painter ought to make himself acquainted with the construction and connexion of the nerves productive of these changes; at least every one who undertakes to write systematically upon the subject, should acquire such a portion of anatomical knowledge, as to be able to instruct his disciples in the general rules that flow from it.

The paleness arising from fear, or a sudden alarm, depends, equally with blushing, upon the action of the nerves. These

changes of colour may be accurately expressed by the painter; and in this he has the advantage over the statuary, engraver, &c. But orators and public actors have the superior advantage of giving the greatest force to the expressions of the features, by exciting the requisite movements in the parts themselves.

As dissecting of human bodies has been my constant occupation, I have had frequent opportunities of examining which of the nerves, communicating with these more active parts, must have been particularly affected; consequently, which of the muscles must have been excited to action by those nerves; and from the action of these muscles depending upon their origins, insertions, course, and connexions, we may easily learn what pleats in the face, what kind of action in the hands, &c. they must necessarily occasion. It is these appearances alone that I propose to elucidate in the present Lecture.

It may be objected, that according to the above representation, the ancients must have been acquainted with the anatomy of the passions; or that they, together with Raphael, Callot, Le Brun, and others, have succeeded wonderfully without this knowledge:—that Hogarth himself, who excelled in representing the passions, was ignorant of all that I have advanced to be so necessary:—that John Steen, who was frequently so inimitable in the delineation of the passions, never dreamed of studying the muscles stript of their integuments, or of acquiring an intimate knowledge of those nerves which so many anatomists themselves know but imperfectly.

Notwithstanding these objections, I am well assured that my remarks will prove both important and acceptable to this audience. Tracing the operations of Nature is always an useful employment; you will also see and admire her wonderful address; and finally, we shall point out a method by which not only youth, but painters themselves may make a speedy progress in this most enchanting branch of the art.

We shall confine ourselves to the face.

I shall first enable you to recollect the constituent parts of the cranium, its form, cavities, connexions, proportions, &c.*

Secondly, I shall delineate the principal muscles of the face, and mark the true situation of the eyes, that you may be convinced that Le Brun has placed them too much inclining downwards; and that, in his representation of Laughter, he has given an improper bend downwards to the inward angles of the eyes: he has committed a similar fault in Weeping.

Thirdly, I shall demonstrate that the pleats or wrinkles of the face must necessarily run in a rectangular direction, according to the course of the muscular fibrillæ.

Fourthly, I shall exhibit before you some of the nerves, in order that you may understand the immediate connexion

* Several of these sketches were *extemporaneous*, and have not been preserved.

which takes place in the action of some of the muscles in the same passion.

The sixth pair, as they were denominated by ancient anatomists, or the eighth of the moderns, has long been termed the Pathetic. This pair communicates with the throat, breast, abdomen, and, by the intercostal muscles, with the nerves of the arms and legs.

The fourth pair, or the lesser pathetics, produce wonderful effects in surprise, in love, in dying.

It is by the action of the seventh pair, that we laugh, blush, or look pale.

Finally. I shall delineate the muscles of the eyes, that a just idea may be formed of their motion in the full vigour of life, and in the article of death; and subjoin some observations concerning the synchronous and alternate motion of the oblique muscles in friendly greetings, and in tokens of respect.

In Dying, the eyes are drawn towards each other; because the power of the will ceases, and the muscles act in consequence of the remains of life seated in them.

Such are the principles we shall lay down; the right study and application of which, will enable the artist to ex-

press the passions of the soul with the utmost accuracy, and in their full energy.

EXAMPLES.*

I SHALL first sketch a Death's Head. See Plate I. Fig. 1. Secondly, The principal Muscles of the Face. Fig. 2. Thirdly, A countenance perfectly PLACID. Fig. 3. Fourthly, Expressing SURPRISE. Fig. 4. Fifthly, CONTEMPT. Fig. 5. Sixthly, COMPLACENCY, FRIENDLINESS, TACIT JOY. Plate II. Fig. 6. Seventhly, LAUGHTER. Fig. 7. Eighthly, SORROW. Fig. 8. Ninthly, WEEPING. Fig. 9. Tenthly, VEXATION and WRATH. Fig. 10. Finally, The DYING. Fig. 11.

The quick transitions from one passion to another, which I am about to exhibit, may not, perhaps, excite less surprise than that which the great Ferdinand of Tuscany experienced, when he saw Peter of Cortona working with his pencil at Florence. The painter perceiving that the Duke was particularly struck with the figure of a child crying, convinced him that a very few touches of the pencil would exhibit laughter. He then restored the former strokes, and the child was made to cry again; to the no small astonishment of the Prince. I hope that you will experience something of a

* The Professor in demonstrating these changes, made the requisite alterations on the same face; and also pointed out the defects of other painters in a similar manner. This had a powerful effect upon the audience, which cannot be produced to an equal degree by distinct figures.

similar emotion, although it is not a Peter of Cortona that handles the pencil, but simply a lover of the arts.

Contemplate first the **PLACID** countenance. Fig. 3. Every feature is at rest; no one muscle is brought into particular action; all are in a state of repose, without appearing relaxed or inert. There is a tranquillity in the eye void of languor, and the lips are in unconstrained contact.

Let us suppose something to present itself which excites a degree of **SURPRISE** or **WONDER**. Fig. 4. The intercostal nerves are immediately affected, and act upon the third pair; hence the eye-lid is opened, and the eye stands motionless in the socket. The same nerve acts upon the eighth pair at the same time; respiration is suspended, the free motion of the heart is impeded, and the mouth is opened, as the maxillary muscles destined to this purpose are affected; but as these act alone upon the lower maxilla, the teeth are not discovered. The hands are extended, and more particularly the fingers, from the action of their muscular plexus.

The effects of **CONTEMPT** are very different. Fig. 5. The fifth pair of nerves are put in motion. Thus are the eyebrows drawn inwards and downwards; the mouth is firmly closed; but as the lower lip rises in the middle, it becomes arched. The eyes are drawn sideways, the musculus abducens and adducens acting together by the force of habit.—By making the head to turn towards the right, and the

eyes toward the left hand, the passion is rendered more expressive.

Fig. 6. In COMPLACENCY, FRIENDLY GREETINGS, and TACIT JOY, those parts alone act which have an immediate communication with the seventh pair of nerves. The angles of the mouth must never be drawn up alone, without other tokens of an incipient smile. Great care should be taken to avoid drawing the eyebrows inwards: an error frequently committed by the French in their portraits.

LAUGHTER. Fig. 7. In laughter all the effects produced by the former affection are greatly increased, and others are superadded. The whole countenance inclines forwards, but without the attention being fixed upon any determinate object. The outward edges of the orbicular muscles of the eye are contracted, producing wrinkles and folds around the eyes. The lips are opened by the action of the orbicular muscle, on the external sides; hence the teeth, particularly the upper, are made to appear; small wrinkles arise at the corners of the mouth, and the cheeks become fuller, &c.

If you would add an arch, or a wanton look, place the eye sideways, and contract the upper eyelid expressive of a wink.

In a SORROWFUL countenance (Fig. 8.) the fifth pair of nerves are principally affected; the mouth is drawn downwards by the descent of the upper lip. To add DESPAIR to

this emotion, the face must be made to look upwards, and somewhat obliquely; the brow must be furrowed with wrinkles; and the middle of the eyebrows be drawn upwards.

In **WEEPING** (Fig. 9) all the muscles which receive the fifth pair of nerves, act in a very forcible manner. Hence the corners of the mouth are drawn downwards, the lower part of the nose upwards, the eyebrows descend, the eyes are nearly closed, and tears are pressed out of the lacrymal glands.

If **ANGER** (Fig. 10.) accompanies the emotion, the action of the muscles draws the eyes wide open; the eyebrows descend still lower, and the teeth are violently compressed together.

DYING. Fig. 2. In dying it is to be observed, First, That all the muscles of the neck open the mouth, and elongate the chin. Secondly, That the pathetic nerves draw the eyes towards each other. And thirdly, That all the other muscles cease to act.

What Le Brun terms Veneration, is not well expressed*, as the eyes are represented drawn upwards by the action of the two oblique muscles alone; whereas the upper and under *musculi obliqui* must act.

* Plate III. p. 18. Plate IV. Fig. 5.

Accept, Gentlemen, these short specimens, by way of elucidating my principles. To represent every passion and possible emotion of the mind, would require more time than could be allowed by one who professes to be an anatomist, and not a painter. My sole object has been to awaken attention, and excite a spirit of enquiry; that you may be induced to consult Nature herself, without indulging implicit confidence in the rules and examples given by the most celebrated masters, which are frequently imperfect. If in these specimens I have not answered your expectations; if my expressions have not been sufficiently explicit; and my hand has failed in giving the requisite strokes of the pencil, I can still perceive, by the satisfaction painted upon your countenances, that my endeavours to please you have proved successful.

LECTURE II.

CONCERNING THE POINTS OF SIMILARITY BETWEEN QUADRUPEDS, BIRDS,
AND FISH.

THE object of the present and following Lectures, shall be to shew the great similarity there is between Quadrupeds, and the resemblance of these to Birds and Fish; and also to indicate a very easy method of delineating all these animals in the most exact manner.

Should my audience deem the undertaking of little moment, or consider the precise form of animals as beneath the attention even of painters themselves, I could justify the design by quoting the laudable example of the antients. The Greeks, the Romans, and before these the Egyptians, were obliged to pay the most minute attention to every species of animals, not merely as emblems of their different idols, but as inseparable from their sacrifices, races, triumphs, &c. but these could neither be painted nor represented in stone or metal, without the knowledge of what constitutes the beauty and perfection of the animal creation.

The high value in which this art was held by the antients, will moreover appear from the Dog cast in metal, which Pliny* informs us, was preserved in the Capitolium, as an

* Lib. XXXIV. C. XVII. p. 646. Vol. II.

exquisite piece of workmanship, with so much care, that the superintendents were threatened with death in case of negligence.

We read also that Myron* had formed so beautiful a Cow in metal, that it was not only celebrated by the poets, but copied by the most skilful engravers with equal zeal, as a Venus, or any other fine workmanship, of the greatest masters. Count Caylus † has this cow engraved on a Cornelian; which is no inconsiderable addition to the cabinet of that celebrated connoisseur. Canachis acquired no less honour by a Hart, which he had formed in copper, that appeared so light and swift, that a thread might apparently be made to pass under the feet. Tisicrates is immortalized by his Lion; Simon, by a Dog; Nicias, by his paintings of several species of animals; and Androcydes, by his skilful representation of Fish.

Whoever consults the *Monumenti Antichi Inediti* of Winkelman, and particularly the Introduction ‡, will be made acquainted with the high value which, in the present day, is placed upon the Lion in the Capitol; the Sphinx in the palace of Borgheze; and also the other animals by the fountain *Dell' Aqua Felice*.

The Horse has excited still greater ambition. I shall not mention the story of Apelles, nor of his follower Lysippus.

* Lib. XXXIV. C. XIX. p. 650. § 3.

† Caylus, Vol. I. Tab. I. Fig. 3. p. 135.

‡ P. 18.

Their successor Calamis obtained such renown for his horses, that he is not only celebrated by Pliny* and Cicero, but Ovid has immortalized him in his verses. Pliny says, that he was unrivalled in his representation of Cars drawn by two or four horses, notwithstanding that Lysippus, and his disciple Euthykrates, had distinguished themselves in this department.

The valuable cabinet of Stofch † manifests how great a master Aspafius was in the engraving of Horses. Hylus has also excelled in Steers, and Lucius in Horses.

Many triumphant cars, with four horses abreast, are represented in *bass-relief*, and engraved on precious stones, in a manner that exceed all imagination. They are mostly represented with two, and with four horses. I have never seen them with ten; though Nero introduced hunting with this number. In the cabinet of Count Caylus, there is an engraving, on Cornelian, of a conqueror with twenty horses by the side of each other, which can be minutely distinguished, and of exquisite beauty.

It would be endless to enumerate all those who have acquired celebrity by depicting of animals. Let me recommend to you the Catalogue of Ancient Artists, arranged with so much judgment, by Franc. Junius. This will inform you of the number of artists, who have acquired immortal fame by their representations of various animals.

* Tom. II. p. 654. § 11.

† l. m. n. Tab. xiii.—40, 15, 16, 31.

We will now direct our attention to those great masters that were your immediate predecessors, whose admirable performances must have made an indelible impresson upon your minds. Who, of the present assembly, does not pant after the immortal fame, so justly acquired by a Van Berchem, a Potter, a Wouwerman, a Wenix, an Adrian Van de Velde, a Houdekoeter, and other great men which this country has produced? So superior and so manifold are the excellencies of these masters, that it would require too much of our time to particularize them; yet I do not recollect that any one, except the indefatigable Crispin Van de Pas, has professedly written on the proportions of animals; or has given, to the ambitious student, any rules to forward his success.

What Da Vinci has advanced upon the subject of horses, is not adapted to give general ideas. All that is communicated by P. Lomazzo, is merely a poetic description of the beauty of some animals. Charles Vander Mander amuses himself with trifles; and Laireffe passes over the subject in total silence.

My undertaking must consequently appear to you the more bold and hazardous. But although the imperfections of the attempt cannot escape the observation of this intelligent audience, yet I am persuaded they will find an apology in its difficulties. You will readily perceive that the idea could alone suggest itself, by my attention to the close connexion there is between the tedious and indelicate employment of dissecting animals, and the most elegant of the arts! To

the accidental union of these two useful pursuits in the same person, may be ascribed all that may be deemed useful in the following remarks. I will add, that a very large collection of the skeletons of different animals, in my cabinet, has given me frequent opportunities of comparing together their specific forms. I shall deem myself abundantly recompensed, if my labours should awaken and direct Genius to bring this part of the science to the perfection of which it is capable.

I propose to give two Lectures upon the subject. In the first, I shall point out the similarities that exist between quadrupeds of every kind; between these and fowls; and also fish; and, finally, indicate those peculiarities to which the painter, or statuary, should direct his principal attention.

In the second Lecture, I shall point out the resemblance between quadrupeds, fowls, and fish; and propose an infallible method of sketching all these animals; and shall conclude with demonstrating, that, like another Proteus, we may with a few strokes of the pencil, change a cow into a horse, a stork, or into any kind of fish we please.

I will not waste your time by attempting to delineate animals in the most perfect manner with the pencil of Zeuxis, but rather, like Agatharchus, hastily draw the outlines, and leave it to your taste and judgment to supply the minutæ which add elegance to a figure. I shall be amply satisfied if you should be able to discover, amidst these imperfect essays,

principles that may serve as the foundation of more perfect attempts.

No one who holds the art of painting in due estimation, can doubt that it is the grand object of the artist to delineate his figures after the life, and with the utmost accuracy; or to represent, by the closest imitation, the different objects which all-bounteous Nature has bestowed upon us in so rich an abundance; yet it is highly advantageous, and, to excel, absolutely necessary for the painter to acquire an intimate knowledge of all those created beings he wishes to represent; and to penetrate, as it were, into the plans and designs of the great Creator, in the formation of the astonishing variety which strikes us in the animal creation, and which excites within us the pleasing emotions of wonder and admiration!

I shall begin with Man, whom we will consider as the most perfect quadruped, and gradually descend to apes, dogs, the yerboa, &c. thence proceed to fowls, and then pass over to the finny tribe.

Perhaps you will consider the undertaking as extravagant, and the expression unguarded; but I hope soon to convince you, that fish and fowls, as well as horses and cows, may justly be deemed quadrupeds, although they are differently formed, that each may be able to exert the requisite movements in the most easy manner, according to its particular station. Each animal differs also in the form of its head, body, feet, tail, &c. according to the design for which it was created; yet, extra-

vagant as the position may appear, I shall prove that the oyster, bound to a particular spot, contains the first principle of the fishy tribe, these of fowls, these of the dog, and every other quadruped, up to man himself!

I would willingly give you ocular demonstration of the fact, by placing before you a sketch of each; but this would be impracticable, within the limits of the hour. I shall confine myself, in the present Lecture, to the close resemblance that subsists between the different parts of these animals. I shall therefore delineate before you, the skeleton of a man, of a dog, an eagle, and a penguin, that you may be convinced of the likeness that subsists between them. The fish we shall reserve for the next Lecture*.

