The anatomical instructor, or, An illustration of the modern and most approved methods of preparing and preserving the different parts of the human body, and of quadrupeds, by injection, corrosion, maceration, distension, articulation, modelling, &c; : with a variety of copper-plates / by Thomas Pole.

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THE ANATOMICAL INSTRUCTOR;

OR, AN

ILLUSTRATION

OF THE

MODERN AND MOST APPROVED METHODS OF PREPARING AND PRESERVING THE DIFFERENT PARTS

OF THE

HUMAN BODY,

AND OF

QUADRUPEDS,

BY

INJECTION,	DISTENTION,
CORROSION,	ARTICULATION,
MACERATION,	MODELLING, &c.

WITH A VARIETY OF

COPPER-PLATES.

By THOMAS POLE,

MEMBER of the CORPORATION of SURGEONS in LONDON.

AD CÆDES HOMINUM PRISCA AMPHITHEATRA PATEBANT:
UT LONGUM DISCANT VIVERE, NOSTRA PATENT.

INSCRIP. ON ANAT. THEATRE AT PARIS.

LONDON:

PRINTED BY COUCHMAN AND FRY;

AND SOLD BY THE AUTHOR, NO. 11, TALBOT-COURT, GRACECHURCH-STREET;

AND BY W. DARTON AND CO. NO. 55, GRACECHURCH-STREET.

M DCC XC.

TO THE

CORPORATION OF SURGEONS

OF

LONDON,

THIS WORK

IS

RESPECTFULLY INSCRIBED,

BY

THEIR FRIEND,

LONDON, 9th Mo. 1, 1790.

THE AUTHOR.

PREFACE.

ANATOMY being the foundation of that noble ſuperſtructure, the Healing Art, muſt ſurely be conſidered as a branch of ſcience, claiming ſuperior attention from the philoſopher and natural hiſtorian. Prompted by this ſentiment, I have undertaken a work, which, in its effects, may operate moſt uſefully on medicine; to the true practice of which no one will diſpute its being an eſſential requiſite, as on an accurate knowledge of of the ſtructure and uſe of each part of the body, a true therapeia can only be formed. To Surgery it is more immediately ſubſervient; it being rational to conclude, that independent of anatomical knowledge, operations muſt be not merely ambiguous in their ſucceſs, but, frequently, fatal to the patient.

To the art of Farriery, hitherto, for the moſt part, in the hands of the loweſt and leaſt informed of mankind, a treatiſe of this kind may be ſingularly uſeful; as any means which will facilitate the acquiſition of the knowledge of quadrupeds will highly benefit the human ſpecies, more particularly by rendering an eſſential

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ſervice to that noble and uſeful animal, the horſe, whoſe diſeaſes being now treated by the hands of ignorance, would more frequently prove fatal, had not an allwiſe Providence happily furniſhed the animate body with power, not only to counteract deleterious remedies, but frequently, without foreign aſſiſtance, to effect a cure.

By the gentleman, Anatomy ought to be conſidered as a branch of education, no leſs neceſſary to form the accompliſhed character, than any other department of philoſophy: it not only being to him an ornament, and, if a true ſpeculatiſt, an amuſement, but alſo enables him to determine, when the means which are uſually employed

employed for the cure of diſeaſes, even in the brute creation, are conſonant to reaſon and ſound ſenſe: a faculty of ſome conſequence in an age when the breed of horſes is not thought unworthy the attention of men eminent as to ſtation and abilities.

It is, however, to be regretted, that a department of natural knowledge, ſo replete with advantages to every ſpecies of animal, ſhould languiſh, for want of proper opportunities of engaging in it with that ardour, by which alone a due and neceſſary information can be procured. In the capitals of moſt kingdoms it is admitted, that anatomical objects are more eaſily obtained, and it may therefore be

preſumed,

presumed, that at least among those who profess to heal, this science is more frequently and extensively cultivated: but even by them, from the dangers and difficulties with which bodies are procured, an accurate knowledge of minute Anatomy is rarely attained.

To the inhabitants of the country such a portion only is imparted, as a few months residence near the theatres of dissection can furnish them with; private anatomical investigation of the human, is with them too difficult and dangerous, to tempt even the hardiest to engage in: the inspection of morbid bodies seldom, if ever, falls under their notice; and, supposing this to ſometimes occur, it is, in general, ſo curſory, as to add but little to their ſtock of anatomical facts. Hitherto, the pupil has experienced difficulties in proſecuting the anatomical part of his education, by being precluded from acquiring a knowledge of the different modes of preparing ſuch parts of the body as would ſerve, not only, to impreſs his mind more forcibly with their ſtructure and true uſe, while in preparation, but would be to him a memento to which he could always refer, when diſtantly removed. On a ſubject ſo undoubtedly neceſſary, nothing has hitherto been publiſhed; excepting the paper in the Edinburgh Medical Eſſays, on the ſubject of Injections, by the late

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truly ingenious Doctor Monro; and what has been done by John Sheldon, in his History of the Absorbent System, Chap. I. who treats only of that part of the subject which respects "*The method of discovering, injecting, dissecting, and preparing the Absorbent Vessels;*" and to which I may refer my readers for some useful hints in this particular branch of practical Anatomy: nothing, however, systematic, or, in any degree comprising extensive and substantial information, such as the Tryo will require, has yet been offered to anatomical students.

A sedulous attention, persevering industry, and a love of science, ſhould be the invariable characteriſtics of an anatomical genius: poſſeſſed of theſe, he cannot fail to acquire ſuch proficiency as will render him an ornament to ſociety, and, in medicine, highly uſeful to the country which he may favour by his reſidence. To ſuch the lectures of our theatres, now delivered by men of the firſt abilities, as Anatomiſts, and gentlemen, will afford ample gratification. By incidental diſſection and converſation on the buſineſs of the day, with others engaged in the ſame purſuits, he may indelibly imprint thoſe ſubjects on his mind.

The deſign of this work is ſtill further to aſſiſt his ſtudies, by enabling him to make ſuch preparations of the human body, when diſſecting, as will hereafter be uſeful ornaments to his cabinet, and put it in his power to preſerve the different parts of quadrupeds, whereby comparative Anatomy, hitherto much neglected, may be ſo cultivated, as to throw conſiderable light on the organization and phyſiology of the human.

To profeſſed Anatomiſts it is not preſumed to offer this treatiſe; their good ſenſe will, however, admit its neceſſity, and, perhaps, their candour may induce them to add ſuch hints as may, hereafter, authoriſe another and more complete edition. From men, hitherto, uninformed, it appears evident, and,

and, perhaps, with ſome reaſon, that I expect encouragement; its utility to them will, I truſt, warrant their good opinion. The difficulty of deſcribing the mode by which every part is prepared, has directed me to ſelect ſuch only, as are of moſt importance, and, from an acquaintance with which, every other will naturally occur. Thoſe who wiſh to become complete Anatomiſts, I muſt urge to devote a ſufficient time at the uſual places of inſtruction; to them, I hope, this treatiſe will be found, what I mean it to be, an uſeful companion and aſſiſtant.

My ſubject has been arranged in the way that ſeemed to be plaineſt, and beſt adapted to commu-

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nicate each proceſs in the moſt complete and conciſe manner: it would appear, that beginning with the eaſieſt mode of preparation ſhould have been followed; but, as each part requires a complicated treatment, ſuch diviſion was thought impracticable, at leaſt inadequate to furniſh the neceſſary information.

Numerous have been the difficulties which I have had to encounter in the proſecution of this work; being anxiouſly ſolicitous to avoid introducing any mode, which had not been previouſly ſubmitted to the teſt of my own experience; practical engagements have, neceſſarily, interrupted that chain of attentive inveſtigation ſo eſſential

eſſential to my ſubject. The want of proper accommodation to perform my proceſſes, has, not unfrequently, been a ſource of inconvenience, and the well-known expence of purſuing Anatomy is no inconſiderable obſtacle to its improvement.

By an experience of my work's proving uſeful; by its promoting Medical and Chirurgical knowledge, I ſhall be amply gratified: with this view, therefore, I ſolicit the candour and attention of my readers.

INTRODUCTION.

TO attain that knowledge to which the faculties of man are competent, ſhould be the invariable buſineſs of life: as on a due and wiſe appropriation of our time and talents, not only depends our temporal benefit, but eternal advantage.

The mind impreſſed with this truth will be directed to the nobleſt purpoſe: ever under the influence of active habits, prudence will recommend ſome profeſſional attention. No one, of whatever fortune or quality, ſhould be without his peculiar art or ſcience. To induſtry, the tribute

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of praiſe is always due; to excellence, ſomething more.

The mind, unoccupied by ſome laudable purſuit, is ever expoſed to the inſidious attacks of alluring pleaſure; the progreſs of this enemy is imperceptible; and, in proportion to the rapidity of its encroachment ought ever to be the alarm of virtue, reaſon, and good ſenſe.

To the particular department of natural philoſophy, which is the ſubject of the following pages, I wiſh moſt anxiouſly to draw the attention of rational men; to rouſe the activity of intelligence to a reſearch, which promiſes the ampleſt gratification, the ſublimeſt truth; no leſs than a wide diſplay of the wiſdom of Omnipotence in the admirable ſtructure of the firſt of created beings, a demonſtration of the fabric, which ſerves to convey ſentiments emanating from that divine principle which conſtitutes the eſſence of human nature. The field is extenſive; the path, though often

often trodden, has ſtill its intricacy, and it is by ſedulous and ſcientific inveſtigation alone that the traveller will be more enlightened.

If reference be made to the literal signification of the word Anatomy, it will appear unneceſſary to adduce any particular definition; but ſince a more extenſive, and, it may be added, liberal ſenſe is now applied to many words, either by a figurative ſimilarity, or a kind of tacit enlargement of their meaning, it may be ſaid, that under this term is comprehended not only the knowledge gained by the mere inſpection of parts; but, by an accurate and comparative attention to circumſtances, all probable conjecture reſpecting the functions of the parts of animals; and, by a rational deduction from eſtabliſhed healthy appearance, with a collateral conſideration of morbid cauſes, that obſervation which enables the practitioner to form a ſyſtem of pathological opinion.

That this is the generally received meaning of the word Anatomy will, it is preſumed, be now univerſally admitted. To anſwer the purpoſe of this publication, it may be ſcarcely neceſſary to inform the pupil that Ανατεμνω means merely cutting through; he would have comprehended the ſyſtem of preparation without ſuch claſſical information; but the dignity of Anatomy requires a more exalted and comprehenſive character. To be brief, the knowledge implied by the words Diſſection, Phyſiology, and Pathology, conſtitutes the ſum of the ſcience.