You perceive by this general comparison, that man is the most perfect of all animals; not because he walks with an erect countenance, as Plato, and after him Cicero and Ovid, have remarked; as if it was a peculiar privilege in a man to look towards the heavens; for, as Galen has justly observed, several species of fish enjoy this privilege in a more perfect manner. The grand corporeal advantage enjoyed by man is, that he can walk, and even sit, in an erect attitude. I

* The publication is necessarily imperfect concerning this very interesting article, as the Professor's principles cannot be illustrated by the diversity of examples he delineated before the audience; in which he demonstrated the grand points of resemblance, and traced progressively the kinds and degrees of deviations from them.

may also add, that man alone is able to repose upon his back; and that, by the centre of motion being placed in the middle of his body, he is enabled to turn himself, to bend his body in a great diversity of manners, and to walk with peculiar facility. All these advantages necessarily flow from the peculiar mechanism of his form. He has also many other advantages, which it would be foreign from our purpose to enumerate. To return to the brute creation.

1. Every one that contemplates a fine horse, is struck with the beauty of his neck. When we view a camel, the length of his neck and the smallness of his head strike us the most. In the elephant, its long trunk, or proboscis, is the principal object of admiration. In the cow, the thickness of its body is most remarkable. In the greyhound, on the contrary, it is the thinness of body and slenderness of the feet that attract our chief attention. In the mean time it is extremely obvious, that these forms of particular parts are a necessary consequence of the ends to which these different animals are destined. Cicero has given us a beautiful description of these singular differences, which manifests his deep penetration into the designs of Nature. "Some animals," says he, "are low of stature, that they may the more easily reach from the earth the food it affords for their nutrition. But those animals which, for wise reasons, are taller (as cranes, and also the camel) are assisted by the length of their necks. Elephants are furnished with a species of hand, by which those animals gather their food from the ground; as the immense

bulk of their bodies renders it impracticable for them to bend or stoop." *

This idea is exemplified in the shark; which, although it has long teeth, is destitute of a snout, which would be useless, as that animal seeks and devours its food while swimming in the water. Many are the instances of the necessity of a snout in some animals, and its uselessness in others; and Nature has wisely made their forms correspondent. Galen has moreover justly remarked, that in those animals which gather their food from the earth, the neck is the length of the feet †.

However worthy these observations of Cicero and Galen may be of their authors, and applicable to our present purpose, I confess that I had not an adequate conception of their importance, until my remarks concerning animals were brought to some degree of perfection, and those further discoveries were made which shall be hereafter explained.

That distinguished naturalist Ray, has, in his Preface to Willoughby's Treatise on Fish, expressed the thought of Cicero in other terms. He has further observed, that fish are destitute of necks; not merely because they have not feet, but because they can procure their food in every part of the watery element without them. Aristotle has likewise remarked that fish are destitute of necks. Snakes are also without them; and in this respect is their form very similar to that of fish.

* Cic. de Nat. Deor. Cap. XLVII. p. 248.

† De Ufu Part. Lib. VIII. Cap. I.

2. Respecting the feet, it is to be observed that the wise Creator has uniformly made the fore feet of those animals, whose stature renders a long neck necessary, lower than the hind feet, as in the sheep, the deer, and camel; and in such animals the *dorsal vertebræ* gradually descend from the hips. The giraffe is an exception, being destined to other purposes.

3. If we attend to the belly, we shall perceive that it is much larger in those animals that feed upon grass, than in the carnivorous class; and in those which chew the cud, than in those which do not. The reason is evident; the organs of digestion, or, in other words, the intestines destined to convert animal substance into animal substance, need not be so ample and voluminous as those whose office it is to transmute grass into animal substance. In this kind of vegetable, nutritious particles are diffused over a large surface, while it is comprised in a much smaller space in animal food.

The cow eats a large quantity at once, and afterwards ruminates. The horse eats continually. The cow must consequently have a much larger belly than the horse, and this a larger one than the dog, &c.

4. The comparative length of animals is also proportionate to the number of the vertebræ of the loins. Some, as the elephant, have only three; the horse, has five; the cow, six; the lion, cat, and camel, have seven.

5. In animals that live upon gramina ; as elephants, horses, oxen, deer, camels, and in all that chew the cud, also in swine, the feet are horned, whether they be whole as in the horse, or cloven as in the cow and sheep ; because the animals must stand continually to procure their food. All the others are divided into two, three, four, or five fingers, as in man. More than five fingers are never found in any quadruped.

6. In fowls, the wings terminate in fingers. All have a thumb to each wing ; in the majority two fingers are super-added. Many are furnished with nails ; as the ostrich and the spurred water-hen.

The above remarks are sufficient to evince this truth : The more perfectly an artist is acquainted with the nature of animals, and the designs of their particular formation, the better he will succeed in his attempts to delineate them.

But as verbal descriptions may not be sufficiently obvious, we will call in the aid of sketches ; the explanation of which will clearly indicate the truth and importance of my observations.

E X A M P L E S.

EXAMPLE I.

THE HORSE. See PLATE III. FIG. I.

1. Let B C D E F. limit the body and feet of the horse. For the animal to move itself properly, the feet must be as G E. and H D. in length.

2. Trace the course of the spine with its cavity. Let A Y. be the foremost rib; and A. the moveable point of the first vertebræ of the neck. All quadrupeds have seven of these vertebræ.

INFERENCES.

1. The neck and head of the animal must be so long, that he shall be able to reach his food; that is, as A Y + Y Z.

2. When the head is small in proportion to the height of the animal, the neck must necessarily be longer; as takes place in camels, sheep, &c.

3. When the head is erect, the neck must necessarily be curved; either externally as B ⊙ F, or inwardly, as in aged horses; and the neck is more or less in the direction of B ≐ F, in proportion as it sinks.

4. In order to support so long a neck, the processes of the vertebræ nearest to the prominence of the neck, or withers, must be very long, as in the horse. See A B.

They are of consequence shorter in the animals whose necks are differently formed; and the shortest in the human species, as man carries his head erect.

It is to be remarked, that the horse is furnished with a large muscle which runs over S C. to R. and unites with the *Soleus* at α , which empowers him to kick backwards with so much force, and which is peculiar to this animal. The cow being destitute of it, this part of the body is consequently hollow.

By the way, the head of Bourgelat's horse in the Hippique is too small; the length from E to S, or from the extremity of the shoulder to the extremity of the buttocks, being two heads and two-thirds, whereas it must be two and one-half, as in the painting of Stubbs, and other good masters. In the English model of a horse stript of its integuments, the head is only one-third of the length from F. to S. that is, considerably shorter. Unless these animals were furnished with extraordinary long necks, they would not be able to graze.

The height B E. from the withers to the hoofs, is generally equal to F S. and mostly five feet. I have found the majority of heads to be two feet in length, even in foals; but the necks of these are proportionably longer.

EXAMPLE II.

THE COW. PLATE III. FIG. 2.

First, Draw the outlines of a horse as before. Secondly, Shorten the feet from E to e. and from D to d.

INFERENCE.

In consequence of this considerable difference in the length of the feet, the neck of the cow need not be longer than from A to Γ. and when stretched in stooping to graze, as from A to Y. Hence the neck cannot be arched, as in the horse, nor is it necessary, but it gently inclines upwards. The weight of the head always sinks it, and also the horns, lower than the prominence B. This is always the case in that species of cattle that is mostly known in Holland. It is for this reason that the withers, or prominence B. is not so elevated as in the horse. Other peculiarities will manifest themselves.

EXAMPLE III.

THE DOG. PLATE IV. FIG. 3.

1. Draw, as before, the outlines of the horse, and the line of the vertebræ.

2. Contract the belly from G H. to G Z. this difference being occasioned by the nature of the food, as has been explained.

The neck of this animal is of various lengths, as it frequently eats and gnaws its food lying, ás well as in a standing posture.

4. The feet must be made slender, in proportion to the swiftness of the animal.

5. As the thigh bone from H to α , is longer than in a horse, the leg $\alpha \nu$ becomes proportionably shorter.

6. The tail must be made to spring upwards.

EXAMPLE IV.

THE CAMEL. PLATE IV. FIG. 4.

1. Sketch as before; but the feet must be made longer, and the belly thicker. In consequence of this difference,

2. The neck must necessarily be longer than that of the horse; and the head, though it be of equal size with that of the horse, will appear smaller, from the same cause.

3. When the head is erect, the neck must be made to curve from beneath upwards, contrary to that of the horse; and in such a direction, that the position of the head may correspond with the centre of gravity.

4. In this animal, as well as in the sheep and deer, the line A F. must have only a small degree of inclination upwards.

EXAMPLE V.

THE ELEPHANT. PLATE V. FIG. 5.

1. Draw the horse as before.

2. Were the neck of this animal to be as in the horse, from A to F, that is, long enough for the mouth to reach the ground, high and prominent withers would become requisite, proportionate to the weight to be supported. But this form could not take place according to the general construction of the animal. Therefore must the neck be shortened, as from A to r. But the animal not being able to reach the ground, a trunk, or proboscis, becomes necessary.

3. The vertebræ of the breast and back must now be made to form an arch.

4. The elephant has only three vertebræ of the loins, and becomes proportionably shorter.

Other peculiarities shall be left to your own observation.

LECTURE III.

THE SUBJECT CONTINUED.

IT has been observed in the preceding Lecture, that no one, excepting Crispin Van de Pas, has given us particular rules for delineating every species of animal, with any degree of precision. I will now add, that the skeletons which lay the foundation of the whole superstructure, and direct the form both of men and animals have generally been represented in so imperfect a manner, that they are of no use to the painter.

All the skeletons represented by Coiters, are extremely bad; those of Meyer are still worse. Nor is there a single one in the costly, and in other respects, excellent work of Buffon, that can be of the least service to the artist. In all of these, as in the productions of Coiters, the *dorsal vertebrae*, or back-bones, are in a right line: the shoulder-bones, with the bones of the fore arm, the bones of the thigh, with the shanks, are also in a right line. Thus are the feet, in proportion to the length of the neck, so long, that not one of these animals would be able to reach its food from the ground.

Cheselden, in his valuable Treatise on the Bones, has given us a very large collection of the skeletons of different animals;

which are beautifully executed. These have been engraved by Vander Gucht and Schynvoet in a masterly manner; but after imperfect models. Those of the lizard, the turtle, the crocodile, and the eagle, are beautiful; those of the bear, rabbit, and swan, are inimitable. The skeleton of the ostrich may serve; but that of the hog is entirely useless. Upon the whole, the skeletons of animals left us by Chefelden, are the most beautiful and accurate of any.

You will naturally suppose that the skeleton of the horse, which is the most beautiful and most useful of animals, must have been delineated with peculiar care and exactness. But alas! exclusive of those painted by the great master in this department, Stubbs, and engraved after his paintings, I know not of any that deserve commendation.

The representations of Carlo Ruini, who led the way, are useful to convey a general idea of the anatomy of the parts; but they cannot serve the painter. What then is to be expected from the works of Sannier and Snape, and of others, which are merely bad copies from the imperfect engravings of Carlo Ruini! It is a subject of still greater astonishment, that in the celebrated Royal Veterinary School at Charenton, near Paris, there is not a single skeleton of a horse that I would admit into my cabinet, although they were all mounted by Bourgelat himself. In every one of them the shoulder-blades and bones of the arms are badly placed. The skeleton of the horse given us by Buffon, and that by La Gueriniere, are still worse than the preceding.

That of Stubbs is masterly and accurate; all the parts are properly placed, are in just proportions, and well delineated. In his finished pieces the muscles are represented with an accuracy that cannot be exceeded. In a word, his skeleton of the horse, and his arrangement of the muscles, exhibit such a master-piece, that the author deserves the highest honours that were ever bestowed upon an artist.

If artists in general succeed so ill with the horse, whose extensive utility places him perpetually before our eyes, what is to be expected in the figures of other animals that have not been imitated by a Stubbs?

It is acknowledged, that a minute acquaintance with the anatomy of every animal would require so much time, that no artist could possibly attain it. Observation also manifests, that the most renowned artists have acquired their celebrity before they were thirty years of age. But an accurate knowledge of the principal parts, particularly of those which I have demonstrated to possess a general similitude, is absolutely necessary, both to sketch the different animals with more expedition, and with a greater degree of precision.

This seems to have been the method followed by Potter, Berchem, Wouverman, Snyder, Castiglioni, and the inimitable Testa, whose works I can recommend for their peculiar accuracy. I shall not mention Reidinger, because all his animals, a few of his dogs and deer excepted, are

absolutely caricatures, and have nothing but the execution to recommend them.

Van Berchem is not perfectly accurate in the disposition of the parts in his cows, asses, &c. The shoulder-blades are mostly imperfect, particularly of those represented in a front position. The heads of his apes are bad. Many of his sheep are ill delineated, though etched by himself. The skeleton is uniformly imperfect; yet his books for drawing are the least erroneous. Those engraved by D. Vischer have the imperfections of their originals; and the hairy covering is much inferior.

In the hunting of the deer, by Dankerts, is a beautiful horse; but the body of the deer is too slender.

Adrian Van de Velde has well delineated most of the cows, in his Book of Horned Cattle. The bull, in a standing posture, is remarkably well drawn; and also a grazing heifer, although its feet are somewhat too long. In some, the hip-bones are too long, particularly in the walking cows. His eating horse is bad. The head is one-third too small for the height. The prominence on the neck, or withers, is not high enough; and, on account of the smallness of the head, the neck is of an unusual length. Some may think that the painter should avoid, as much as possible, representing a horse in the act of grazing, as the extreme length of the distended neck is no pleasing figure. Great address is requisite to make it graceful.

A grazing cow, which Van de Velde has etched himself, is remarkably beautiful.

Paul Potter has etched a bull, which is much inferior to that of Van de Velde. Many of his cows are very imperfect in their form. He is always embarrassed with the shoulder-blade. This appears principally to be the case in those that have been etched by M. de Bijé.

But you will enquire, Why then do we consider the pieces of all these celebrated masters as so beautiful? The explanation is not difficult. Our own imperfect knowledge of the exact form of animals, renders us contented with whatever is agreeably executed upon the whole. We are enchanted by a graceful attitude, by a masterly stroke of the pencil, or by the high finishing of the whole; and this conceals our own ignorance, as well as the imperfections of the artist.

The works of D. Stoop are in some estimation by connoisseurs; but all his horses are ill drawn. The feet are too clumsy, the heads and necks are too small. All his greyhounds are inaccurate. In short, he scarcely deserves the name of a master.

What shall we say of S. de Vlieger? His landscapes indeed are picturesque; but his fowls are bad; his hounds are

imperfect in their shoulders and fore legs. Neither are his hogs or sheep accurate.

Peter de Laer has sketched his goats, dogs, asses, and hogs, tolerably well; but his horses have the same imperfections as those of Stoop; and his cows are bad.

Joan Vanden Hecke deserves no commendation, although he is not unknown to connoisseurs. His horses, cows, asses, dogs, in a word, all his animals are badly delineated.

A. B. Flamen has succeeded very well in his fishes; but his quadrupeds are very inferior to most others.

Picart le Roman has left behind him a large collection of lions; most of which are ill drawn. Some by Rembrandt are extremely fine; and that by Alb. Durer is beautiful upon the whole; but the heads of all are defective, excepting those by Rembrandt.

Many painters give a disagreeable physiognomy to their animals, through inattention to the pupil of the eye. Although the pupil is round in multitudes, yet in all animals that graze, it is oblong in an horizontal direction. In lions, tygers, cats, &c. it is perpendicularly oblong. In dogs the pupil is not in the centre of the eye, but approaching to the nose.

Respecting the teeth, most artists are guilty of great errors.

Ph. Wouwerman has not only painted his horses in a very spirited manner, but with more accuracy than I have observed in most others.

Those engraved by Dankerts, and Joh. de Vifcher, I place in the superior class of engravings.

To enumerate every particular would be an endless task. Let it suffice, that I have pointed out to you all such defects in the greatest and most celebrated masters as might have been avoided, by the manner I am about to explain. But we will first examine what C. Vander Pas has done.

This artist, in the fifth part of his work, page the sixth, has proposed what he deems an easy method of sketching the figure of a horse, without the rule or compass.

He draws a square by the eye (see Plate VI. Fig. 6.) A B C D. This he divides into nine equal parts, see 1, 2, 3, &c. He then makes three circles; one for the breech, one for the belly, and one for the breast and shoulders.

C. Van Mander has also recommended three circles; and it is possible that Van de Pas, who published his work in the

year 1665, has copied the method of C. Van Mander, which was published in 1603.