Though it may be fairly inferred, that attempts to remove diſeaſe are of higher antiquity than anatomical knowledge; yet there is abundant reaſon to believe that in the earlieſt ages of the world mankind were convinced of what is, at this day, ſo obvious to the ſlighteſt obſervation, that without ſome information as to the human ſtructure, no true plan of

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cure could be formed. The elegant defcriptions of Homer lead us to imagine, that fome anatomical facts were accidently acquired by the wounds and death received by the numerous heroes who fell victims to the adultery of Paris; the comparative inferences which the inhabitants of earlier times had fuch frequent opportunities of making by their facrificial offerings, muft have been no inconfiderable means of promoting a knowledge of Anatomy. The ftory of Hippocrates, when requefted by the inhabitants of Abdera to vifit and cure their fellow-citizen Democrates of infanity, difcovers to us that by men of intelligence, this department of phyfics was reputed of no inconfiderable moment, as it muft be evident to them that it could alone form the true bafis of medical fkill.

Various, arduous, and interefting, have been the truly fcientific ftruggles of philofophers of all ages, to fecure to their particular countries or cities, the honourable

claim

claim of having firſt cultivated, and moſt aſſiduouſly purſued the ſtudy of their favourite branch of ſcience: ſuch competition may be termed honourable, when the purpoſe of knowledge has been utility to man. The wiſh to poſſeſs the flattering diſtinction has generally originated in benevolence; and, though vanity, or the love of fame may be gratified by the grant of ſuch a claim, yet the man, whoſe attention is uniformly directed to the good of his ſpecies, being ſuppoſed to be under the influence of the ſame foibles, may ſurely be permitted to derive ſatisfaction from the ſame ſource.

Whether Athens, Rome, or Alexandria was moſt ready to beſtow the civic crown on the votary of anatomical ſtudy, is ſcarcely in the power of the modern hiſtorian to determine, and, perhaps, ſuch is the humiliating declenſion from ſcience in thoſe countries, where the arts and ſciences once fixed their moſt flouriſhing ſeat, that even to the preſent native of thoſe cele-

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brated ſpots, the diſcuſſion would be uninteresting, and the deciſion of little importance.

The curioſity of the preſent age can derive but little gratification from ſuch conjectural opinion, and moſt probably would be more ſubſtantially amuſed by ſome attention to the times when this part of natural knowledge has been moſt cultivated in the modern cities of Europe, and by accurate information, as to the identity of thoſe great characters, whoſe labours have thrown moſt light on Anatomy in general, and to whom we are indebted for the large ſhare of anatomical experience now acquired. To true lovers of the ſcience, the demonſtrative excellence of a Hunter, and the phyſiological accuracy of the Monros, muſt ever be objects of emulation.

The importance of every part of philoſophy will be eſtimated, in the ſcale of reaſon, by the magnitude of the advan-

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tage which man is to derive from it; Providence has wifely decreed the developement of natural knowledge to be equally progreffive with the wants of the inhabitants of the world. As difeafes have multiplied, as the luxury of man has created other and newer caufes of diftrefs to himfelf, that merciful being has quickly opened to the view of the phyfician fources, whence the moft unambigous antidotes have been procured; as that progreffion has derived moft of its energy from the lights thrown on the human ftructure by means of Anatomy, it may be juftly inferred that, in point of real benefit to man, it has the pre-eminence of every other branch of natural fcience.

It is only from a long and laborious courfe of anatomical diffection, that fufficient information can be obtained, in order to afcertain with precifion, either the real ftructure of the human frame, or the fpecific purpofe to which each part is deftined.

The ſtudy of Anatomy will be moſt ſucceſsfully cultivated when the pupil has opportunities of inveſtigating the ſtructure of animals which have ſuffered little previous to death, and been little changed by diſeaſe; ſuch are perſons who have died ſuddenly, whether by the common accidents of life, poiſon, ſuffocation; as by water, the halter, or, what have been vulgarly ſuppoſed to be, noxious fumes. By theſe the true end of the ſtudy will be obtained, viz. an accurate acquaintance with the real appearance of parts: this will ever after be the ſtandard of anatomical truth, and, by the obſervation to which it muſt unavoidably lead, throw ſuch light on the phyſiology of every part, as will, in moſt inſtances, direct to the moſt probable certainty.

Humanity revolts at the ſuggeſtion of there ſtill remaining a ſource from which further information may be drawn, and, indeed, by which ſome particular facts are alone to be aſcertained; but, unleſs the man of feeling will ſubmit to derive his knowledge from the teſtimony of the leſs compaſſionate, and, perhaps, more induſtrious Anatomiſt, he muſt condeſcend to hurt his ſenſibility by adopting thoſe means, from which he can alone acquire ſubſtantial information: the diſſection of living animals is here meant. Thoſe which are moſt tenacious of life are beſt adapted to theſe experiments: the frog, the toad, and the eel, are deſtroyed for far leſs uſeful purpoſes. As the animal œconomy can only be ſufficiently elucidated by a real obſervation of the action of the living powers, neceſſity will occaſionally require a reluctant acquieſcence with ſuch means; but the feelings of human nature lead us to hope that this employment will never be wantonly indulged in. The action of the heart in its ſyſtole and diaſtole, can be beſt ſeen in theſe animals, ſince it is well known, that the expoſure of ſuch an important cavity in the human and moſt other animals, would be productive of more ſudden deſtruction; but, wonderful as it may appear, theſe little tortured objects of experiment are frequently ſeen, not only capable of vigorous muſcular action, when the cheſt and præcordia are laid open, but even when the heart itſelf is removed from the body: for ſome wiſe, and, to man, unknown end, has the beneficient ruler of his creatures endowed them with this wonderful and ſuperior tenacity of life; to us, who are ſo incapable of comprehending the myſterious deſigns of the all-wiſe Creator, ſuch a quality appears unneceſſarily to prolong their ſufferings.

The living action of muſcles, as depending on a certain influence conveyed by the nerves, can only be demonſtrated by an expoſure of theſe organs of ſenſe. No animals, therefore, are ſo conveniently the ſubjects of experiment as theſe: a conviction of their ſubſerviency to aſcertain phyſiological and neceſſary truths, can alone juſtify ſuch practices; but the health of man muſt be ſecured even at the expence of the lives and feelings of other animals. Anatomy, therefore, when ſtudied on the healthy ſubject, is a ſource of the higheſt utility.

Nor is the inſpection of the morbid body, leſs uſeful and intereſting; hence alſo fair inferences may be drawn of the real ſtructure and true function of parts to which diſeaſe has not been extended; the abſolute condition of organs, whoſe original office may have been materially changed, will be aſcertained with accuracy, and evidence adduced of the propriety, as to the uſe of remedies, which were intended for the removal of the diſeaſe: in ſome inſtances, their effects known, and the unſatisfactory knowledge attained of what might have ſaved life; though unſatisfactory in the preſent inſtance, yet this may govern the judgment in future ſimilar caſes to the moſt happy ends. The lives of ſurvivors may be preſerved through ſuch means. This alone would induce us to conclude on the great utility of morbid diſſection, were not other views, equally important, effectually ſerved: it is the only genuine ſource of noſological knowledge; ſymptoms may be arranged, definitions may be compoſed with ſeeming accuracy, whilſt in the daily exerciſe of the healing art; but truth can only be arrived at by the ſubſequent inſpection of thoſe bodies, which have been the unſucceſsful objects of attempts to heal. By a judicious compariſon of previous ſymptoms, with the real morbid appearance of the body, ſuch facility may, by the quick-ſighted phyſician, be acquired of attaching the moſt certain pathology to the circumſtances of thoſe ſick, who are bleſſed with ſcientific treatment, as will afford them the faireſt chance of relief. Another grand purpoſe, which is eſſentially promoted by ſubmitting the dead body to the examination of medical men, is the great light which the inſpection may throw on the numerous cauſes, by which life has been finally deſtr6yed; no other argument need be adduced

adduced in ſupport of this aſſertion, than a reference to that ineſtimable work of the great and indefatigable Morgagni, De Cauſis Sedibuſque Morborum, in which he has given the world ſuch a multiplicity of caſes, with a deſcriptive connection between preceding cauſes and ſubſequent diſſection, as affords the ampleſt information, ſhould excite emulation, and render his laborious reſearch as much regarded, as the utility of his publication is extenſive. The moſt obvious cauſes are wounds, poiſon, and the retention of other foreign bodies. Death is often the conſequence of wounds, which at firſt affect no part of great importance to life; inflammation, frequently the ſequel of ſlight injury, by its extenſion to parts of conſequence in the animal œconomy may prove a deſtructive cauſe: abſceſs being ſometimes the effect of the ſame primary agent, may pour its contents into cavities of importance; ſerous or other effuſion may produce ſuffocation, if taking place in the cavity of the

the plura: in ſhort, numerous inſtances may be brought to ſupport the aſſertion of the greateſt good reſulting from opening bodies deprived of life by the infliction of wounds; a diſcovery of the happy effect which would have followed the artificial evacuation of theſe effuſions, or the timely extraction of a bullet, might, in future caſes, produce the moſt ſalutary practice.

The examination of dead bodies will, in many inſtances, clear up ſuſpicious appearances, as to the cauſe of fatality. The effects of ſeveral poiſons, which are active in their operation, may be diſcovered by an occular inquiry into the ſtate of the ſtomach and bowels. On this criterion ſo many important particulars hinge, the future happineſs, reputation, nay, even life of individuals, as will fully juſtify having recourſe to it whenever anomalous ſymptoms, poſthumous appearance, or report warrant ſuch an appeal.

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In the too common occurrence of the birth of children, under circumſtances which tend to criminate the mother; ſome, though in no reſpect unambiguous, information may be procured by an attentive examination of the body of the child; the introduction of air into the lungs, occaſion ſuch a change, not only in that organ, but in other parts, as leaves great room for the exerciſe of the experienced judgment of the Anatomiſt: the frequency, however, of children dying quickly after their expulſion from the uterus, when, perhaps, a feeble dying effort may have partially inflated the lungs, leaves this circumſtance ſo obſcure as not to warrant the name of criterion being beſtowed upon it. Happily, however, for the accuſed, if any evidence is drawn from it, the abſolute ſinking of a piece of lung in water, muſt be a certain proof that little, or, moſt probably, no air has ever entered into it; and the well known fact of the quick diſtenſion of every part of the pulmonary organ,

organ, leaves no room for ſuppoſing that a part ſhould not have undergone the action of the ſame cauſe.