V. de Pas gives a third part of the fourth and fifth squares to complete the shoulder, and the lower part of the belly. A tenth square he destines to the neck; the diagonal of which limits the length of the neck and head.

To the above method it must be objected, First, That very few persons would be able to form these squares with sufficient accuracy by the hand. Secondly, The author has not explained the reason why the centre of these circles should be placed on the oblique lines F G. nor how they are circumscribed. According to this rule the croup rises higher than the withers at H. whereas the latter, according to Bourgelat, should be one-tenth higher; and, according to Stubbs, it is at least of an equal height. This proportion differs also from his own drawings (see p. 7, of his Treatise). Thirdly, By this method the head of the horse cannot be one-third of its height; for the height of the withers H. to the bottom of the foot I. is two heads and an half; or rather, the head is equal to one-fifth of the height and length of the horse. Fourthly, He makes the heel M. and the fore hand N. of an equal height; whereas the latter is the length of one head from the ground, and the former 1 and 1-6th.

Thus it is manifest, that the method proposed is imperfect

and uncertain; particularly when the animal is to be delineated in any other posture.

The proportions given by Bourgelat are not bad; but the head of his horse is too small.

The directions of one Heinrich Lauten Saks*, for delineating the proportions of men and horses, are highly praised by Chr. Theoph. Murr. But I have never seen that publication.

Vander Pas, in the twenty-fourth page of his Treatise, gives the following directions for drawing the cow:

Divide the length A B. (see Plate VI. Fig. 7.) into three parts; twice one-third of which, or four parts out of six, describe the height of the animal, and one-third its thickness. The head is made one-fourth of this line. The other parts are not determinate: nor does a cow ever stand with its head so high. Thus the method proposed is of little use to the artist; for it neither describes the height or shape of the withers, back, or loins, nor does it limit the neck.

The same author, in his twenty-third table, proposes the following rules for the elephant. He divides a square into twelve equal portions, and makes an oval for the rump, without giving any determinate size. But the whole figure is

* Unterweisung der perspectiv und proportion der Menschen und Roffe.

void of proportion. Nor has he delineated the feet in a proper manner. He has made the hind thicker than the fore feet; whereas in elephants, camels, and horses, the reverse is observable.

The skeleton given by Perrault is very imperfect, and out of all proportion. The same may be asserted of that by Buffon. His representation of the elephant, in Plate I. p. 142, is made after a model that is by no means satisfactory.

I am positive that the model which I had taken of an elephant is accurate in all its proportions: but it was only a calf, and its head was in reality lower than its back. The head of the elephant delineated by Buffon, has the prominence, or withers, higher than the rump. I was surpris'd at this difference; but when I was at Paris last summer, I saw a much larger elephant than that I had modelled, and perceived that the head and withers were higher. This animal was in size, between that of Buffon and mine. Thus the proportions I have given are only applicable to younger elephants.

In his twenty-fifth table, Vander Pas has delineated a camel, and he has given an oval for the form of its belly. Every other part is also badly drawn. The dogs, represented in his thirty-first table, are universally defective; and also the rules he proposes for drawing the cat.

He also proposes in his forty-third table, three circles for the deer; the first smaller than the second, and the second than the third; but without explaining the reason, or limiting the size of either circle.

Since this artist is the only one who has attempted to give us rules for delineating different species of animals, and I have demonstrated the imperfection of these rules, though it is acknowledged that the attempt was highly laudable, I shall now proceed to indicate a method that is more simple, and much more certain.

GENERAL RULES,
APPLICABLE TO ALL ANIMALS.

See Plate V. Fig. 8.

RULE THE FIRST.

1. Draw the line A B C. according to the proposed length; or rather, according to the nature of the animal to be delineated; of consequence inclined, less inclined, or more inclined; as in sheep, camels, &c.
2. Complete the horizontal oval A B C D.
3. Draw the line F E. to mark the shoulder-blade; and C H. for the hip-bone; which, for a horse, must be made equal to two-thirds of the head in length; and for a cow, equal to the whole length of its head. Sketch also the bone of the arm by E G. and that of the thigh by I K. so that the elbow and knee in a horse, cow, &c. be exactly of a height, and even with the belly.
4. Complete the fore and hind legs; that is, draw K L, M N, N O, O P; and G R, R S, S T.

When R and L are of equal length, the heel M L. naturally rises higher.

5. Sketch the neck according to the nature of the animal, and afterwards the head, paying attention to the rules already laid down. See the preceding Examples, Lecture II. p. 110.

By recollecting the observations made respecting the different forms of animals, according to their destination; and also the difference in the length of the loins, the above sketch may be made applicable to every case*.

RULE THE SECOND.

By sketching the muscles of the shoulder and fore arm a, Q, g, t, G, f, R. the form of the fore leg will be obtained; and by sketching c, b, H, c, d, M, &c. the form of the hind leg.

RULE THE THIRD.

The foremost rib is always rectilinear, and covered by the shoulder-blade. The hind ribs always incline obliquely backwards. In a horse, they run near to the hip-bone; in a cow, the loins are longer. Hence proceeds the triangular cavity (Plate III. Fig. 2.) E F G.

* See Page 146. No. 12, &c.

RULE THE FOURTH,

In all animals with hoofs, or horny feet, the arms and legs, from the middle to the lower joints, are the longest. Fig. 8. R S. and M N.

In all animals that spring forwards, as lions, hares, dogs, &c. the thighs are much longer than the legs. See the Greyhound, Plate IV. Fig. 3.

APPLICATION OF THE ABOVE RULES IN DELINEATING FOWLS.

PLATE VI. FIG. 9.

1. Draw the oval as before, and place the arm in A B. which is now folded up, as the bird is in a state of rest. Draw, in like manner, C D. which may be termed the hand, and D F. which corresponds with the thumb, and D E. the remaining fingers.

2. Draw next G H. the hip-bone and the rump; I K. the ham; K L. the thigh; L M. the leg; and M. the claws.

3. Draw the neck Q N. proportionate to the height of the body, and complete the head Q R. In some fowls the upper jaw, or beak, is very moveable, to the extent of R S. as in ducks, &c.

4. If it be a flying fowl, the breast-bone must be furnished with a large rib, destined to the insertion of muscles (the ostrich and cassowary are destitute of this) and also with an arched bone (the merry-thought) N O. for the same purpose.

By filling up with muscles, the form of the thigh, &c. is obtained; by placing the feathers upon these, the whole form of the fowl. Cover first the wings, then the thighs, &c.*

OBSERVATIONS.

I. In order to place the centre of gravity forwards, Nature has formed in all fowls the back very short, and made them destitute of loins. Many fowls have only six vertebræ, and consequently not more than six ribs on each side; which is scarcely more than one-third of the seventeen vertebræ with which the human species is furnished. In the frog, in which the centre of gravity is necessarily thrown backwards, the reverse takes place. It was necessary that this animal should retain the loins, in order to throw the strength of the muscles into its thighs and hind legs. Thus has the Supreme Creator rendered it almost destitute of a back, and placed the head contiguous to the loins. For the same reason it is def-

* Belon de Mans has given two skeletons, the one of the human form, and the other of birds; in which he has represented the resemblance of all the bones from the head to the feet, in a very satisfactory and elegant manner. I had not taken notice of this before the year 1779. See *Histoire de la Nature des Oiseaux*, published in 1554. pages 40, 41.

titute of ribs, and hence does its body appear so extremely short.

II. Since it has been shewn that the fore feet of all animals are correspondent with the wings of birds, and also with our arms, it is to the highest degree absurd to give wings to the human form; as is the practice in the representation of angels, Cupids, &c.* In like manner the existence of a centaur is impossible. For this quadruped would in reality have six feet, double breasts, and two distinct bellies. That neither tritons nor mermaids can exist, will appear from the above remarks concerning the form of birds.

* It is observable, that in all the birds which fly, the pectoral muscles constitute the principal part of their bulk: peculiarly strong muscles being necessary to communicate such force to the wings, that they should be able to suspend the body in the air, and to propel it forwards. Were the painter to furnish his angels with these muscles, they would become monsters; without them, he supposes an impossibility. This idea might be extended much further. In the human form, a mass of pectoral muscles, infinitely larger in proportion to that in fowls, would be requisite, in order to overcome the weight of man's posteriors; which being intended to enable him to walk firmly upon the earth, prevents him from springing more than a few feet above it. Would not painters therefore do wisely to leave those unmeaning fans, and, in their representation of celestial beings, trust to the lightness and elegance of their forms, and divinity of their countenances? If custom has so far consecrated wings, that they cannot be dispensed with, surely much more care should be taken than is generally observable, that they be not made to carry a greater weight than is absolutely necessary.

APPLICATION OF THE ABOVE RULE IN DELINEATING
FISHES.

PLATE VI. FIG. 11.

The simularity of fish to quadrupeds may be demonstrated in the following manner:

1. Draw as before the oblong oval $BACG$. as in Plate V. Fig. 8. Since the fish neither have nor require a neck, excepting those that respire, which are furnished with a short one, place the head $DABE$. immediately upon the back-bone A . *

2. As the rump has no distinct and separate motion, though it is in equipoise with the water, a power is required similar to the oar of a boat (see $\Delta\Pi\Theta$ of Fig. 11.) to which the fish may now be compared. As great mobility is requisite in a fish, it is obvious that the tail CH . becomes necessary; and also the large transverse bones for the insertion of the muscles. In proportion as $\Pi\Theta$, or the tail, is long, will the fish be able to move itself with the greater velocity.

* In all fish the head is joined to the first vertebra, through the medium of cartilage, in like manner as the vertebræ are united with each other.

INFERENCES.

INFERENCE I.

The boat would be the most steady, were the centres of motion and gravity to unite in the same point. This is impossible in a boat, but it always takes place in a fish. Hence it is that fish are able to swim in a right line; whereas the fore part of the boat must move from side to side. But the fish must keep itself in a straight line, and it is furnished with fins for this purpose, both upon the breast B F. and under the belly at G. Take away B F. and the fish will fall upon its side.

INFERENCE II.

1. Since fish are naturally in equipoise with the water, and they all swim, or row themselves forwards by means of the tail, it follows, that their position in the water must be horizontal.

2. The centre of motion will vary according to the weight of the head; and upon this circumstance will depend the length of the tail.

3. Since greater diversity of form can take place in fish than in quadrupeds, there is space for a much greater diversity of species in the first than in the last.

4. The existence of such sea-monsters as mermaids and tritons is impossible, and the idea of them absurd; as these animals must be supposed to swim in an erect position, the tail forming an acute angle with the back; whereas the centre of gravity would unavoidably force them into a right line. But to return.

Since fish move by means of the tail, they have no occasion for thighs, legs, or feet. Also, from the nature of their food, they do not in general require an ossified jaw, as in quadrupeds and fowls.

The Natural History of the Frog affords us a curious and striking example of the changes respecting these circumstances, appointed by the wise Creator, in conformity to the exigencies of the animal. The frog is provided with a tail, as long as it is destitute of feet; but when these protrude, and have acquired sufficient force, the tail gradually contracts, until it totally disappears. This singular phenomenon might be contemplated every spring, were not the animal too common, and deemed too insignificant to attract our notice.

THE TRANSFORMATION OF QUADRUPEDS INTO BIRDS.

PLATE VII. FIG. 12.

To change a cow into a crane.

1. Draw the skeleton of the cow as in the Second Example, p. 151.

2. Raise this upon the rump, as in G C. and the fore feet must necessarily rise from the ground.

3. As the centre of gravity can no longer be supported by the assistance of the fore feet, the hind feet E F. must be brought forwards to F I.

4. The carcase, or body, being raised so much higher above the ground, the neck must be extended to G H. and the head must be placed backwards to be supported in H I. the line of gravity.

5. The fore feet not being any longer necessary, are changed into wings, which are to be formed according to the Fourth Rule, p. 66.

6. As fowls are protected by their feathers, from being teased by flies, &c. a long tail is not necessary; for this, a short and very moveable tail is substituted to assist their flight.

THE TRANSFORMATION OF A QUADRUPED INTO THE
HUMAN FIGURE.

PLATE VII. FIG. 13.

In order to avoid a multiplicity of lines, which would create confusion, it is best to represent any quadruped upon its four

feet; the horse, for example; and afterwards to place him erect upon his hind feet. The following changes will naturally follow:

1. The hips will be compressed into a right line with the hams or thighs.

2. The fore feet will hang downwards, close to the sides of the animal; hence a clavicle will become necessary.

3. The thighs and legs will now be rectilinear.

4. The head need not be placed upon a long neck, as the animal cannot graze in this position; and therefore the prominence above the shoulders, or withers, becomes unnecessary.

5. The back, in consequence of these alterations, is flatter.

6. The brains being of a larger volume, and placed before each other, require the head to be of a rounder form; and the centres of motion and of gravity must unite in the same point.

7. The maxilla being necessarily drawn inwards, the nose projects beyond them.

8. The feet become shorter, and terminate in five toes.

N. B. It follows, from the Third Rule, that the thighs and calves, as well as the posteriors, must be made proportionably thick to support the body in an erect position. This has been judiciously remarked by Aristotle, "*Homo unus cauda vacat, nates habet, quod nulli quadrupedum datum est. Crura etiam homini femore suraque carnulenta sunt. — Quorum causa una est omnium, quod homo solus animalium erectus est, itaque nates carnosas fecit, et femora et suras.*"

Thus, Gentlemen, have I accomplished the task which I had imposed upon myself, by pointing out to you the analogy that runs through animal nature. If I have not succeeded to your expectations, in presenting the rules so clear and decisive as might have been wished, I hope I have awakened your curiosity, by having made you more acquainted with the general plan of the Creator, in the formation of animals; and demonstrated that a minute acquaintance with this will best enable the statuary and painter to excel in the different branches of their art.

THE END.

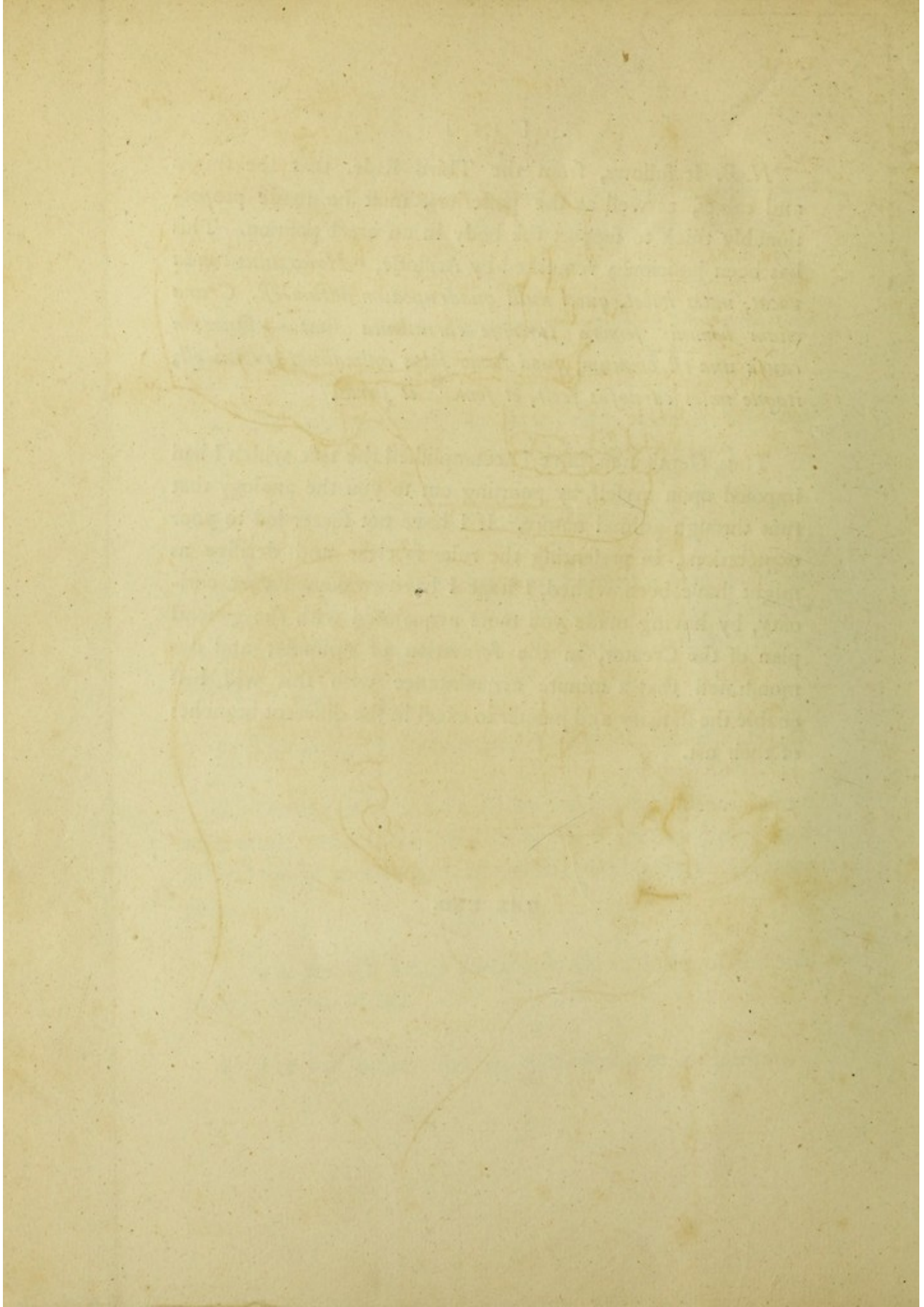


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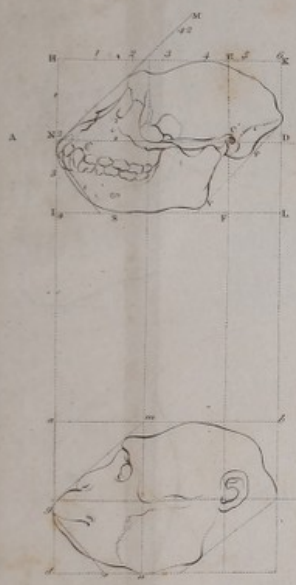


Fig. II.



Fig. III.

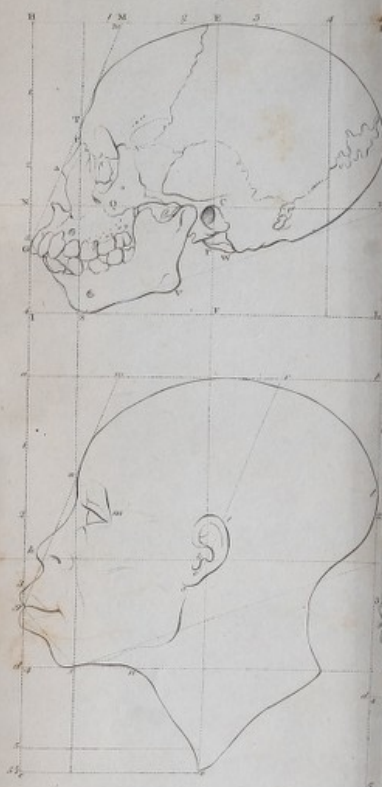
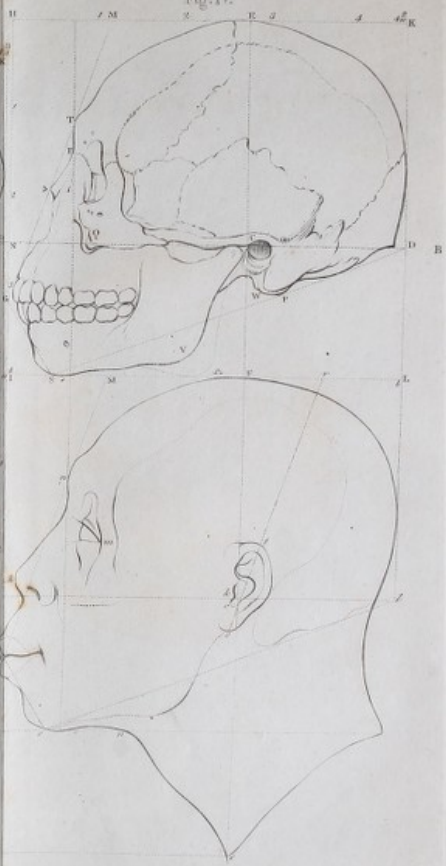


Fig. IV.



W. Chesnut sculp.



TAB. II.

Fig. I.



Fig. II.

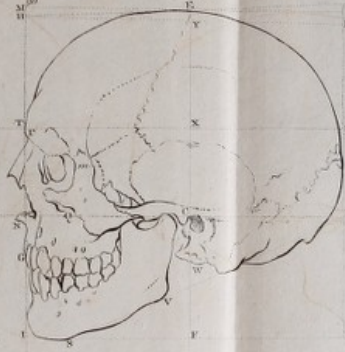


Fig. III.

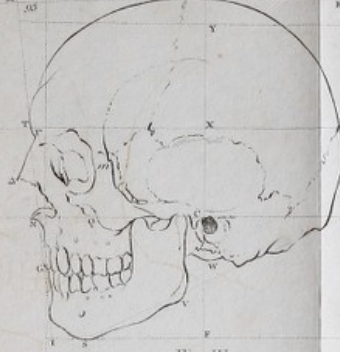


Fig. IV.



Fig. I.



Fig. II.



Fig. III.

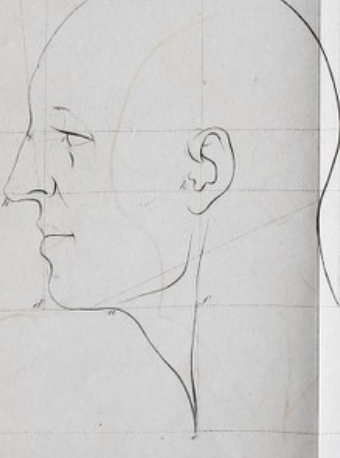
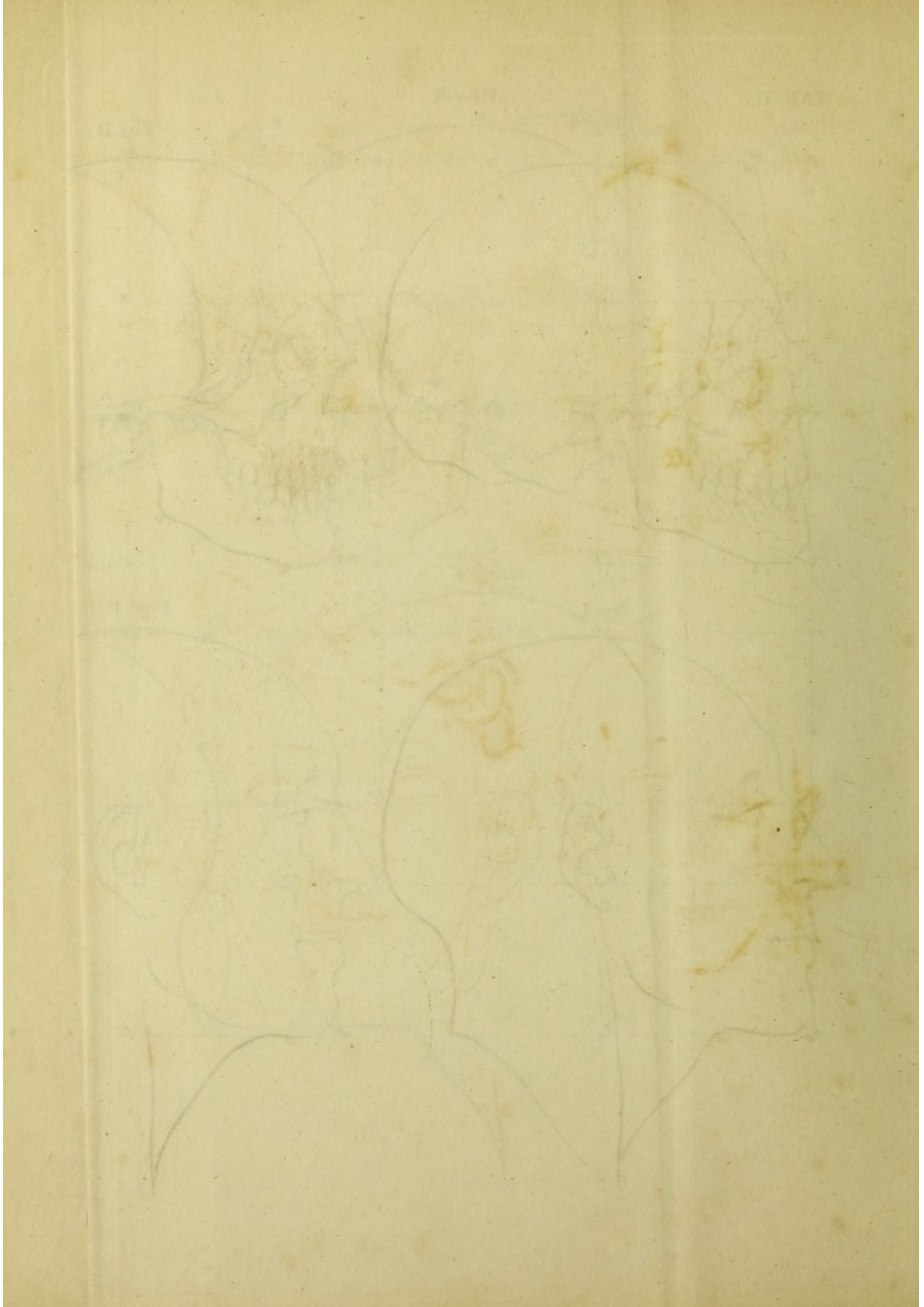


Fig. IV.



Schick sculp.



TAB. III.

Fig. I.

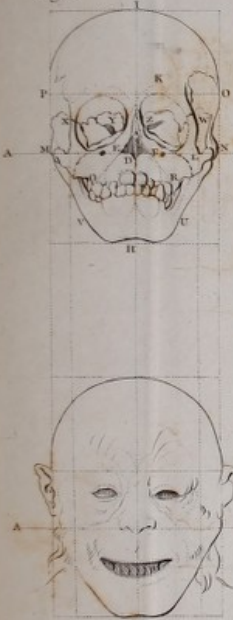


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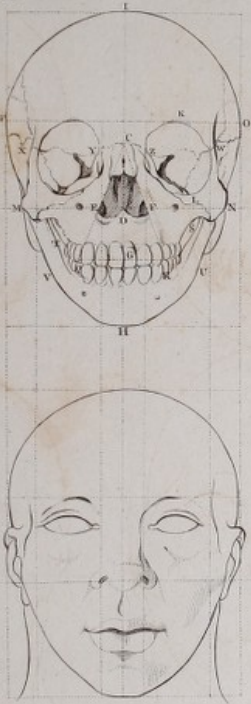


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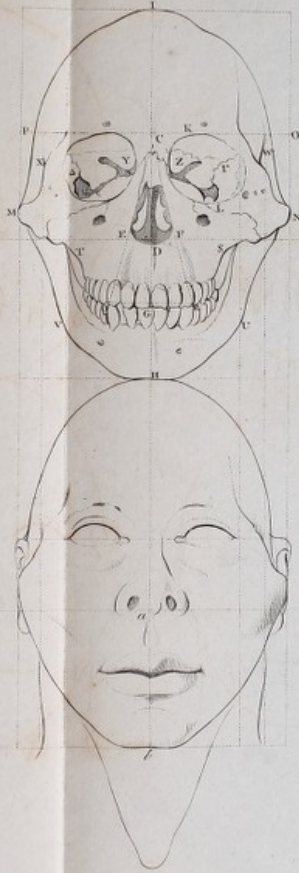


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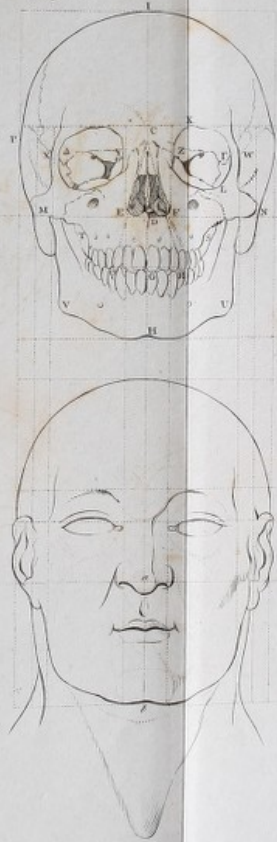


Fig. V.



F. Beck sculp.

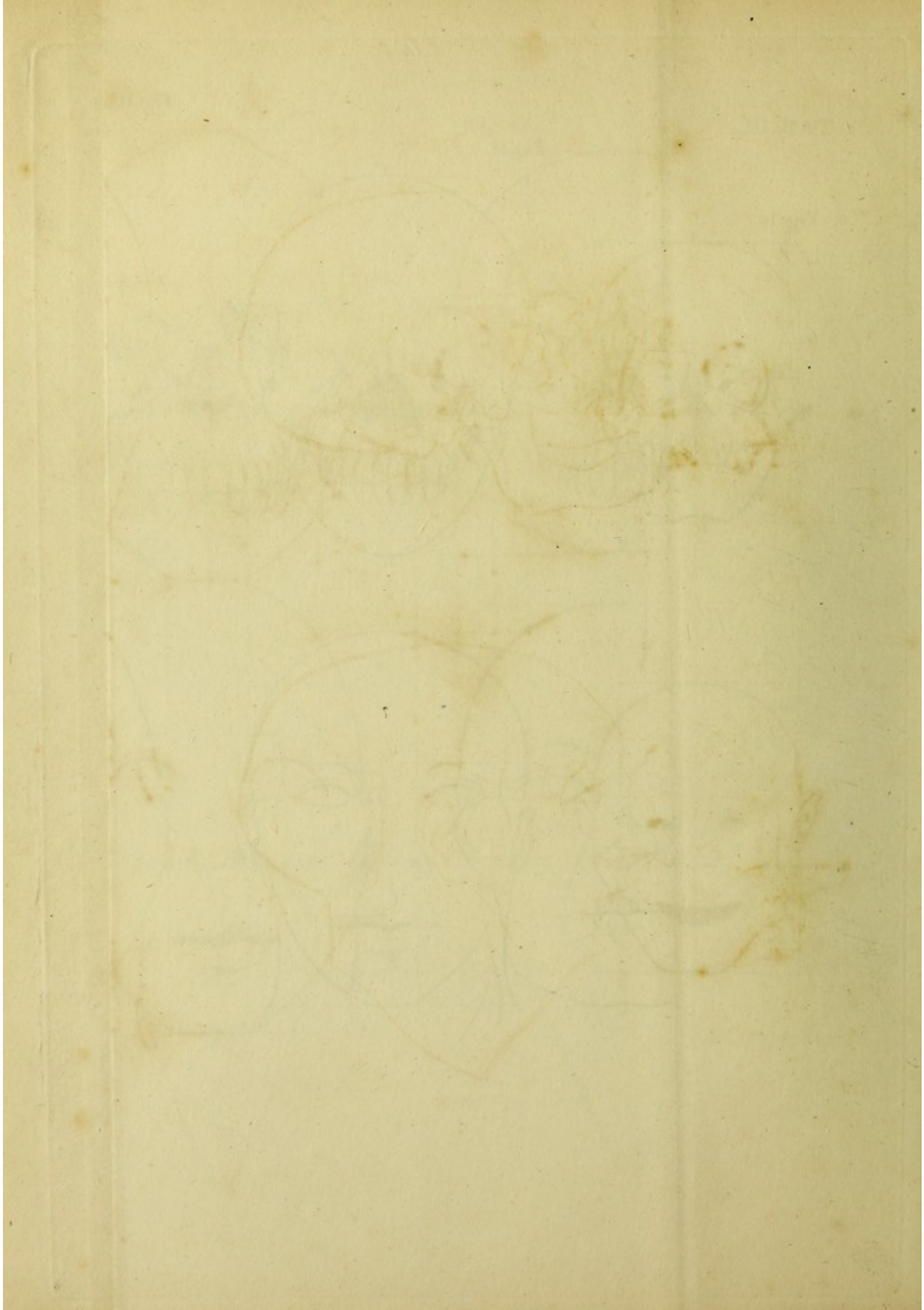


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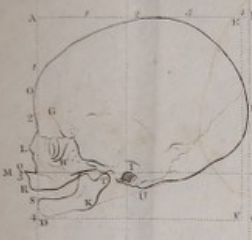


Fig. II.



Fig. III.