Death has been ſo frequently known to follow the retention of foreign ſubſtances, that in this caſe, as well as in every other, where the cauſe cannot be aſcertained, prudence will direct an inſpection of the body.

Pins, money, ſtones of fruit, and many other ſtrange bodies have been occaſionally introduced into every external cavity, by the unthinking curioſity of children; from theſe the moſt pernicious effects ſometimes follow; inflammation; convulſion, by preſſure on neighbouring nerves, or by producing general irritation; vomiting, pain, and diarrhœa; contraction of limbs; and, in many inſtances, death are often occaſioned. Whenever the laſt unhappily takes place, the body ſhould be examined: as the peculiar ſituation of the offending ſubſtance might have rendered it eaſy to have relieved the ſymptoms, if not prevented the final diſſolution of the patient, by a timely and ſkilful operation. This knowledge may be a valuable acquiſition to the faculty, and alſo to the friends of the deceaſed, as, on the occurrence of ſimilar ſymptoms, the cauſe and, ſometimes, the cure may be pointed out.

As the truth of every indication, by which the cure of diſeaſe is conducted, depends in a great meaſure on the light thrown on the ſubject of pathology, by the frequent diſſection of morbid bodies; it follows, that where opportunities of this kind are often granted to the phyſician or ſurgeon, by the liberal and wiſe candour of the relations or friends, a juſter and more deciſive mode of practice may be attained; vague conjectures and obſcure ſuppoſitions give way to principles eſtabliſhed by real appearance; truth will take place of error; health will be the portion of mankind; and their

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happineſs ſecured on a ſolid, becauſe rational, baſis.

The high point at which man is fixed in the ſcale of animated nature; the various diſeaſes to which he is ſubjected, either by his nature or his habits: the frequent occaſion for the management of theſe being intruſted to the phyſician, call for a ſuperior ſhare of attention to the ſtructure of that nobleſt of all machines, the human frame.

The importance of human Anatomy may be eſtimated by the ſuperiority which man holds above the brute creation, in conſequence of the invaluable gift of rational faculties, with which it has pleaſed Providence to bleſs him: the body endowed with reaſon, unabuſed, will ſurely be admitted to claim a more attentive ſolicitude for its preſervation, than that which is only under the influence of inſtinctive perception; the power of determining the exiſtence of which, when the calls of nature demand it, the ſame benignant hand has diſpenſed to the human race.

Man, like other animals, has his relative value; as an individual of one family, his faculties ſhould be uniformly directed, either to his own future happineſs in common with the reſt of his fellow mortals, or in rendering their reſidence here as comfortable as the nature of ſo tranſient a ſituation admits. According to his ſucceſs in ſuch attempts, is man eſteemed more or leſs meriting the regard of man; more or leſs worthy ſolicitude for his preſervation. Admitting then the neceſſity of this ſtudy, as ſubſervient to the intereſt of mankind at large, by its immediate influence on the practice of medicine, which it tends to diveſt of that conjectural analogy unavoidably governing the plan of cure; when the idea of the Anatomiſt, as to ſtructure and uſe, are derived only from his ſpeculative obſervation of the brute part of the creation: a greater certainty would appear to flow from know-

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ledge collected by a philosophic attention to that piece of mechanism, whose function is deranged, than can possibly arise out of vague conclusion, drawn from appearances seemingly analogous, yet, perhaps, opposite in those minute particulars, which cannot be submitted to the examination of the senses.

By those opportunites being granted to medical men, which may be, and, most assuredly are to them, sources of the most important intelligence, a sameness of language and description would pervade the medical world: authors, teachers, and pupils would derive the most essential good from such effects; and from this happy similarity mankind must ultimately derive lasting benefit; as, by such extensive and rational communication, a multiplicity of well-grounded truths would uniformly direct the practice to the most successful ends.

It has been urged, that the dissection of of the brute creation would furniſh inſtruction ſufficient to enable the phyſician ſucceſsfully to manage the diſeaſes of man; that the beſt ſyſtems of phyſic, obſervations that have been handed down by the ancients, have ſtood the teſt of ſome thouſands of years, among whom human diſſection was ſeldom permitted; aud that it is therefore ſuppoſed that the means which were adequate to procure them ſucceſs would now be equally efficacious. The diſeaſes of quadrupeds may be ſufficiently elucidated by a proper attention to their ſtructure; and, to the ſhame of beings, to whoſe ſervice they are ſo entirely ſubſervient, it may be ſaid this ſtudy is irrationally neglected. The knowledge of the Anatomy of each claſs of animals, is the only means on which a philoſophic mode of curing the diſeaſes of each can be founded. An appeal to ſome few inſtances of comparative Anatomy will readily prove the fallacy of all comparative inference. Can the diſeaſes of the ſtomach of man be always ſimilar to thoſe

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of the ſtomach of the ox, or the ſame remedies equally competent to their removal? In the laſt, digeſtion being carried on by repeated maſtication, and, probably ſolution, by means of different menſtrua in different veſſels; in the other, by a more ſimple proceſs, directed by beneficent Providence, to obviate the inconveniencies the human ſpecies would otherwiſe be ſubjected to from its tedioufneſs: to the quadruped, as not enjoying the light of reaſon, digeſtion is kindly made a ſource of amuſement. Can the ſtomachs of the oſtrich, and the ſheep, receive benefit by the ſame mode of cure? Surely not; the operation of the ſame remedy muſt be totally different in animals, whoſe nature, ſtructure, and propenſities ſo widely differ. It may be therefore fairly concluded, that the diſeaſes of each claſs of animated beings muſt have a ſpecific treatment; conſequently, that a method of curing the impaired health of man, founded on a mere knowledge of the Anatomy of the brute, muſt be fallacious and unſucceſsful.

That the medical opinions of the ancients are built on knowledge, for the moſt part derived from this ſource, is readily admitted; their deſcriptions, and practice, fully convince us of this truth.

The ſtudy, however, of comparative Anatomy is ſtrongly recommended; as long as its objects are neceſſary to the maintenance or the ſupport of man, ſo long ſhould every regard be paid to the alleviation of their ſervitude and the preſervation of their lives. The practice of medicine may be as judiciouſly directed to good purpoſes in the treatment of their diſeaſes as thoſe of man: the want of oral information muſt frequently miſlead; but, an attentive obſervation of their action, when in pain, will equally well direct the practitioner, as when endeavouring to cure the complaints of infants.

From comparative Anatomy much amuſement may be alſo procured; with this view, as well as to extend a taſte for anatomical

anatomical proficiency, it is highly commendable.

To thoſe who view Anatomy as a medium of happineſs to man, it is a matter of no leſs ſurpriſe than concern, that its improvement has been invariably impeded, by obſtacles which have, for the moſt part, had their origin in the prejudices of that very being, whoſe intereſt it has ever eventually promoted.

In minds unenlightened by ſcientific truths, inſenſible to the expanſive powers of genuine philoſophy, much prejudice, however oppoſite to reaſon, may be overlooked. In theſe, opinion is ſeldom ſubmitted to that criterion, to which rational faculties ought to appeal; its conſiſtency with common ſenſe. The vulgar, ever under the influence of paſſion, led away by falſe appearances, are commonly the inſtruments of deſigning men. How often tumult, riot, and diſorder effect their ends, frequent experience has fully evinced.

Ignorance incompetent to conceive the good which ariſes from the examination of the dead, has ever imputed to the Anatomiſt, an attention to that cauſe only, which, from its prevailing agency in the world, is uſually looked on as the *primum mobile* of action, ſelf-intereſt. Inattentive to, or rather inſenſible of the myſtery which muſt envelope the effects, when the cauſe is little underſtood, it can ſcarcely be expected that innovation ſhould meet encouragement.

The ground of objection to human diſſection has often been an attachment to that body, which once was the medium of communication between friends. To men of thought; to thoſe whoſe attention has been directed to the truths of ſcience, it would be ſuppoſed unneceſſary to offer any arguments by way of convincing their underſtandings; it may be preſumed the connection of ſuch friends has been chiefly mental; the body, when diſpoſſeſſed of the mind, is reduced to a level with every other part of inanimate nature; totally devoid of feeling, and may, without any poſſible injury to it, or its former inhabitant, be aptly appropriated to promote the end of all knowledge—the temporary and laſting felicity of man.

This poſition once granted, and confidently urged as a ſelf-evident truth, the ſtudy will gain more indulgence with men of liberal education; and though it may, perhaps with ſome degree of juſtneſs, be ſaid, that the licentiouſneſs of the faculty has been ſuch as to require the neceſſary impoſition of reſtraint, it will never be ſufficient argument with them, for the entire prevention of a ſcience; the ſtudy of which has been improperly purſued by ſome worthleſs men. The influence of popular opinion, which has, on ſome occaſions, effected the impriſonment, exile, confiſcation, and death, of men whoſe attention to this department of natural knowledge, has been exceedingly beneficial to mankind, either by their own ſummary juriſprudence, or by the legiſlative power of countries. Thoſe who are not ſufficiently independent of the furious clamour, ſhould be moderated by the mild perſuaſion of the better part of mankind, and by the judicious conduct of Anatomiſts. It is hoped, however, that even the vulgar begin to diſcover the utility of diſſection; and to be convinced of its abſolute neceſſity in the acquiſition of ſuch a knowledge of healing, as may ultimately prove to themſelves a means of relief from pain: a ſerious appeal to the ſenſes of man will in moſt caſes influence his judgment: and who does not wiſh an exemption from painful diſeaſe?

Since thoſe whoſe ſituation in life, either by their fortune or their influence, has ſet them above the neceſſity of always ſubmitting their actions to the teſt of public approbation, ſeldom have embarked deeply in this ſtudy: it follows, that from the difficulty of procuring bodies, and the unavoidable expence of diſſection, the profeſſor

professor of Anatomy must find himself frequently debarred those opportunities of acquiring that knowledge which he is to impart to others; this then is an obstacle of no little weight; the want of anatomical objects is no where so much felt, as in that part of this island, where medicine has at present a pre-eminence; and where unhappily the acquisition of its students so fully justifies the general opinion, that dogma usurps the place of fact, and theoretical speculation that of useful truth. The flourishing state of medicine in the kingdom alluded to, is so far from being a proof in point of the inutility of dissection to healing, that from this observation, the most powerful conclusions in favour of human Anatomy may be adduced; speculative knowledge no where more abounds, than in those situations which deny to the professor and pupil the means of investigating true principles; where the one is obliged to ground his opinion on cursory and casual observation, and the other implicitly directed by the

the ill-digeſted aſſertions of the former. To the diſgrace of the inhabitants, their minds are ſtill influenced by the errors of leſs-enlightened days; and it may with truth be ſaid, that in this reſpect they are more than a century behind the nations around them; and it is wonderful, that a people with whom intereſt is ſometimes a ſtimulus to action, ſhould not have diſcovered, that, as their principal city derives much of its ſplendour from the otherwiſe liberal cultivation of medicine, more indulgence to its votaries can alone prevent their emigration to other countries, where fanaticiſm has left the mind unreſtrained; and this ſcience is riſing free from the ſhackles of ignorance.

The mind is ſtill more ſurpriſed, that in the metropolis of a great empire, where Anatomy is ſucceſsfully attended to, from ſubjects being more eaſily procured, and the number of receptacles for the ſick ſo great, a more ſyſtematic mode of education has not hitherto been purſued:

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the attention of the pupil ſhould be enforced by the neceſſary reſtraint of academical regulation, by which the time devoted to its purſuit being much longer, more ſubſtantial knowledge would be acquired, and the ſcience of healing eſtabliſhed on better information. This obſervation muſt be admitted, when it is well known, that twelve months, ſometimes ſix, nay, even three, are thought ſufficient to form the practitioner in medicine. To the uninformed pupil, the attention of the profeſſor is ſo indiſpenſably neceſſary, that when this has been wanting; and it muſt be confeſſed, that, in ſome inſtances, a condeſcenſion ſo uſeful has not always marked their character; the obſtacle to their improvement has not been inconſiderable: whether this is occaſioned by the preſſure of other avocations, or a diſlike to the drudgery of initiatory inſtruction is uncertain; but it is true, that the pupil's advancement is frequently much diſcouraged and retarded. They are therefore called on to uſe that induſtry from which they

they will ultimately derive much honour and profit. Other caufes of obftruction alfo are too prevalent, which arife from fome qualities inherent in medical pupils, and form confiderable bars to their due proficiency. A natural antipathy to meddle with the dead, may at firft occafion a reluctance to arduous purfuit; but the well-known effects of cuftom in producing habit, will quickly do away every obftacle of this kind; and did not others of a much more ferious nature ftep in, little difadvantage would refult from this. A want of induftry, an averfion to confinement, a thirft for fafhionable amufement, and a propenfity to trifling affociation either with fellow-ftudents, or perfons whofe converfation can furnifh neither lafting pleafure nor temporary inftruction, have hitherto been great impediments to improvement in this fcience. The advantages which fome experience from clofe attention; the ftate of mind which diffipation ultimately produces, would appear to be fufficient to direct pupils to what ought to conftitute their

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only employment during their reſidence at the places of inſtruction, inſtead of diſappointing, by a diſregard to time and expence (an occurrence much too frequent) the expectations of affectionate friends; and thus occaſion to themſelves a laſting cauſe of regret. As ſome apology for the frequent inattention of medical pupils, it is admitted that, at the period of life, when this ſtudy is generally commenced, their minds may not be fully impreſſed with a conviction of the abſolute neceſſity of much fundamental knowledge; nor may they be ſufficiently apprized, of what has perhaps already been too often mentioned, that without a due ſhare of anatomical knowledge, the practice of medicine muſt be conducted ignorantly and ineſficaciouſly.

In an age peculiarly marked by its literary advancement, it is natural to expect that the aſſiſtance of good policy would not have been wanting; that the attention of legiſlatures would have been directed to promote the progreſs of ſcience. It would have been particularly grateful to the Anatomiſt to have derived encouragement from an enlightened adminiſtration: hitherto, however, buſineſs of a more active kind, has unfortunately deprived him of the co-operative influence of government; and he has been obliged, reluctantly, to follow the clandeſtine means of proficiency, when a legal ſanction would have given a pointedneſs to his reſearch, and a ſecurity to his profeſſion, from which he would eventually have experienced that ſatisfaction and credit, hitherto denied him, and which muſt inevitably have ſecured to judicious and well-regulated diſſection, the tribute of praiſe.

From the influence which the clergy have, from the earlieſt ages, had over the minds of the multitude, it will not be wondered at, that the Anatomiſt ſhould feel a regret in the reflection, hat though he might reaſonably have expected every aſſiſtance would have been afforded him by men, whoſe endeavours have effected far leſs rational purpoſes; yet ſo little attention hath the ſtudy of Anatomy been thought to merit, that hitherto the ſilence of the clergy muſt be juſtly cenſured as a conſiderable obſtacle to its advancement.

Had the opportunies of diſſection, either of the human or brute ſubject, offered more generally in the country, it could not have been ſaid, that the locality of the employment had rather impeded than advanced its progreſs; whilſt knowledge can only be acquired in particular ſituations, it cannot experience that happy diffuſion, which philanthropy would lead us to wiſh.

The want of a more general acquaintance with the art of preparing and preſerving the whole, or different parts of the animal body, is not to be reckoned among the leaſt impediments to the improvement of Anatomy: a more extenſive field being now opened, it is hoped the public will not fail to embrace the means, and thereby the ſcience be in ſome meaſure indebted to this work for the aſſiſtance it may afford.

The obſtacles to the ſtudy of Anatomy having been ſufficiently pointed out, it ſeems equally incumbent on the author to mention the different modes by which theſe may be either perfectly ſet aſide, or their effects obviated: a particular enumeration of the means by which theſe ends may be obtained will be unneceſſary, when it is conſidered, that the impediments themſelves, naturally produce in the mind, reflections, which muſt lead to the moſt obvious prevention; more liberality on the ſide of the people, the conſequence of the mental influence of the clergy, in private life, and the authoritative ſupport of the government; with increaſed induſtry on the part of medical men, would, moſt probably, produce a general remedy.

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It is however ſincerely to be wiſhed, that ſome mode could be adopted by which ſecurity would be given to the diſſector. It appears to a ſuperficial obſerver, that the numerous executions, as they evince the depravity of man, might ſerve to advance this branch of natural knowledge: by being placed under ſuch regulation as to time and place, as would both ſerve this laudable end, and not improbably prevent, in ſome degree, that dreadful frequency of crimes, by the horror which the proſpect of being ſubmitted to the knife of the diſſector, produces in the mind. How feaſible ſuch a plan is, the author, with reſpect, ſubmits to the more mature judgment of the ſtateſman.

Since the advantages ariſing from a cloſe attention to anatomical purſuit are ſelf-evident, and have been now premiſed, it becomes, in the next place, neceſſary to offer to the ſtudents ſome advice as to the mode to be obſerved for its more expeditious, eaſy, and moſt certain attainment.

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An early and deep conviction of the neceſſity of ſtudy, is univerſally allowed moſt uſefully to prepare the mind for the reception of ſcientific inveſtigation: it therefore becomes the duty of parents, whoſe choice of a profeſſion for their children ſhould ſtimulate them to facilitate their progreſs, and to ſmooth the apparently rugged path of ſcience, aſſiduouſly and early to repreſent to them the acquirements which have been the rich reward of zeal, perſeverance, and induſtry; and that, by theſe only, men can arrive at profeſſional reputation; that all labour will be amply compenſated by the gratification which the mind will ultimately receive from ſuperior erudition. As no inconſiderable obſtacle to the improvement of Anatomy, the ſhort time, uſually allotted to the pupil for the proſecution of his ſtudies, may be mentioned; the impoſſibility of making a proficiency, ſufficient to afford him adequate and ſatisfactory information, induces the author to call on parents, whoſe circumſtances may ena-

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ble them to indulge their ſons with longer time, cheerfully to ſupport them while there is ſtill further information reſpecting this important buſineſs of their lives to be acquired, and while their time is properly employed: it is alſo a truth worth attending to, that no parents, whoſe ſituations do not admit of this latitude, ſhould ever think of embarking a ſon in a profeſſion in which a narrow education will be found his greateſt miſfortune.

As the following obſervations on the moſt ſucceſsful means of aquiring anatomical knowledge have been derived from no author; but, though their congeniality with the commonly received opinions of profeſſors may mark their origin, are the genuine reſult of reflection, on a ſubject which has hitherto been too much neglected; it is hoped they will be read with candour, and either adopted or rejected with judgment. The ſubject may be be principally arranged under the five following heads.

1. A diligent attendance on the lectures of profeſſors of reputation.—2. The being occaſionally a ſpectator of the diſſections of fellow-ſtudents.—3. An attention to good plates.—4. Reading the beſt authors on Anatomy.—5. Actual and attentive diſſection.

The advantages of inſtruction delivered in a public theatre, when the attention is fixed on the ſubject before the teacher, are ſo numerous and obvious as to make it ſcarcely neceſſary to enter into an enumeration of them: without ſuch a preparatory courſe, the ſtudent may be aſſured his progreſs will be very difficult, his information very circumſcribed, and the ultimate application leſs general. A conſtant and diligent attention to public anatomical lectures is therefore ſtrongly recommended; it is by them alone the ſtudent can be properly, and,

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as it were, insensibly initiated: the most important facts, established by the experience of the Anatomist, will be lastingly impressed; subsequent dissection rendered much more familiar, and the necessary habits of reflection acquired: whereby new and just ideas will enrich the mind, comparative inferences will be also drawn, and useful conclusions arise.

As a circumstance of no small importance to students, whose object undoubtedly is, to gain as much instruction as possible, whilst the teacher is delivering his lecture; the fixing the attention, in such a manner as most effectually to answer this purpose, appears to merit some notice. Various have been the opinions of men respecting the best mode of doing this; indeed so different, and so often contrary, are the views of students, and into such latitude does their anxiety to learn much in a short time lead them, that it appears difficult to adopt any rules equally applicable to all.

It is preſumed that the mind is fully impreſſed with a ſenſe of the magnitude of the object which it has in view; an impreſſion which ſhould primarily and weightily operate on it: ſuppoſing it to be ſo, the neceſſity of any other is ſuperſeded; yet, as this may not be the caſe with all, the ſtudent is aſſured, that, without the moſt perfect conviction of the neceſſity, of his mind being abſtracted from every circumſtance, that has a tendency to occupy his time and thoughts unprofitably, and an aſſiduity conſiſtent with ſuch conviction, it is impoſſible he can ever advance to knowledge, with that ſteady and uniform perſeverance, on which depends the excellency of his profeſſion.

The mental powers are as capable of improvement, by judicious and well-timed exerciſe, as thoſe of the body; by this the memory becomes more tenacious, and the mind is fitted for the retention of whatever may be afterwards offered it. It is a good method to read to young

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people, and, by way of securing their attention, to require their recapitulating what has been read: this is a most effectual way of promoting an abstraction of thought: it may grow into habit, and will prove a source of gratitude from a child to a parent, or tutor, by the daily opportunities which he will have of experiencing its great utility.