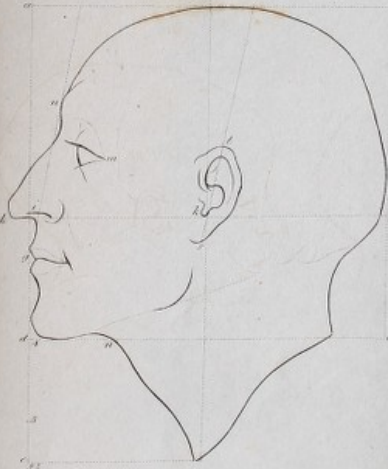
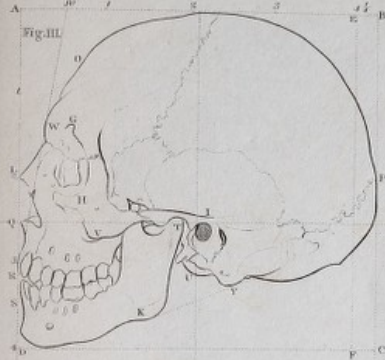


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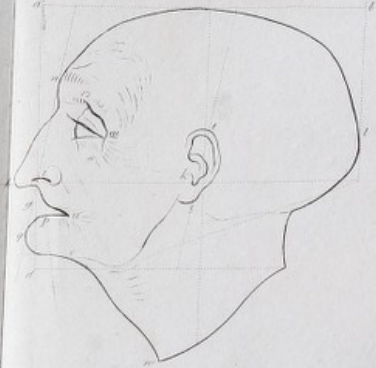
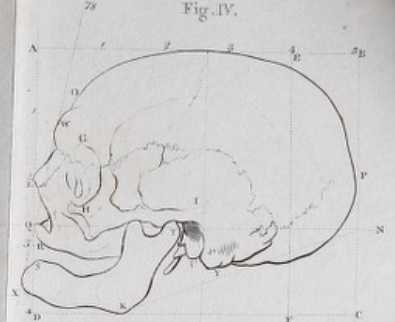




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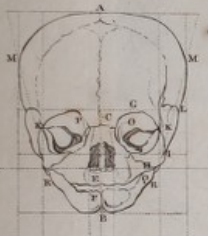


Fig. II.



Fig. III.



Fig. IV.

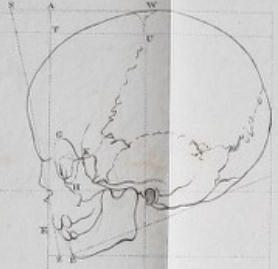
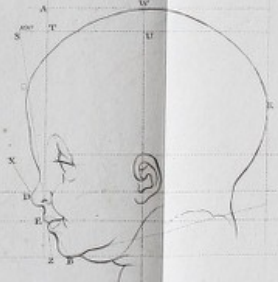
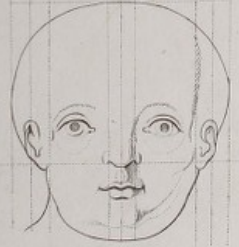


Fig. V.



S. Schell sculp.



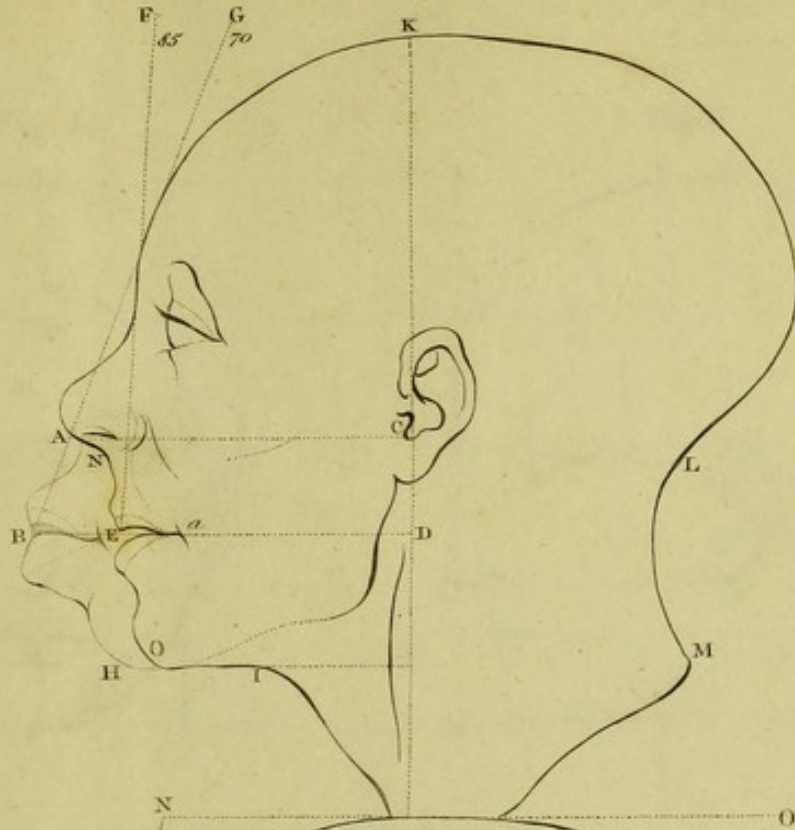


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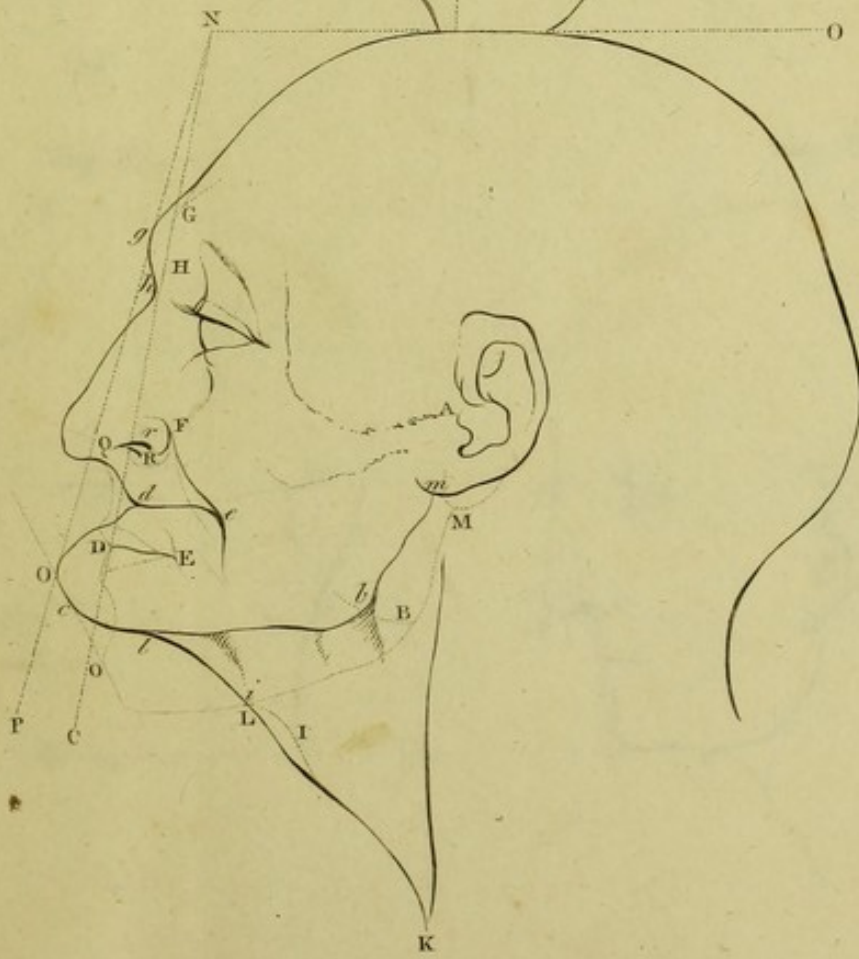


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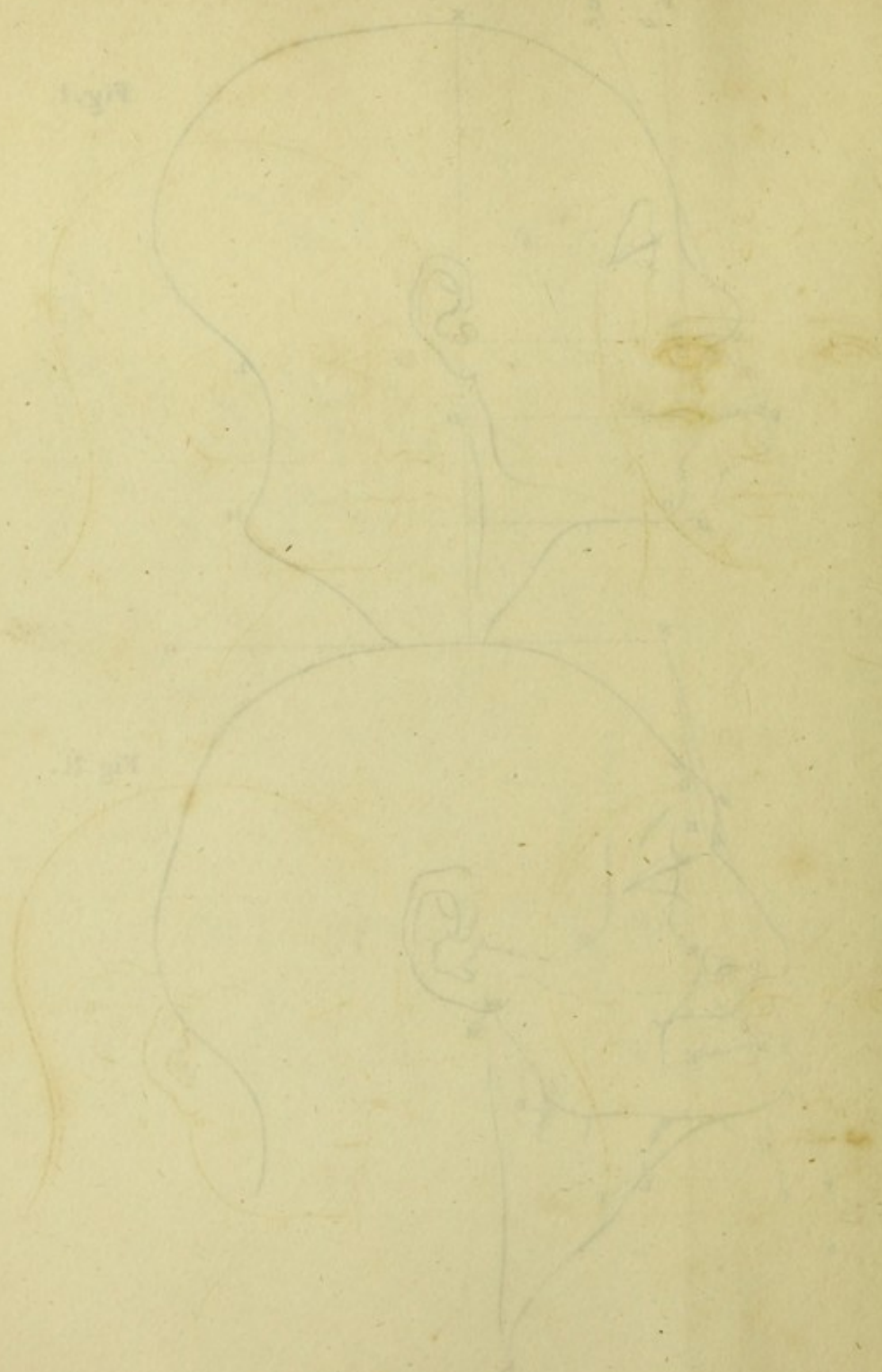


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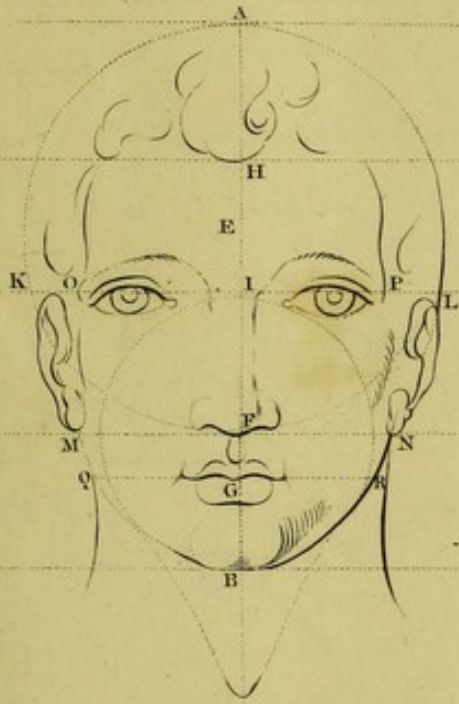


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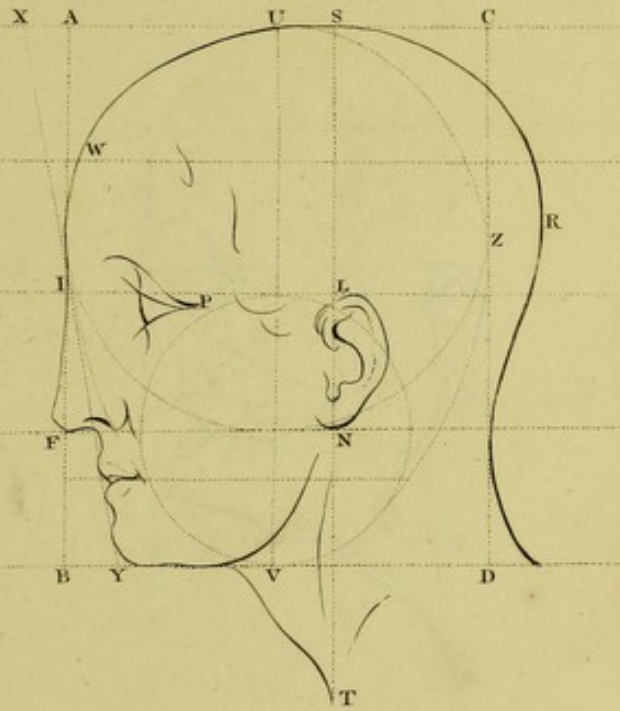


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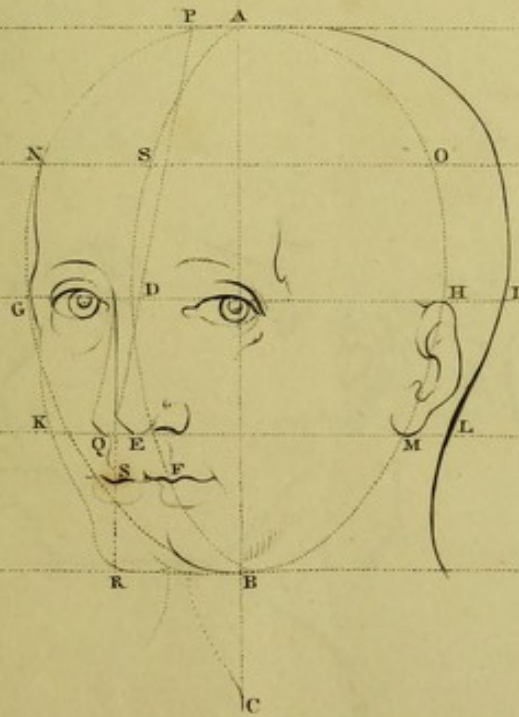
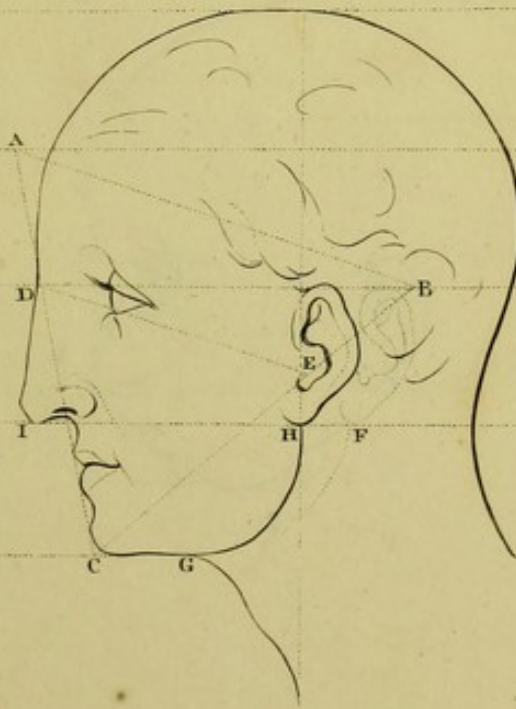


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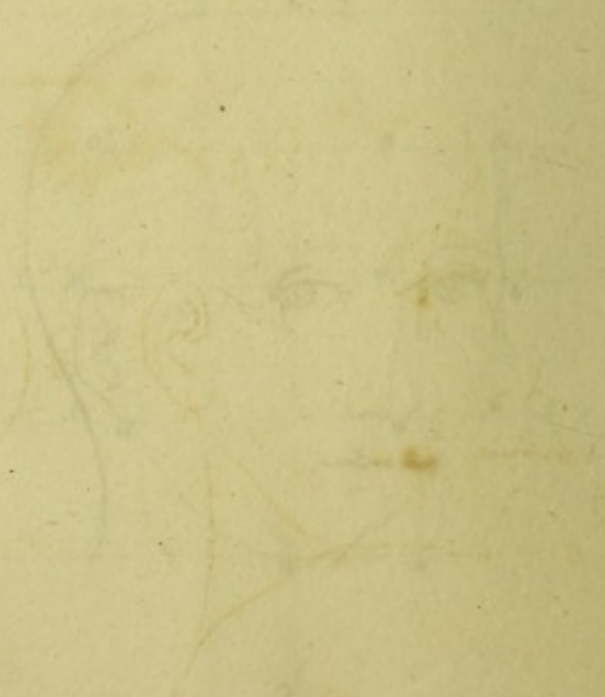


Fig. I.