Preparatory to study, it is recommended to pupils, to read Dr. Watts's Essay on the Improvement of the Mind; by a careful observance of which, their progress will be much facilitated; and by attention to the rules laid down, they will not only be more successful in the pursuit of learning, but may eventually be better men.

The numerous and too well-known practices of the less considerate pupils, of diverting the attention one of another during lecture, as well as in the dissecting-room, by exploits of juvenile trickishness, ought ever cautiouſly to be guarded againſt; as well as the habit of reſorting to places of amuſement and paſtime; all which has an immediate tendency to retard his progreſs, by diſſipating his time, his ſcientific ardour; in ſhort, every thing that is uſeful, good, and virtuous, and, conſequently, unfits him for his profeſſion in every reſpect.

It is urged by many that taking of notes during the lecture, greatly tends to facilitate the ſtudy of Anatomy; but during the firſt courſe of lectures, this is better avoided; for it will be found difficult to follow the lecturer with ſufficient expedition, when the parts of Anatomy and technical terms are not yet familiarized: beſides this, it is as neceſſary that the eye, as that the ear, ſhould be employed, to form in the mind a juſt conception of the thing ſpoken of. After the firſt, or ſecond courſe, notes ſhould be taken during the time of lecture, but as ſhort as poſſible, that the attention may not be unneceſſarily called from the teacher:

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theſe notes ſhould ſerve only as mementos till the evening, or as texts to the pupil, from which the lecture ſhould be wrote as completely as the memory will poſſibly enable him: and lectures penned by himſelf will be incomparably more valuable to him, than a much more complete purchaſed copy; for by writing thus largely, he will acquire a very deſirable facility in committing his thoughts to paper, in an eaſy, accurate, and pleaſing language. The manuſcripts will be a valuable teſtimony of his induſtry and improvement, highly ſatisfactory to his parents or friends, who have been at the expenſe of his education, and, above all, will more deeply impreſs the ſubject on the memory, and prove a valuable repoſitory of important knowledge for his own, and his patients advantage in future practice.

To a perſon at all acquainted with the œconomy of a diſſecting room, it will not appear unneceſſary to inform the pupil, that by the ſecond mode, much knowledge may

may be gained. Young men ſometimes proceed too haſtily to diſſection: it is uſeful to viſit the diſſecting room immediately on the commencement of the lectures; but it would appear very improper for a pupil to attempt minute diſſection, prior to his having been properly furniſhed with theoretical inſtruction: yet, however repugnant to common ſenſe, it is well known to be often the caſe, and that ſtudents by ſuch haſty attempts to ſuperior proficiency, miſs the object at which they aſpire, and are left far behind their more ſyſtematic companions. By being for ſome time a ſpectator in a diſſecting room, a kind of ſpeculative attention will be paid to the operations of others more informed, much uſeful knowledge acquired, many errors avoided, and difficulties more eaſily ſurmounted.

Some knowledge of Anatomy, though imperfect, and often erroneous, may be gained by an attention to plates: though theſe are certainly ſources of information, yet

yet there is a danger of uninſtructed minds being miſled by them, and as it is well known how laſting early impreſſions are, they are not recommended to young men previous to their entrance on actual diſſection; when ſo engaged, ſuch vague channels of information may be better diſpenſed with; but that they may not, from what is here ſaid, infer, that all preparation for a courſe of profeſſional ſtudy, is not only unneceſſary, but injurious, they may be informed that an account of the phyſiology and pathology of parts, may be uſefully read prior to any information reſpecting the real ſtructure of them, carefully avoiding too poſitive an adoption of the opinions of authors, as they may afterwards diſcover, that they have imbibed ſuch falſe principles, as may not be eaſily eraſed by ſubſequent information.

Amongſt the many authors who have publiſhed anatomical plates, the following are recommended for the ſeveral branches of Anatomy to which they have particu-

larly

larly directed their attention, or in which they have excelled.—Chefelden on the Bones; his Ofteographia; alfo Albinus on the Bones; Albinus on the Mufcles; the late Dr. W. Hunter on the Gravid Uterus; Haller's Icones, particularly excellent on the Arteries; Walter, celebrated for his defcription of the Veins of the Head and Neck, as well as his very elegant plates of the Nerves of the Thorax and Abdomen; Euftachius's plates by Albinus, on the Bones, Mufcles, and Vifcera; Monro on the Nerves; Weitbecht on the Ligaments; Zinn on the Eye; Hewfon, Crookfhank, and Sheldon, on the Lymphatics; Trew on the difference of the Fœtal and Adult Veffels; Cowper on Anatomy in general.

It is alfo unneceffary for ftudents in Anatomy to accompany their inveftigations and the lectures by an attentive perufal of the beft authors on the fubject: but fuch reading fhould be collateral, and always immediately fubfequent to, never preceding, the lecture. A circumftance, however,

however, little attended to by pupils, ſhould not be loſt ſight of; that is, carefully to preſerve the peculiar opinions of the lecturer from thoſe of all authors; and it would be found abundantly uſeful, to commit to paper, the recollected paſſages of the previous lecture in a Winſlow interleaved for the purpoſe. The leſs voluminous anatomical works will be found very uſeful: the compendium of Heiſter; the conciſe and accurate information of the ingenious Innes, whoſe work on the muſcles has been, and will be, very uſeful; an occaſional appeal to the deſcriptions of Dr. Douglas and Cheſelden; and, laſtly, a ſtudious application to Ruyſch, Morgagni Adverſaria, with his three vols. de Cauſis et Sedibus Morborum, may be enumerated, as the books which will be found moſt aſſiſting in anatomical purſuits, and which may be properly read in the order laid down.

It may ſeem here neceſſary to ſay ſomething, as to order in medical ſtudy in general; but as every one muſt be ſenſible of the advantages ariſing from a methodical œconomy of time, and as the ſubject might lead to too great a digreſſion, it is thought beſt to leave this to its own ſelf-evident propriety.

It has been already advanced, that without actual diſſection, it is impoſſible to furniſh the Anatomiſt with a due knowledge of his profeſſion: it is therefore ſuperfluous to enlarge on this ſubject: the neceſſary information reſpecting the modes in which diſſection is beſt conducted will now follow.

As the advantages ariſing from diſſection, will be conſiderably augmented, or decreaſed by the degree of accommodation, it becomes a circumſtance of no little importance to the ſtudent to know what will facilitate his progreſs, and leſſen that natural diſlike to the ſtudy, with which ſome minds are early impreſſed.

The

The room in which bodies are diſſected ſhould be large, afford free admiſſion to the external air, be very light, and the windows ſo placed, as that a ſtrong light may be thrown on the ſubject; yet, in ſuch a direction as to exclude as much as poſſible the rays of the ſun, remote from noiſe, and difficult of acceſs, with plain plaſtered walls, properly ſecured from fire, a danger which may ariſe from the inflammability of the compoſitions for injecting; this may be prevented by having a large chimney, and no wood in the parts round it.

As a circumſtance of ſome importance, it may be mentioned, that as few cupboards as poſſible ſhould be placed in a diſſecting room; contaminated air being in no place more injurioufly accumulated.

It ſhould be furniſhed with a large ſupply of freſh ſoft water by a pipe or pump, with the neceſſary reſervoirs for preſerving any required quantity; alſo boilers of different ſizes, which ſhould be heated by a fire communicated from another room; perhaps it would be better was there no fire viſibly in the room, but that all the heat ſhould be applied by means of iron plates, the fire places of which ſhould be in an adjoining apartment. A ready exit to filth ſhould alſo be attended to, and a convenient place made for injecting, in form of a large ſhallow box, fixed, and water tight; as without ſome proviſion of this kind, injecting compoſitions, either by overſetting the pots, or burſting of veſſels, &c. are apt to get about the room;—tables ſufficiently long for an adult ſubject, of a convenient height, and the neceſſary ſeats, ought alſo to be procured.

As the health and ſucceſs of the Anatomiſt will often be in proportion to his attention to neatneſs, and his avoiding the unneceſſary accumulation of putrid matter, a ſervant will be an uſeful attendant on a diſſecting room, not only to clear it of the uſeleſs parts of the body, but to be

at

at hand, in order to ſupport the parts while injecting, to procure and heat water, and prepare injections, to take on him the care of the drying room, admit air to ſubjects in the finiſhing part of preparation, &c.

The dreſs of the diſſector conſiſts of a pair of ſleeves and a large apron with pockets; theſe are uſually made of chocolate-coloured glazed ſhalloon, and lined with linen: though it is recommended to have as little apparatus of this kind as poſſible, yet ſo much ſeems required, eſpecially in a public diſſecting room; as without it, the clothes get ſoiled, and ſmall pieces of the ſubjects adhere to them. An inattention to this circumſtance would not only be a violation of neatneſs, but of decency.

The inſtruments commonly uſed for the purpoſes of diſſection, comprized in a ſmall portable caſe, ſufficient for every intention, are to be had of any of the Surgeon's Inſtrumentſtrument-Makers in London, under the name of Diſſecting Inſtruments.

Diſſection will be more or leſs pleaſant, inſtructive, and entertaining, in proportion as the ſtudent is attentive to uſe his judgment, or that of his friends, better informed than himſelf, in the proper choice of ſubjects. By ignorance on this head, or oftener by careleſſneſs, the buſineſs will be fruſtrated, and ſometimes, by diſſecting of a putrid, or diſeaſed ſubject, the ſafety of the diſſector will be hazarded: greater precaution will be, in this reſpect, more neceſſary than is, perhaps, uſually imagined, as young men will at leaſt diſcover that intereſted perſons will often endeavour to impoſe ſubjects on them which are totally unfit for diſſection. Their choice ſhould therefore be regulated by ſeveral particulars, one of which, and of no ſmall conſequence, is the age. This will require more or leſs attention, according to the particular purpoſe for which the body is intended, whether the demonſtration

demonſtration of muſcles, the vaſcularity of the cutis, or the preparation of the ſkeleton, &c.

The recency of ſubjects ſhould be particularly attended to; and according to the facility or frequency of deception in this reſpect, the attention of the diſſector ſhould be more earneſtly directed to acquire the moſt certain criteria. The appearance of the eyes will generally lead to a pretty certain judgment: if they preſerve their healthy rotundity, it may be ſuppoſed, that death has not long taken place; on the contrary, when flabby and ſunk, the period may be ſuppoſed to be longer, a green colour of the parietes abdominis, an emphaſematous feel of the integuments; and, laſtly, a putrid ſmell are the uſual marks of life having been too long extinguiſhed for the intention or ſecurity of the diſſector; ſuch therefore ſhould be cautiouſly avoided, more eſpecially, ſince the many fatal accidents which have lately happened from diſſecting bodies in an unfit ſtate.

A proper

A proper order of diſſection ſhould be attended to; from a want of this, ſtudents are often diſſecting parts which they are not ſufficiently verſed in to manage, and the intention frequently perverted; it ſhould be conducted in the following way:—As the eaſieſt mode, and that which is of the leaſt conſequence, it is recommended to the pupil, firſt, attentively to diſſect the muſcles of the extremities, then thoſe of the other parts of the body; and when well acquainted with theſe, inquiry may be made into the ſituation, form, and ſtructure of the thoracic and abdominal viſcera; and afterwards he may proceed to trace the blood-veſſels, when njected, firſt, of the extremities, then the entire ſubject may be undertaken; but this work will require much time, care, and patience: after theſe, the ſtructure of the brain, and diſtribution of the nerves may be inveſtigated, and, laſtly, the lymphatic ſyſtem, &c.

As the dead body will vary more or

leſs,

leſs, from its healthy appearance, according to the diſeaſe which has occaſioned its death; it becomes neceſſary to make ſome inquiry on this head, eſpecially when anatomical proficiency is the object: it may be better diſpenſed with when the inſpection is undertaken ſolely to aſcertain the moſt immediate cauſe of fatality.

It has been believed, and ſome facts would prevail, even on the moſt ſceptical, to yield ſome aſſent to it; that the nature of the cauſe of the extinction of life ought to be inquired into by the Anatomiſt, previous to his opening the body; and that in ſome inſtances, where this has been neglected, the moſt diſagreeable and alarming conſequences have enſued. It has been argued by many, and thoſe too whoſe opinion will be found worthy of attention, that a general Acridity acquired by the body ſome conſiderable time after death, and which is loſt on its approximation to actual putreſcence, is the moſt common exciting means of producing thoſe ſymptoms which have ariſen when an accidental inciſion has been made through the cuticle of the diſſector; but the merit of this opinion, the author does not mean to enter into a diſcuſſion of: the inconvenience may however be prevented, by procuring bodies as recent as poſſible. Though real putridity may be eſteemed of leſs conſequence by ſome, yet it is ſtrongly recommended to the pupil, cautiouſly to avoid diſſecting bodies in ſuch a ſtate, as either on this, or the cauſe before mentioned, or from ſome general diſeaſe of the fluids, lymphatic indurations, abſceſs, and death, have frequently followed, when accidental inciſions have occurred; which is a ſtrong argument that ſome foreign and aſſimilating matter has co-operated with the wound.

A ſubject who has died of canine madneſs, it need ſcarcely be ſaid, ſhould never be diſſected, unleſs it may be for the important purpoſe of aſcertaining the nature and ſeat of the diſeaſe; by a knowledge of which,

which, it may hereafter be more ſucceſs-fully combated.

Inſtances have ſometimes occurred in dyſenteric caſes, where the accompanying fever has been of the putrid kind: the inflammatory affection of the colour becomes a proper ſubject of minute inveſtigation; but the danger of contracting contagion, is undoubtedly ſo great, as to be a ſtrong argument againſt it; and there is great reaſon to believe, that the diſſecting of putrid bodies, has produced Typhus and all its attendant evils.

The poſſibility of introducing Lues Venerea into the habit, in a ſimilar way, has not been without its advocates; if ſuch aſſertions have ariſen from the neceſſity to which ſome have been reduced, in order to preſerve a good name, and whoſe conduct on many occaſions, would juſtify ſuch a ſuppoſition, it renders it an uncertain ground of reaſoning; yet from the facility with which fluids are carried into the ſyſtem by means of the lymphatics, it is eaſy to ſuppoſe, that when morbid matter has been introdued under the cuticle, it may produce a correſponding diſeaſe; and when this has been the caſe, analogy would exact ſome faith in the opinion, and induce us to depend more on the narrations of caſes of this kind; ſo much ſo as to wave the diſſection of bodies infected with it; and this will be leſs a cauſe of regret, when it is conſidered, that it can be ſeldom neceſſary in theſe caſes, for an inveſtigation of the diſeaſe.

Scrophulous bodies, on many occaſions, being unfavourable for the purpoſes of Anatomy, particularly when the demonſtration of the natural ſtructure and uſes of glands is intended; as it cannot be ſo well made on a body, where ſtruma has made conſiderable ravage, it is apt to render ſome of the bones unfit for preparation, and in many inſtances, is uneligible for vaſcular preparations.

Such

Such are the caufes of death, which it behoves the Anatomift, either to inquire into, or detect, by his own fagacity, previous to entering on the important bufinefs of diffecting.

By an attention to fome other circumftances the employment may become ftill more agreeable. Neatnefs will be found productive of numerous benefits; keeping the fubject on a clean, dry cloth, is of no fmall importance; the cleannefs of the inftruments, and their prefervation from ruft; the early removal of every part that may be feparated from the body, as ufelefs, are circumftances that will be found of fome moment in diffections. Cleanlinefs, in fhort, is ftrongly recommended, as a means, and not the leaft efficient, of making the employment agreeable, and preferving health.

The moft favourable time for anatomical bufinefs is fo well known, that it feems unneceffary to fay, that as heat is very inconvenient

inconvenient from its prime agency in promoting putrefaction; the winter, or early part of the spring, is the most eligible season; for the body being then more easily preserved from putrefaction, is consequently less dangerous to the operator: at all times, however, it should be avoided having too many subjects in one room; the necessity of this precaution must be obvious, and it is hoped will be attended to.

Dissection becomes much more agreeable when students of similar industry unite in their pursuits; it is therefore recommended as the most successful method of acquiring and fixing anatomical knowledge, to select from the class, some whose assiduity has given them the credit of superior information, for their more particular companions: the advantages of such associates, it is needless to say, will be numerous; the example of their close attention must naturally produce similar exertions; their conversation will be instruc-

tive,

tive, and not a little contribute to render induſtry deſirable and pleaſing.

The laſt means to be noticed, has the ſingular advantage of not only facilitating the acquiſition of knowledge, but of ſtamping it ſo forcibly on the mind, that its impreſſion cannot be eaſily eraſed. Whatever objections may be brought againſt anatomical preparations, ſuch as the impoſſibility of communicating true ideas of the real ſituation, ſtructure, and natural appearance of parts, the value of morbid preparations is on all ſides granted; as by this means alone diſeaſes can be preſerved, their abſolute exiſtence proved, and by which they may be tranſmitted to others, who had not the opportunity of being preſent at the diſſection. Minute parts can only be rendered evident, and ſtructure, which is concealed when in a natural ſtate, be developed by the art of preparing. The making preparations, renders the extenſion of anatomical facts more eaſy, and will create ſuch an emula-

tion

tion amongſt young ſtudents, as well as ſettled practitioners, as muſt produce very eſſential benefits to the world at large. Good preparations are permanent certificates of induſtry and genius; they evince to ſpectators, what ſhare the important object of their welfare has had in the mind of the man, whom they may look to for relief in the hours of affliction: and to a ſcientific mind, what can be more grateful, what an higher feaſt, than to dive into nature's ſecrets, to explore her wonderfully wiſe and beneficent œconomy admirably diſplayed in the animal machine?—What can more invite the inquiſitive genius, than a proſpect of proficiency in a ſcience already a ſource of important benefits to mankind?—What can more amply reward his toils, than the conſideration that he is an inſtrument in the hand of the great Author of creation, to leſſen the ſum of human miſery?

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ANATOMICAL INSTRUCTOR.

COLOURED INJECTIONS.

ARTICLE I.

Compoſition and Qualities of Coloured Injection.

IT is, at all times, neceſſary that the compoſition, called Injection, ſhould have certain properties to anſwer the purpoſes for which it is deſigned. In the firſt place, it ſhould be liquified by a degree of heat leſs than the boiling point, that it may not deſtroy the texture of the veſſels it is intended to fill; and, in the next place, it it ſhould become ſolid, when deprived of that heat, and reduced to the ordinary temperature of the atmoſphere, yet not ſo ſolid but that it may be bent in every direction without breaking: theſe obſervations apply to Injection uſed for any other purpoſe than that of corroded preparations; for the coats of the veſſels, when dry, give an additional ſtrength to the body of Injection they contain: but in corroded preparations, the coats of the veſſels, as well as the ſurrounding ſubſtance, being deſtroyed by the acid, a more ſolid Injection is required, otherwiſe, the preparations, when finiſhed, will not ſupport their own weight, eſpecially in warm weather, and thus the intention of the Anatomiſt will be defeated.

The ſeveral Injections commonly uſed for anatomical purpoſes, are four in number, viz. coarſe, fine, minute, and mercurial: the three firſt of which may be variouſly coloured, according to the inclination or purpoſe of the Anatomiſt:—for the compoſition

ſition of theſe, ſee the Formulæ. The coarſe, is commonly uſed for entire ſubjects, or extremities, and all large veſſels, where it is not neceſſary to fill the minute branches; the fine Injection is uſed to fill the ſmaller branches of the principal veſſels, a portion of which is thrown in firſt, and, immediately after, followed by the coarſe; which forces the former into the finer branches, and is more favourable for an elegant diſplay of thoſe, not too ſmall to be expoſed by diſſection.

The two firſt compoſitions, by frequently being melted over the fire, loſe a part of their fluidity, and the maſs becomes too hard and brittle; it will, therefore, be neceſſary to add, diſcretionally, a little more turpentine varniſh, which reſtores its flexibility. To judge when a ſufficient quantity is added, a little of the Injection may be dropped into a veſſel of cold water, and, when quite cold, it ſhould be tried with the fingers whether it is then ſo flexible as to be bent repeatedly without breaking;

breaking: this is the only criterion of its proper consistence.

The minute Injection is for the purpose of filling the smallest ramifications of the vessels, to give the cutis, or other parts, their natural colour, or to shew their extreme vascularity; afterwards, these preparations are to be preserved in spirits of wine, oil of turpentine, or by drying and varnishing, as hereafter described under their proper heads:—the necessary remarks on quicksilver, as a substance for injecting, will be given in their proper place.

Some have used tallow as the principal ingredient of Injection, on account of its fluidity and readiness to mix with a great variety of colours; but there are two material objections to it,—its brittleness, and its not retaining the colour given to it; on which account, it is now seldom, if ever, used for a coloured Injection.