Fig. II.

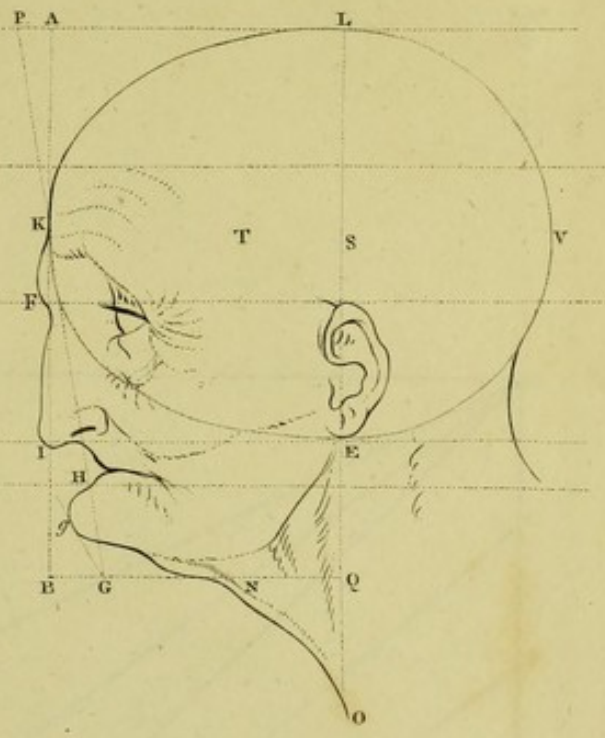
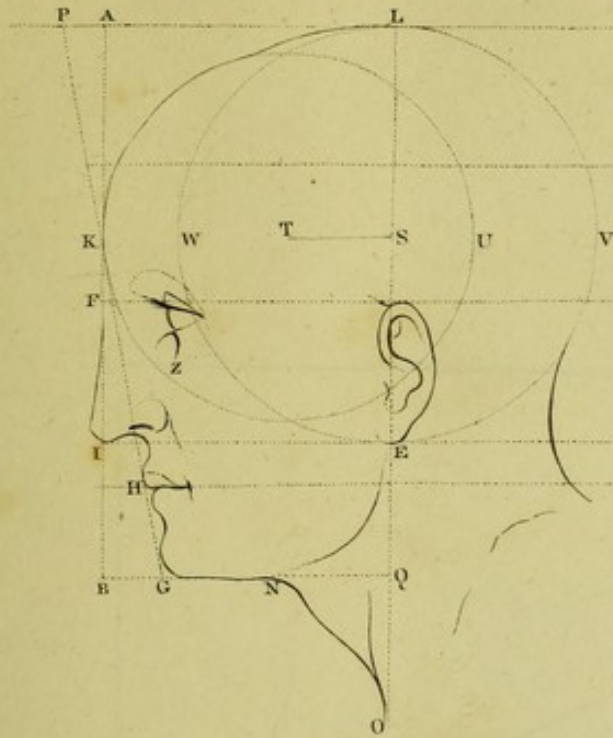
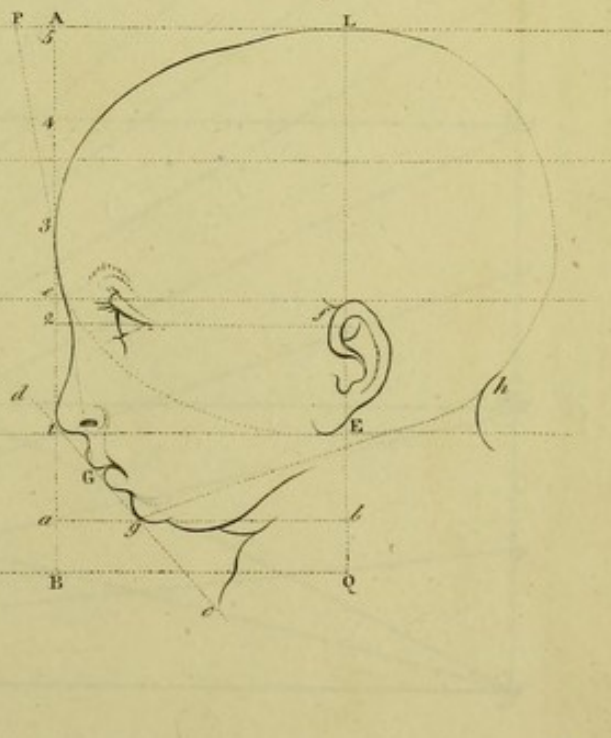
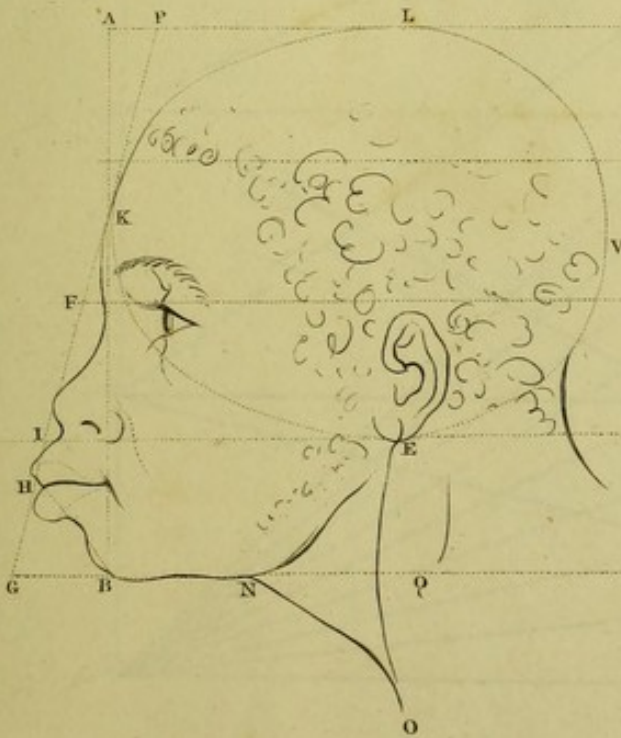
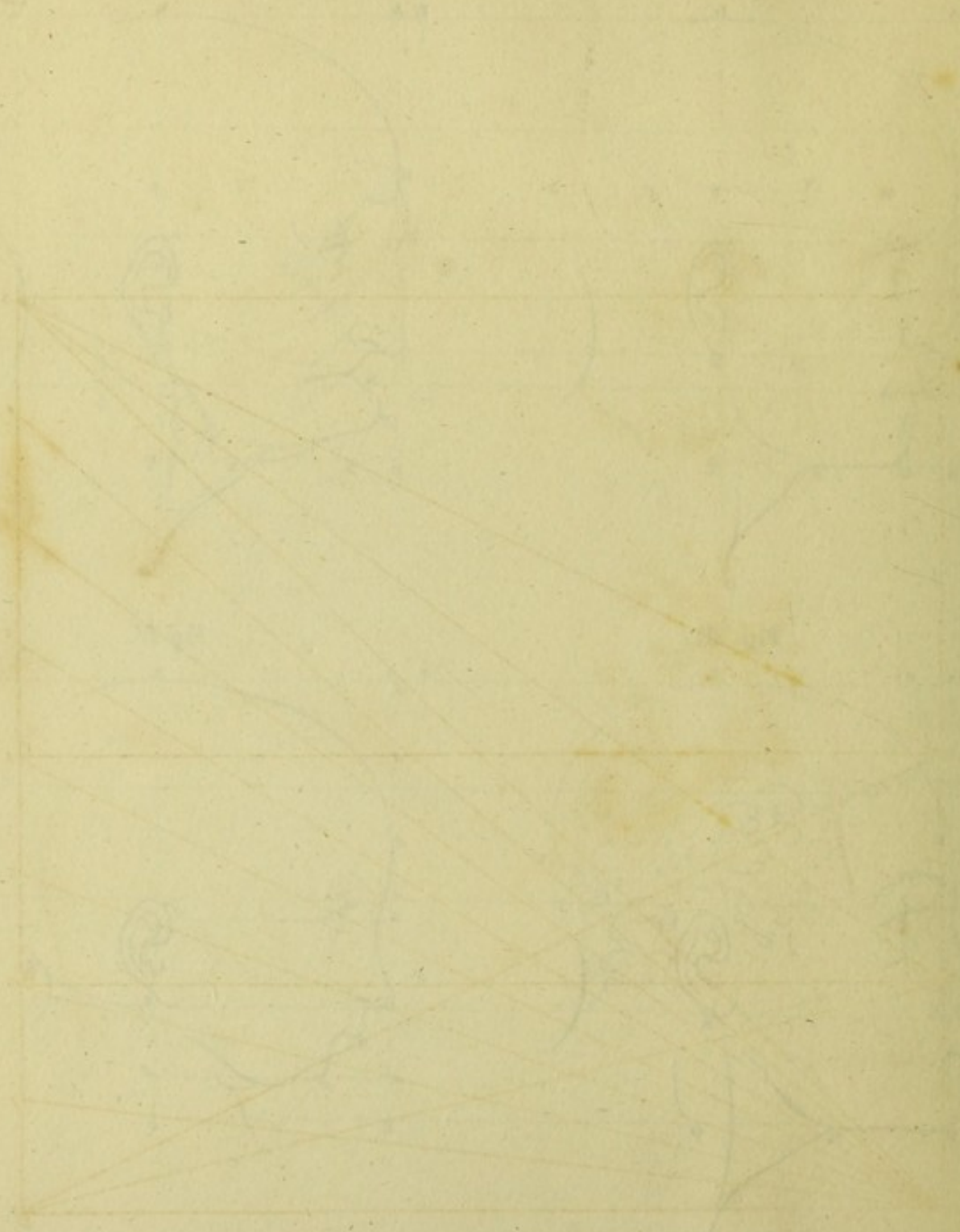
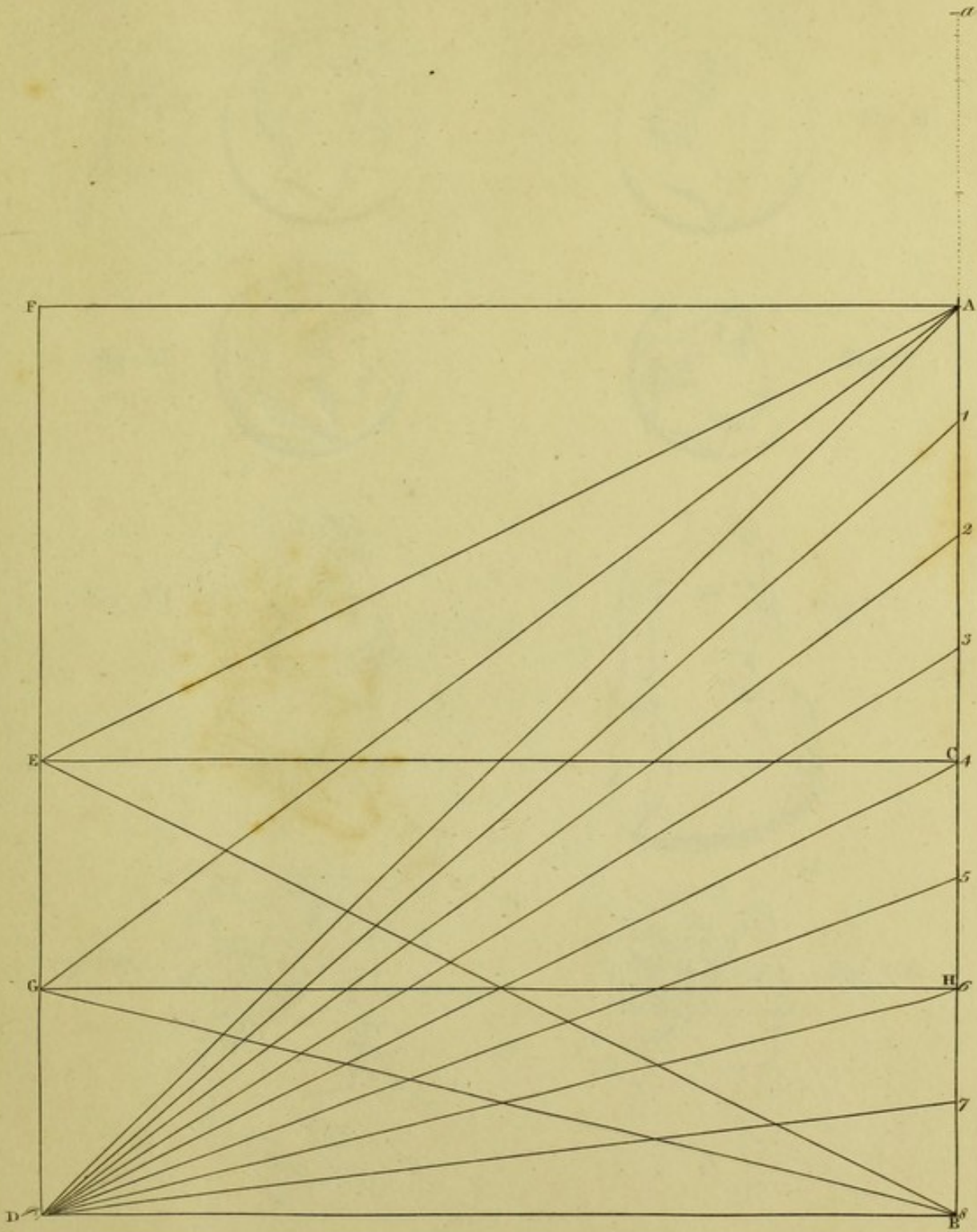


Fig. III.

Fig. IV.