The

The ſeveral colours, red, yellow, green, blue, black, and white, are, generally, employed in Injeƈtions; they ſhould be perfeƈtly opaque, ſpecifically light, have great brightneſs, be unchanged by the inferior degrees of heat, and, during the liquefaƈtion of the compoſition, have no diſpoſition to froth. Though neither of theſe colours poſſeſs all the above qualities, yet they are the leaſt exceptionable of any we are at preſent acquainted with.

No greater degree of heat ſhould be applied to Injeƈtions than is juſt ſufficient to give them their higheſt degree of fluidity, otherwiſe the colour will be changed, and the coats of the veſſels injured.

All the coloured Injeƈtions ſhould be melted in earthen pots, and ſtirred with a wooden inſtrument, in ſhape of a marble peſtle, by which the colouring powder may be prevented colleƈting into lumps; each pot ſhould have an inſtrument of this kind, otherwiſe, by ſhifting the ſame from one colour to another, their beauty will be materially affected.

ARTICLE II.

General Observations on Injecting with Coloured Fluids.

THOUGH instructions may be given, to facilitate the acquisition of this art; yet they will be found insufficient for the dexterous performance of its operations; a moderate share of experience can alone remove the difficulties, which result from the want of it. The truth of these sentiments will be better understood by the young practical Anatomist, after he has met with a few disappointments to his sanguine expectations, by the unexpected destruction of some preparations, which are the objects of his first experiments: for this he must prepare himself with an inflexable resolution and uniform patience.

In

In preparing for injecting any anatomical preparation, great care ſhould be taken to have every thing in readineſs, as the want of ſome one trifling thing will, now and then, fruſtrate the whole proceſs, and, perhaps, ruin a valuable preparation. A proper quantity of hot water to thoroughly heat the preparation; a fire ſufficient to melt the Injections of the ſeveral colours intended to be uſed; as large a quantity of Injection prepared as will be neceſſary, and of proper conſiſtence, are the circumſtances firſt to be attended to. The ſyringe ſhould be hot, but not ſo as to deſtroy the valves: the pipes ſhould be previouſly cleared out, and ſecurely fixed in the veſſels. Every thing being ready for the operation, the ſeveral pots of Injection are to be placed near the ſubject to be injected; an aſſiſtant ſhould then hold the pipe thus fixed in the veſſel, ſo that the operator may expeditiouſly introduce the point of his ſyringe, when filled with Injection, and always obſerving in filling the ſyringe, to put the point to the bottom

 of

of the pot, to avoid drawing in air; and it is beſt to fill and empty it once or twice before we proceed to inject; when filled, convey the point of it into the pipe held by the aſſiſtant, then the operator ſhould take the pipe between the fingers of his left hand, and depreſs the piſton with his right, ſo as to force the fluid into the veſſels with freedom, till they are nearly filled, which he will be ſenſible of, by an increaſing reſiſtance to its paſſage; and, leſt the reſiſtance ſhould be in the ſyringe, he ſhould move the piſton by a ſcrewing motion, when, ſometimes he will find, he may proceed a little further with ſafety; after a prudent force has been applied for a ſhort time, he is to remove his ſyringe, and force the remaining Injection into the pot he took it from, and the aſſiſtant ſhould always be ready, immediately to ſtop the pipe with a cork, or plug made of tow, twiſted into a proper form for the purpoſe, to prevent the return of the Injection from the veſſel. If there are ſeveral veſſels to be injected with different colours, as arteries, veins, excretory ducts, &c. the mode of injecting each, is ſimilar to the firſt.

It is impoſſible to aſcertain the exact force, with which the piſton of the ſyringe ſhould be preſſed in the act of Injecting: it varying greatly, under different circumſtances; the force which is requiſite to inject ſome veſſels, would rupture and deſtroy others.—Arteries, in general, will ſuſtain greater preſſure than veins, and either of them will ſuſtain leſs if they are weakened by any degree of putrefaction.

When a large ſyſtem of veſſels is to be injected by a large pipe, the Injection may be thrown in boldly at firſt, but when there is reaſon to expect, that it is nearly filled, the piſton ſhould be moved with greater caution, and the reſiſtance afforded to the paſſage of the fluid carefully attended to, or elſe the veſſels will probably be ruptured; when this happens, the operator is ſenſible of it by the feel; for the reſiſtance to the

the paſſage of the Injection, is immediately taken off, and the fluid paſſes with the greateſt facility; it then will be in vain making any further attempt to fill the veſſels, unleſs ſuch rupture happens where the part may be ſecured by the finger and thumb of an aſſiſtant, or by a ligature, unleſs it is very ſmall, or happens in a part where but little of the Injection can eſcape. Another inconvenience may ariſe from the veſſels being over diſtended, even where no rupture happens, more eſpecially in the arteries, which though it is not of equal importance with the former, will be better avoided; that is, when they are thus preternaturally diſtended, they become elongated, and thrown into a ſerpentine form, which is apt to give a wrong idea of their natural appearance.

When injecting through a very ſmall pipe, the Injection will paſs proportionably ſlow, as the reſiſtance to the paſſage of the fluid will, of courſe, be greater; this reſiſtance, from not conſidering the cauſe, has

has been ſuppoſed by ſome, not much experienced in the art, to be owing to an entire obſtruction in the pipe, and thence they have deſiſted from forcing the piſton, whilſt the Injection was paſſing with as much freedom as the pipe would admit, and only required a little more time to fill the veſſels completely, and this circumſtance ſhould always be kept in remembrance, when ſmall pipes are uſed.

If the part to be prepared is bulky, and the veſſels not ſo ſuperficial as to be eaſily chilled, as entire ſubjects, large extremities, &c. it may be taken out of the hot water, and laid on a table, or in a diſh; but if it is thin and membranous, or the veſſels paſs near the ſurface, the contact of cold air, or the coldneſs of the table, &c. on which it is laid, would be in danger of chilling the Injection in its paſſage, and greatly injure the preparation, and therefore ſhould always be injected in hot water.

EXPLANATION

EXPLANATION OF PLATE I.

Repreſenting the Braſs Syringe, with its ſeveral Appendages, for injecting with Coloured Fluids.

Fig. 1. The ſyringe complete, conſiſting of ſeveral parts, ſuppoſed to be properly joined and fitted for uſe, viz.

A. The barrel.

B. The piſton.

C. The head of the ſyringe, which ſcrews on to the top of the barrel.

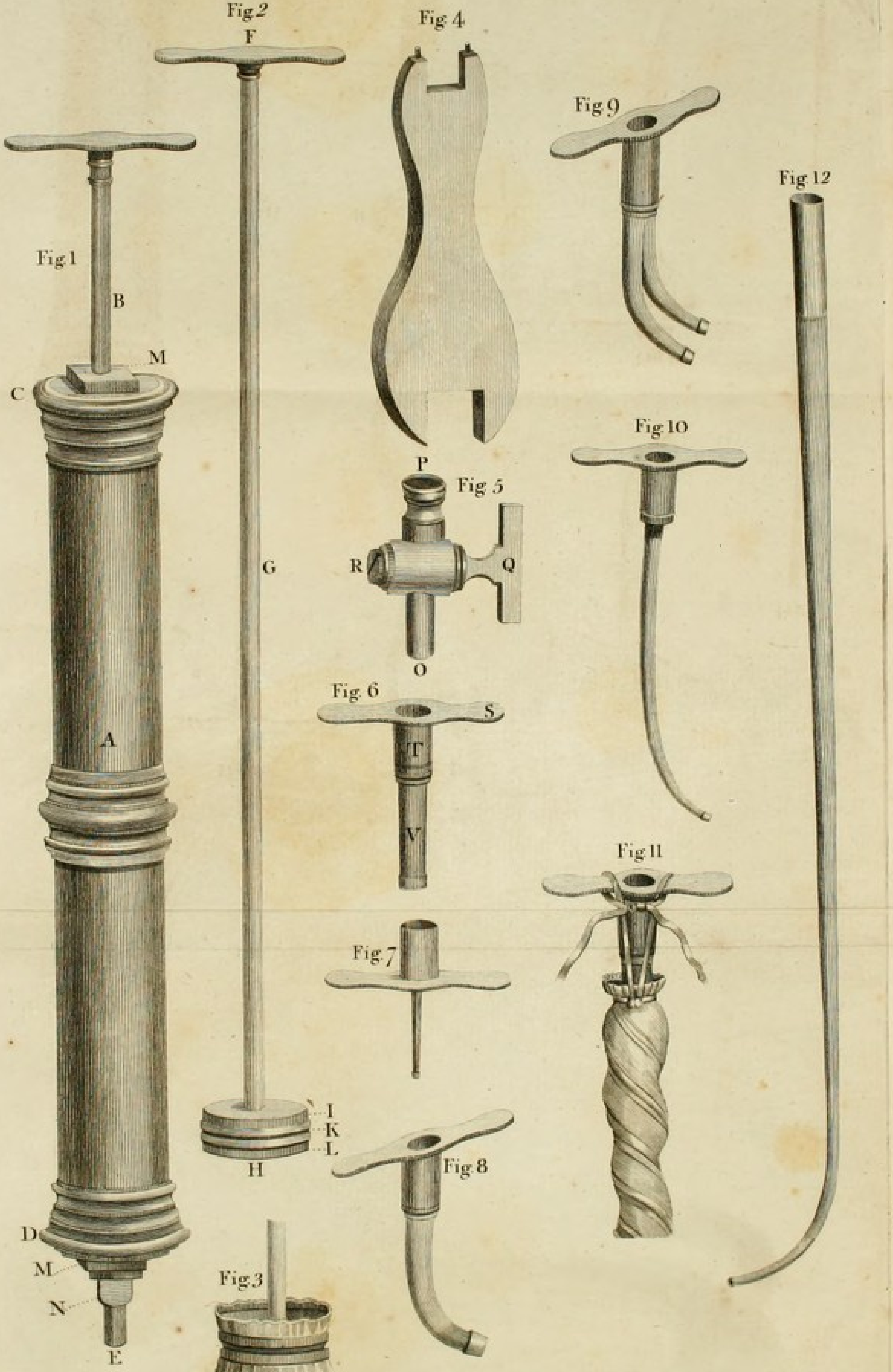
D. The bottom of the ſyringe, which ſcrews on to the bottom of the barrel, in like manner with the head.

E. The point of the ſyringe, which ſcrews into the bottom; this is a tube, to which the bore of all the pipes are adapted, and in the act of Injecting, it is introduced into the pipe.

Fig. 2. The piſton of the ſyringe, taken out of the barrel, to ſhew its ſeveral parts, viz.