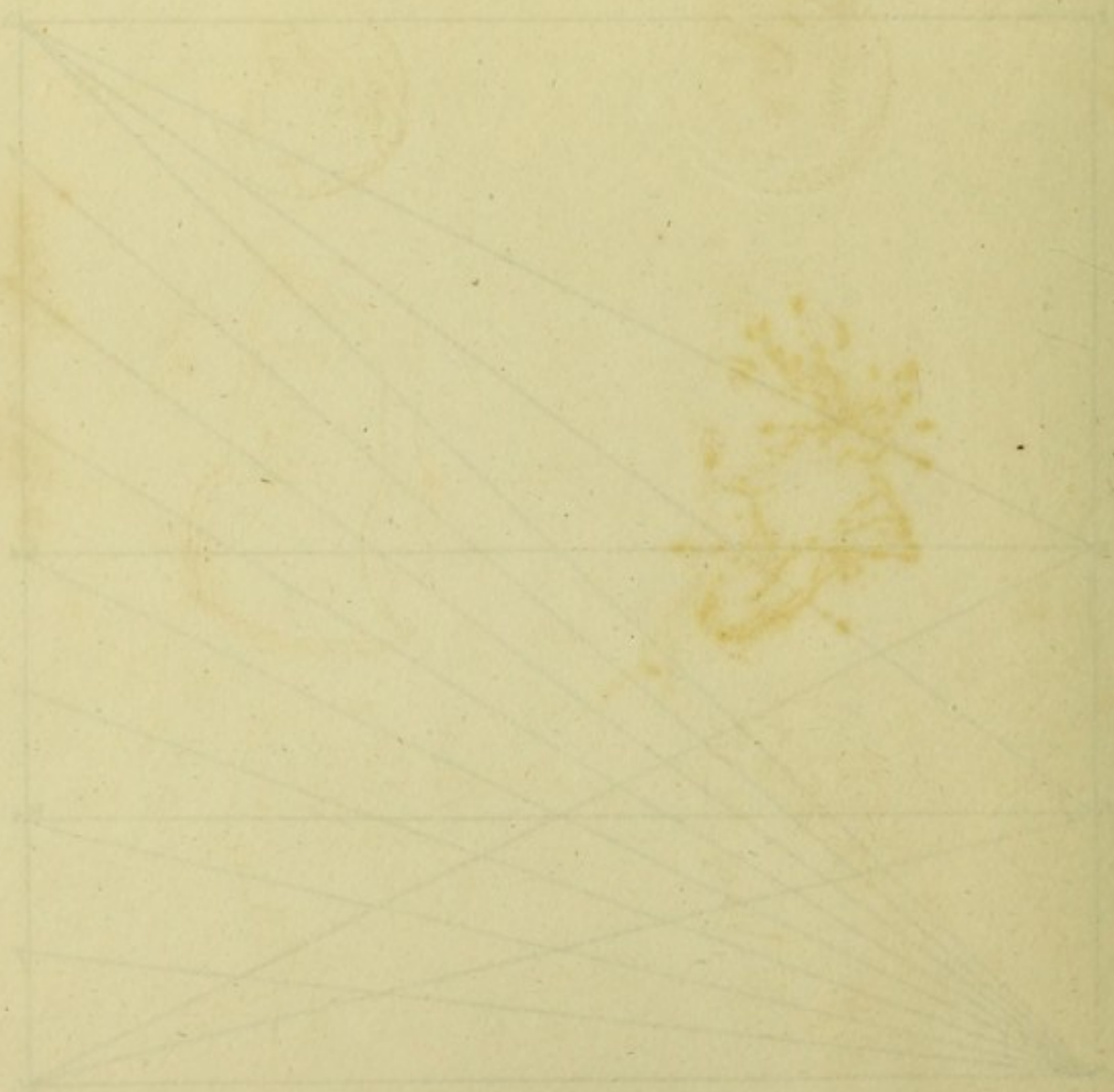


Fig. I.



Fig. II.



Fig. III.



Fig. IV.



Fig. V.



Fig. VI.



Fig. VII.



Fig. VIII.



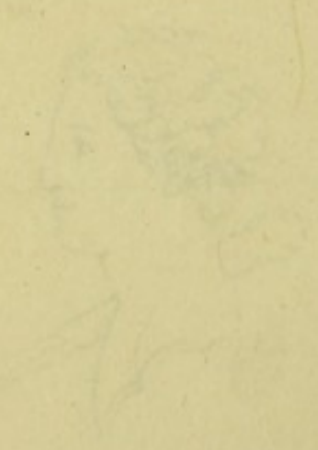


Fig. 2.



Fig. 1.



Fig. 3.



Fig. 4.



Fig. 5.



PL. II.



Fig. 6.



Fig. 7.



Fig. 8.



Fig. 9.

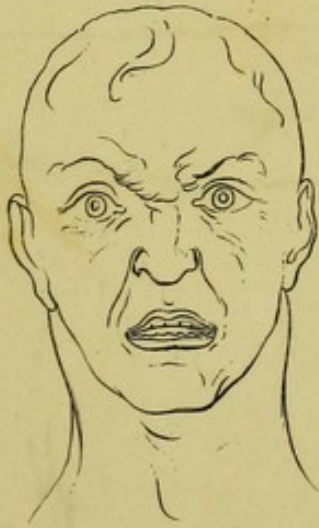


Fig. 10.



Fig. 11.



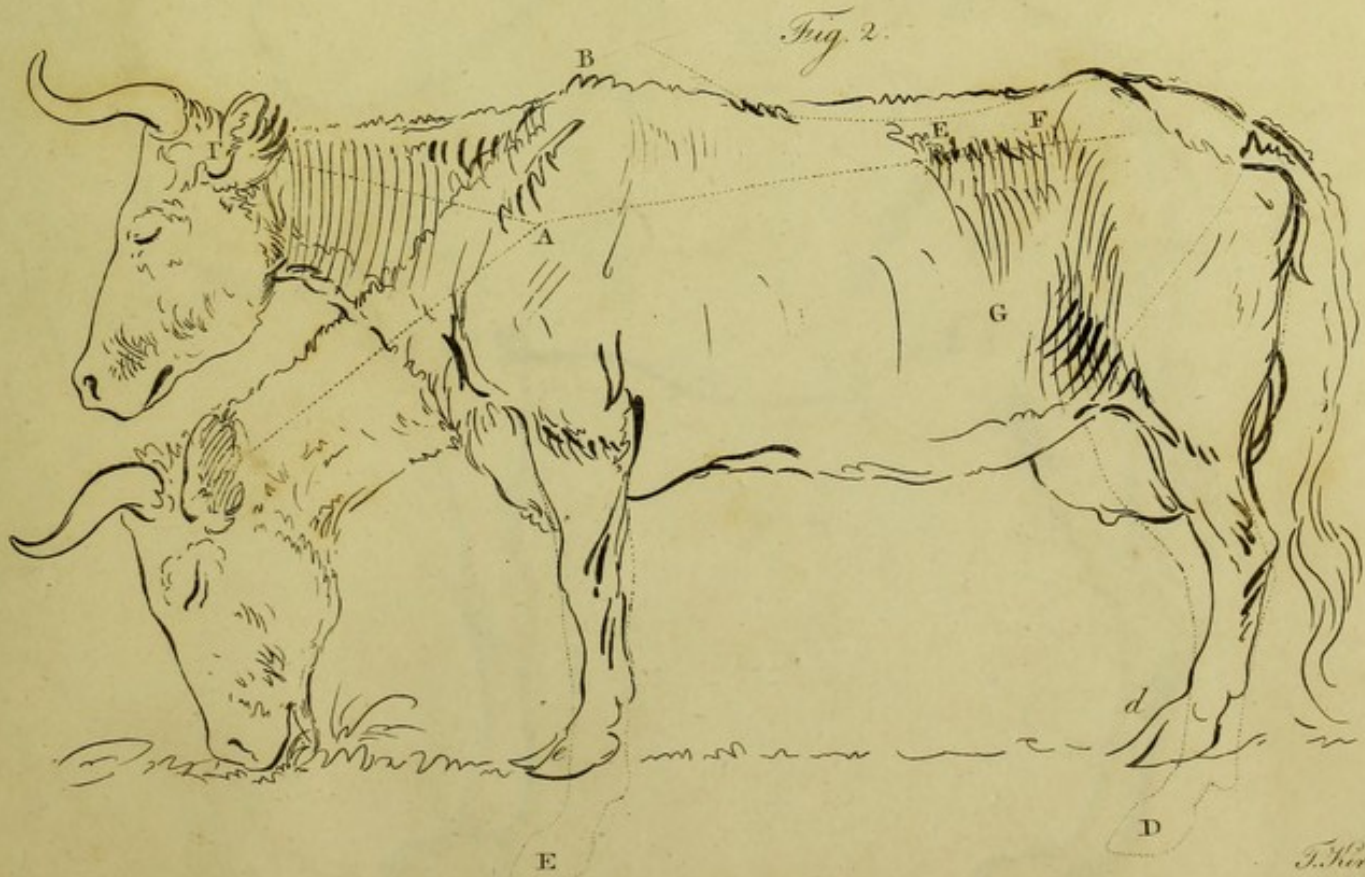
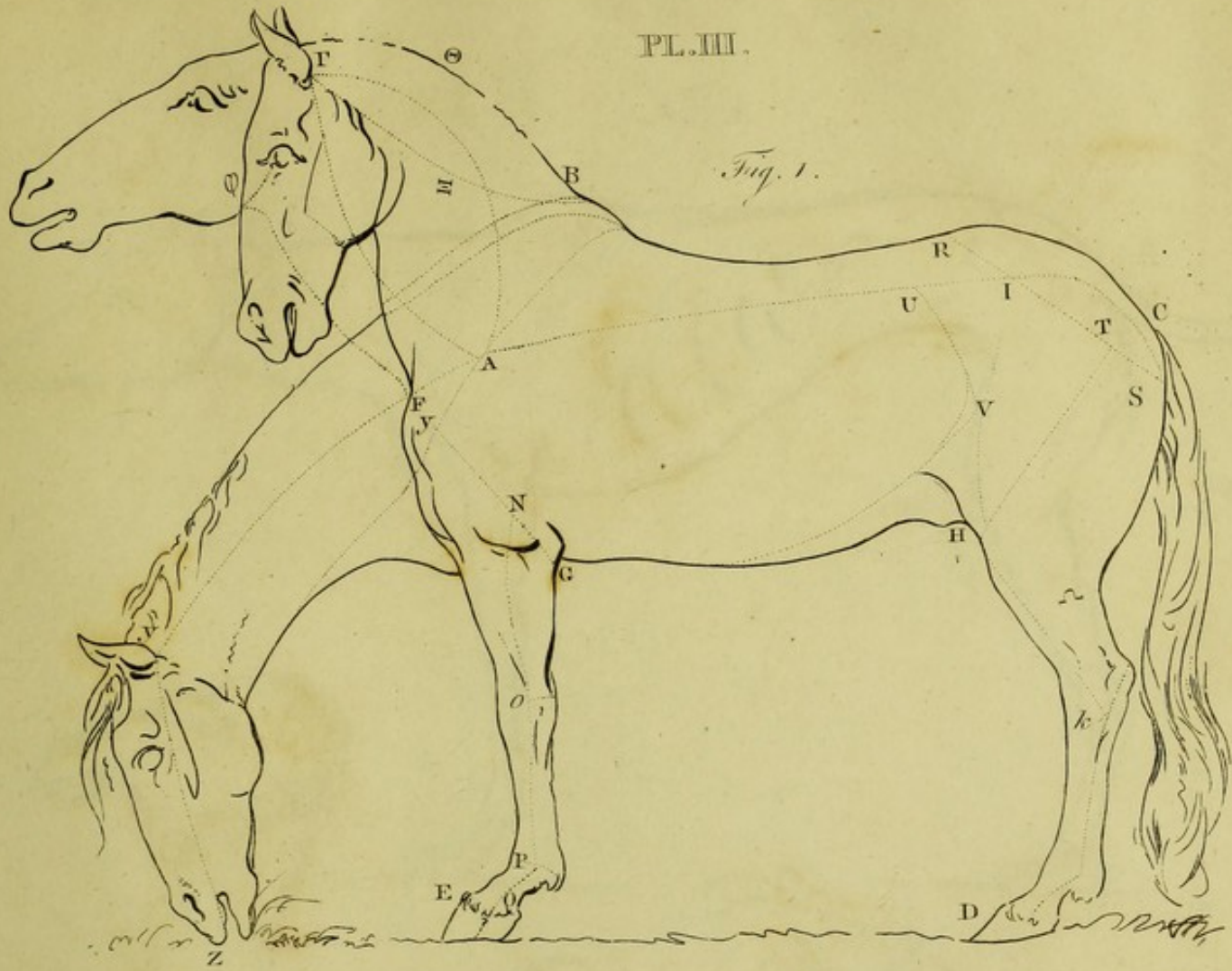




Fig. 3.



Fig. 4.

F. H. W. sculp.



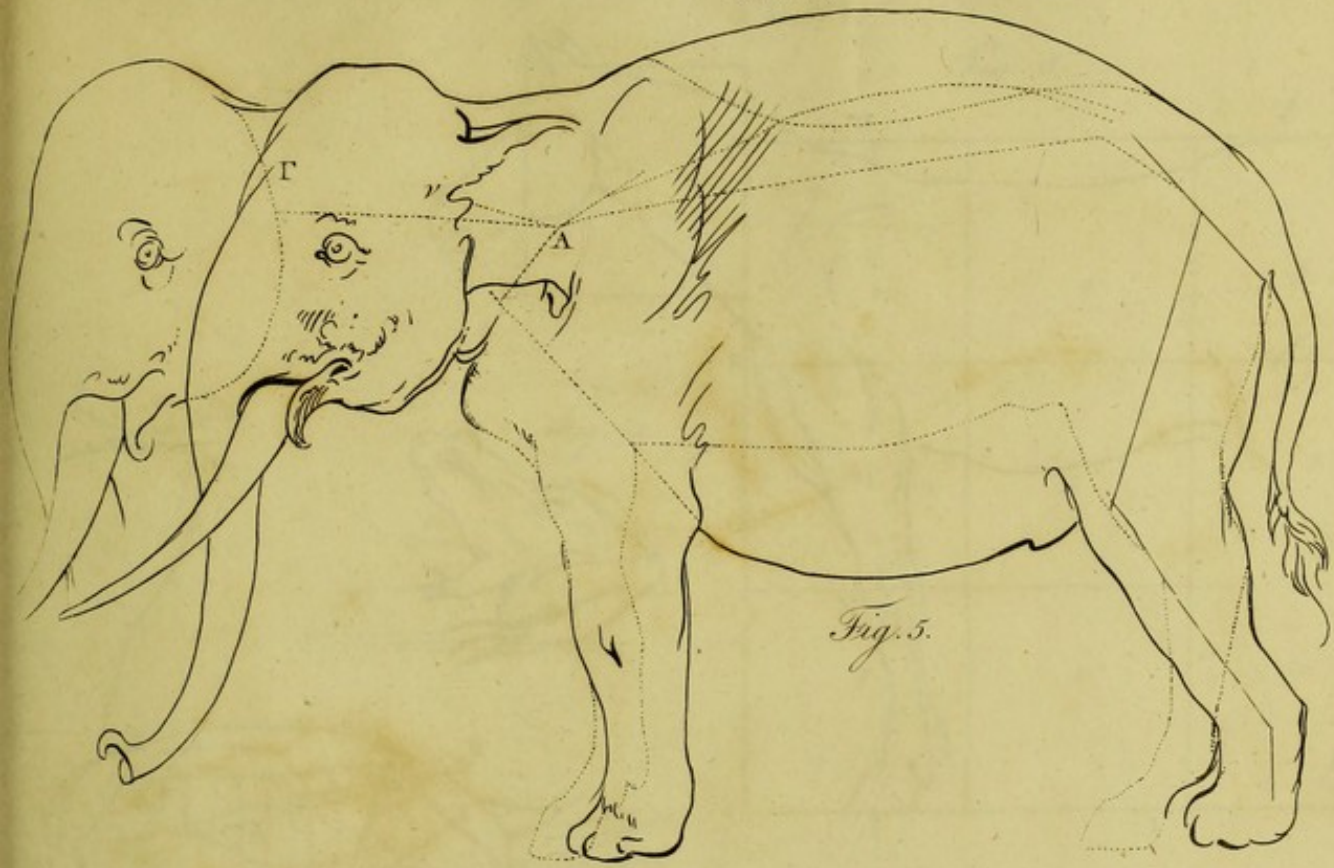


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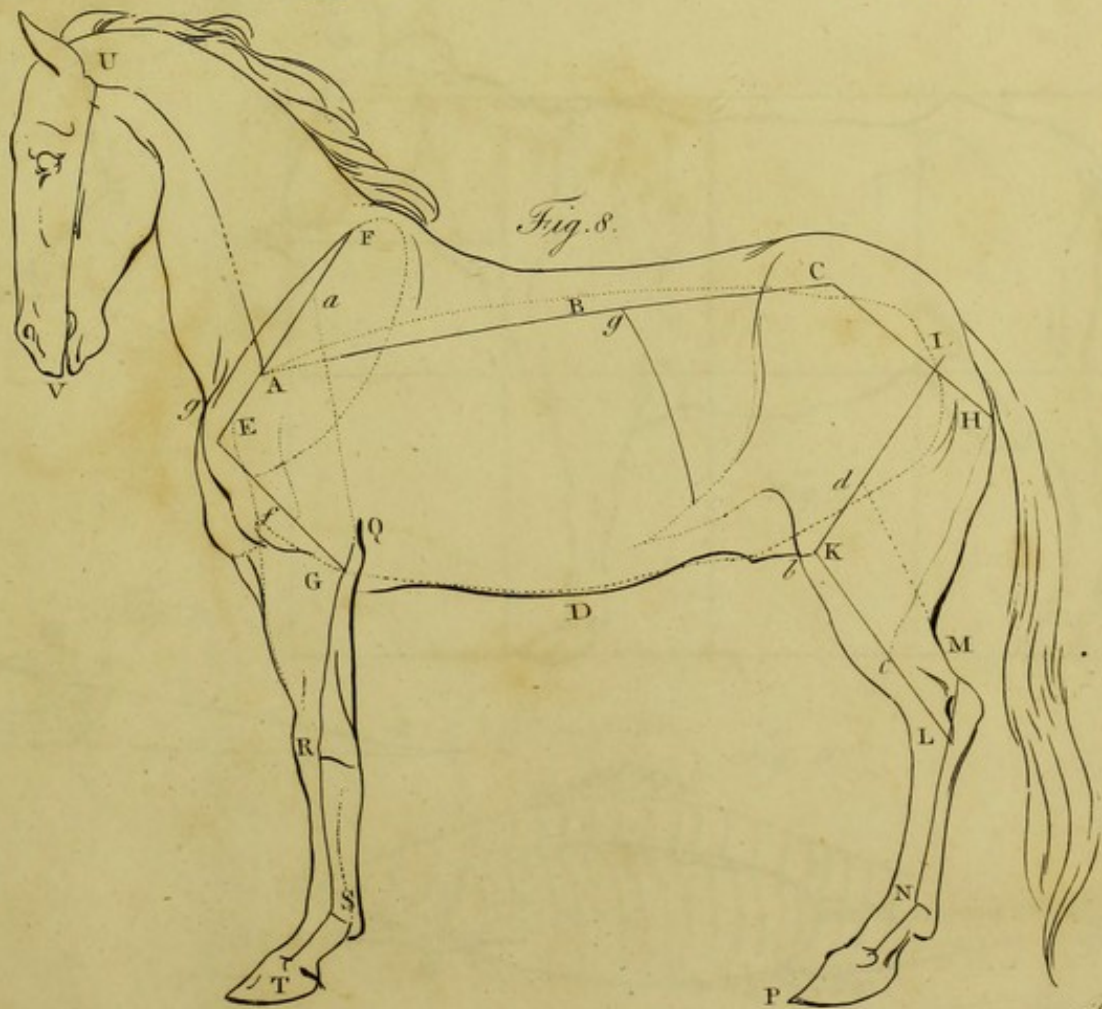


Fig. 8.

To thick scalp.



Fig. 6.

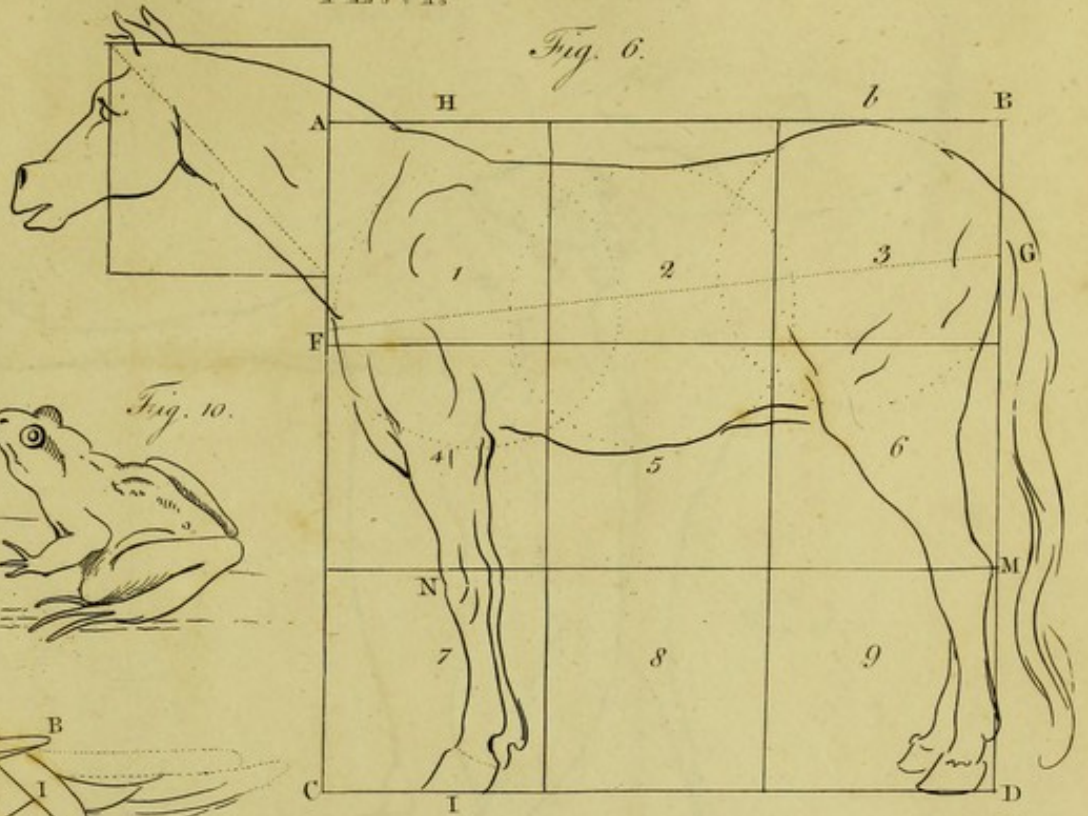


Fig. 10.



Fig. 9.

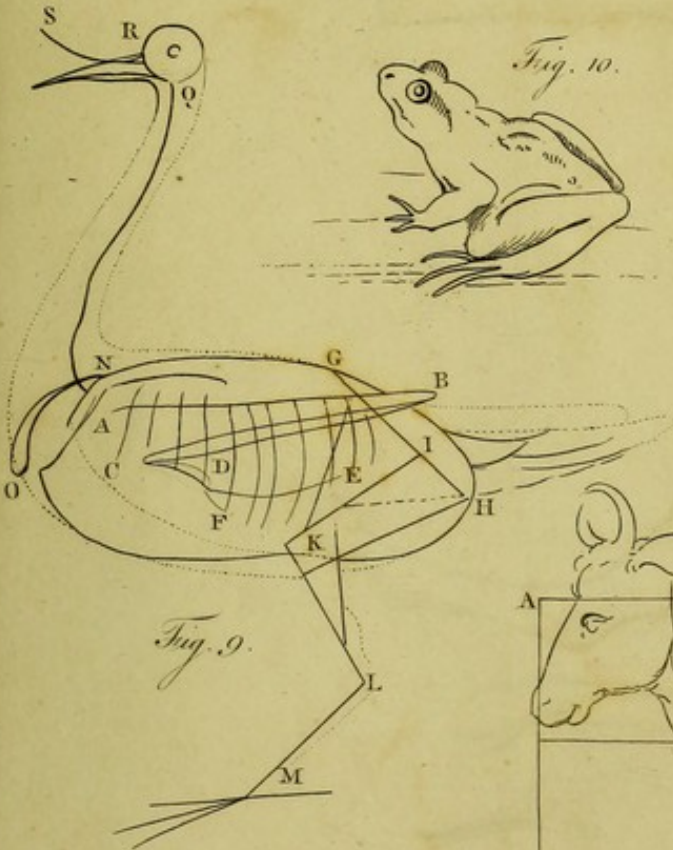


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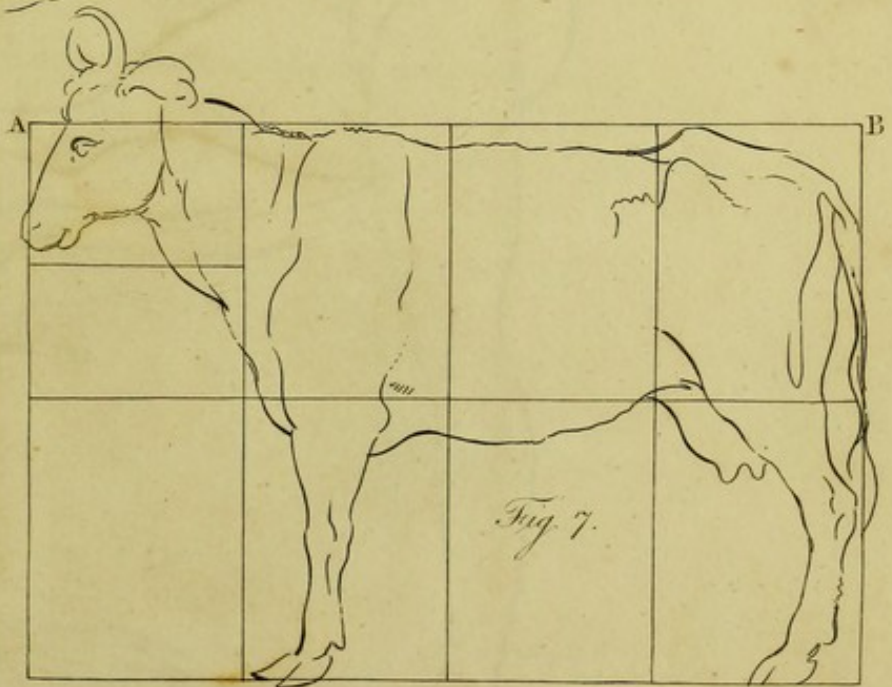


Fig. 11.

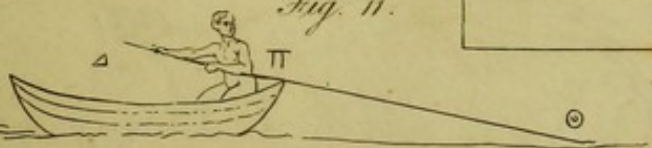
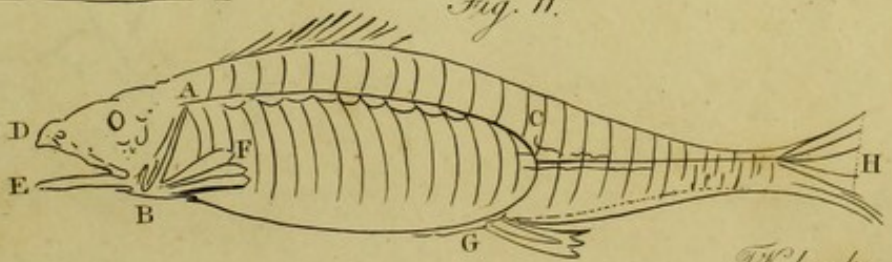


Fig. 11.



A. Kerck sculp.

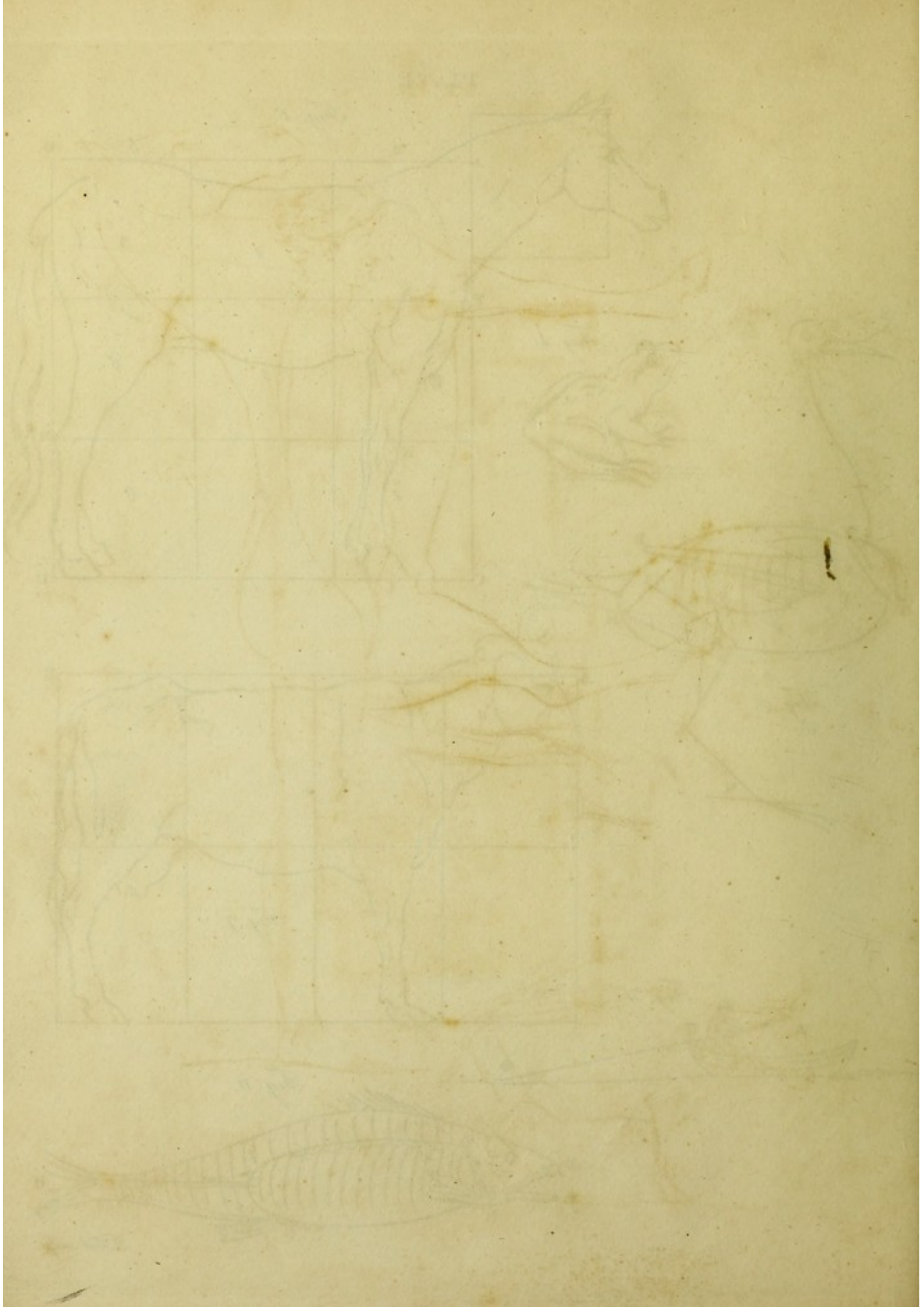


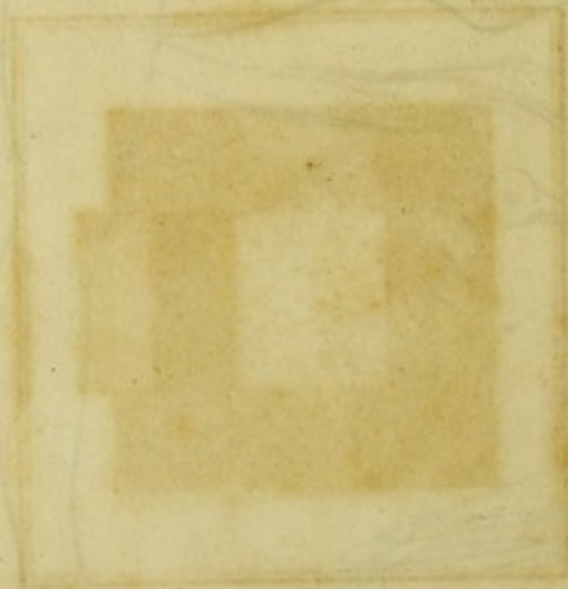
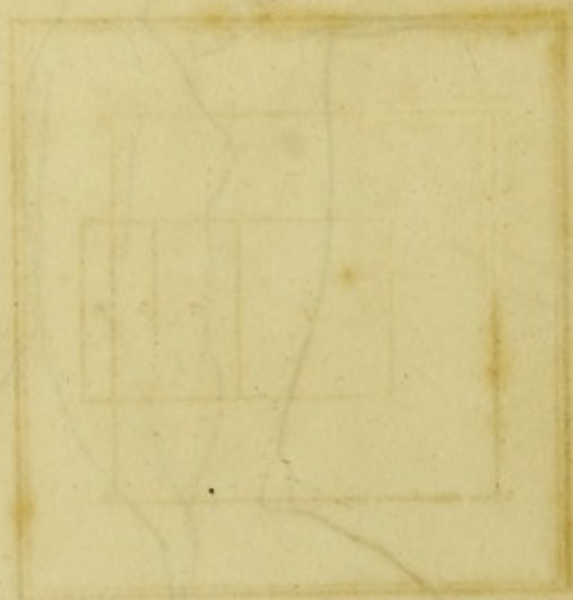


Fig. 13.



Fig. 12.

17 17



17 17

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