F. The Handle.

G. The



T. Pole delin.

W. Darton & Co. sc.

G. The rod.

H. The bottom, conſiſting of three blocks, united to the rod by a ſcrew.

I. The uppermoſt block with a plain edge.

K. The middle block has a grooved edge, is of a larger diameter than the other two, and is adapted to the bore of the barrel of the ſyringe; its groove is for the purpoſe of retaining oil, as a reſervoir to preſerve the free motion of the piſton.

L. The loweſt block, ſimilar to the uppermoſt, and of the ſame diameter, having in its lower ſurface two ſmall holes, to receive the ſteel pins in the key, for the purpoſe of ſcrewing it on or off the rod. The uppermoſt and loweſt blocks are leſs in diameter, to allow room for the two valves.

Fig. 3. Repreſents the bottom of the piſton with the valves, which are made of circular pieces of ſoft waſh-leather, dipped in olive oil, with a hole in the centre, through which paſſes the end of the rod.

The manner of fixing which is as follows: —Firſt, ſcrew on the uppermoſt block on the rod, as far as it will go; then put on one of the leather valves, conſiſting of one or more pieces of leather, as the bore of the ſyringe may require; then ſcrew on the middle block, after which introduce the piſton at the top of the open barrel of the ſyringe, with the edges of the valves turned towards the handle; then force the piſton to the bottom, which, being alſo open, gives an opportunity to put on the lower valve, which is to be confined in its ſituation by firmly ſcrewing on the lowermoſt block by means of the key; the edges of this valve ſhould not be left longer than neceſſary, as it will prevent the lower block of the piſton from going completely down upon the bottom of the ſyringe, which would be a means of retaining ſome of the Injection, and thereby mixing the different colours. Being thus fixed, draw the piſton upward, by which the edges of the lower valve will be turned downward; then ſcrew on the bottom and top of the

ſyringe

ſyringe very cloſely by means of the key; and after moving the piſton a few times up and down in the barrel, try the accuracy of the valves in the following way:—firſt, hold the bottom of the ſyringe with the left hand, and ſtop the point with the fore finger, to prevent the admiſſion of air; then with the right hand draw the piſton up to the top, and ſuddenly let go the handle, when the external air ſhould preſs the piſton completely to the bottom; this is a ſufficient proof that the upper valve is air-tight; then fill the ſyringe with air by drawing the piſton to the top, while the point is open for its admiſſion; place the finger on the point to prevent its eſcape, and forcibly depreſs the piſton; then ſuddenly taking off the hand, the elaſticity of the compreſſed air ſhould raiſe it to the top, making ſome little allowance for the reſiſtance which may ariſe from the fruition of the piſton in the barrel: this is a proof that the lower valve is ſufficiently air-tight, and the inſtrument fit for uſe.

Fig. 4. The braſs key, which is made of conſiderable thickneſs to give it ſtrength; it has a ſquare notch in each end, the larger of which is adapted to receive the ſquare block on the top, and bottom of the ſyringe (M M).—The ſmaller notch is intended to receive the ſmaller block in the bottom of the ſyringe (N).—This key anſwers the purpoſe of a winch, by which we may eaſily apply what force is neceſſary to turn the ſcrews. At the extremities of the ſmaller end of the key, are two ſteel pins; theſe are adapted to two holes in the bottom of the lower block of the piſton, into which they are placed, for the more readily ſcrewing it on or off in altering and repairing the valves.

Fig. 5. A cock, for the purpoſe of retaining in the blood-veſſels, the Injection they have received, whilſt the ſyringe is removed, in caſe of injecting a large ſubject, where ſeveral ſyringes full will be required; the ſmaller and lower extremity (O) is inſerted into the top of the injecting pipe when fixed in the veſſel, repreſented in *fig.* 11, and for the purpoſe of throwing in the Injection, the point of the ſyringe is to be introduced into the upper end of the tube of the cock (P), and when the ſyringe is diſcharged of its contents, turn the handle (Q) in a tranſverſe direction to the tube which will prevent the eſcape of the injected fluid, until the ſyringe is filled and introduced at the top as before; then turn the handle again, and repeat the Injection as often as may be requiſite. The plug is faſtened in its ſituation by means of a ſcrew (R), for the purpoſe of taking it apart at any time, if found neceſſary, to clean or oil it.

Fig. 6. An injecting pipe of the largeſt ſize, in proportion to the ſize of the ſyringe.

S. The finger piece.

T. The barrel.

V. The point.

Theſe pipes ſhould always be made of one ſolid piece of braſs, and the finger piece not ſoldered on to the barrel, as they will

will be liable to ſeparate when the heat of the fire is applied to melt out the Injection, which, though it may be done in a hurry, yet ſhould not be made a conſtant practice of; as boiling them in water is a much more agreeable, and leſs deſtructive method of cleaning them. Near the extremity of the point is a ſmall ſhoulder, to prevent its ſlipping out of the veſſel when the ligature is applied.

Fig. 7. The ſmalleſt ſized injecting pipe with the barrel above the finger piece: this is the mode in which the ſmall pipes are frequently made, but I do not know any peculiar advantage in it.

Fig. 8. A large ſized curved pipe, commonly called Aorta-pipe, being principally uſed for injecting the entire ſubject, where it is introduced into the Aorta aſcendens through an inciſion in the left ventricle of the heart. The advantage of its curvature is, that the extremity of the pipe pointing horizontally or laterally, it admits of of a favourable poſition to introduce the point of the ſyringe.

Fig. 9. A double injecting curved pipe. The advantage of having two points, is in order to inject two veſſels running near each other, at the ſame time, with the ſame coloured Injection, but they are ſeldom uſed except for injecting the head by the two carotid arteries, and the two jugulars; but, for the arteries, the points ſhould be made ſmaller than is repreſented in the plate.

Fig. 10. A long curved pipe, for the purpoſe of injecting veſſels, the orifices of which are out of the reach of the common pipes, as is the caſe with the coronary arteries and veins of the heart, where we have to convey the point of the pipe, a conſiderable diſtance through a larger veſſel, to the veſſel we wiſh to inject; and, as it is more particularly intended for this preparation, may be called the coronary pipe.

Fig.

Fig. 11. Repreſents a pipe fixed in the vein of an umbilical chord, to ſhew the manner in which the ligature is applied, to prevent the eſcape of the Injection, and ſecure the pipe in its ſituation; if the ligature is not brought over the finger-piece of the pipe before the ſecond faſtening is made, as here repreſented, it will generally ſlip out of the veſſel.

Fig. 12. A braſs blow pipe, ſometimes uſed to inflate the veſſels in order to find their orifices, which is frequently attended with difficulty from their lying perfectly collapſed among cellular membrane; it will often be found uſeful to inflate the veſſels of detached parts of Anatomy, to diſcover and ſecure any outlets where the Injection might otherwiſe eſcape; but theſe outlets will be more eaſily diſcovered if inflated under water, than any other way: the end of the pipe which is applied to the mouth ſhould be ſilvered, to prevent any unpleaſant braſſy taſte.

ARTICLE III.

Formulæ for Coarse Injections.

RED.

YELLOW bees wax, sixteen ounces;
White resin [a], eight ounces;
Turpentine varnish, six ounces [b];
Vermillion [c], three ounces.

[a] What is here called white resin, may with equal propriety be called yellow; it is only intended to recommend the whitest that can be procured.

[b] The turpentine varnish is here always directed by measure, the other ingredients by weight.

[c] Carmine possesses more completely the qualities requisite for a colour of Injection, than vermillion; but the price forbids its entering into these compositions.

Firſt liquify the wax, reſin, and turpentine varniſh over a ſlow fire, in an earthen pot; then add the vermillion, previouſly mixing it in another pot, with a very ſmall quantity of the liquified compoſition, and ſtirring it well with a wooden peſtle, ſo that the colouring ingredients may be intimately and ſmoothly blended; then add, by degrees, the whole of the ingredients, and when they have acquired their due heat, by being placed again over the fire, the Injection will be fit for immediate uſe.—Theſe rules are to be obſerved in preparing all the following Injections.

YELLOW.

Yellow bees wax, ſixteen ounces;
White reſin, eight ounces;
Turpentine varniſh, ſix ounces;
King's yellow, two ounces and a half.

WHITE.

Fine white bees wax, ſixteen ounces;
White reſin, eight ounces;

Turpentine

Turpentine varniſh, ſix ounces;
Beſt flake-white[d], five ounces and a half.

PALE BLUE.

White bees wax, ſixteen ounces;
White reſin, eight ounces;
Turpentine varniſh, ſix ounces;
Beſt flake-white, three ounces and a half.
Fine blue ſmalt[e], three ounces and a half.

DARK BLUE.

White bees wax, ſixteen ounces;
White reſin, eight ounces;
Turpentine varniſh, ſix ounces;
Blue verditer, ten ounces and a half.

[d] Flake-white, as uſually ſold in the ſhops, is very unfit for theſe purpoſes, being adulterated with ſtarch, or common whiting.

[e] Fine blue ſmalt is ſold in moſt colour-ſhops, under the name of powder-blue, and in general ſufficiently well prepared.

BLACK.

Yellow bees wax, ſixteen ounces ;
White reſin, eight ounces ;
Turpentine varniſh, ſix ounces ;
Lamp-black [f], one ounce.

GREEN.

Yellow bees wax, ſixteen ounces ;
White reſin, eight ounces ;
Turpentine varniſh, ſix ounces ;
Cryſtallized verdigriſe [g], four ounces and a half ;
Beſt flake-white, one ounce and a half ;
Gamboge, one ounce.

If

[f] Lamp-black has ſometimes a quantity of ſand mixed with it, to increaſe its weight, for the advantage of the ſeller ; it ſhould not be uſed in this ſtate ; or if it cannot be obtained pure, a little more than the proportion above ordered ſhould be uſed, to allow for the deception, which the ſand occaſions, in reſpect to weight ; when the compoſition is prepared, let the ſand ſubſide, and pour off the pure part for uſe.

[g] Conſiderable caution ſhould be uſed in mixing this ingredient with the liquified compoſition, to prevent its

If a quantity of the ingredients of this Injection is kept prepared, without any colour, it will be more convenient for thoſe who are in the frequent practice of making anatomical preparations; being readily ſeparated into ſmall quantities, the different colours may be added in their proper proportions, agreeable to the wiſh of the Anatomiſt.

The cryſtallized verdigriſe and gamboge not being ſold in the ſhops in a ſtate of levigation, particular care ſhould be taken that theſe are finely prepared; the other colours, recommended in this article, are generally ſold in a ſtate fit for the purpoſe.

its boiling over; the heat applied ſhould be moderate, and the beſt method is to mix it with a ſmall quantity of the compoſition, on a tile or marble ſlab, with a bolus knife; and the whole added gradually to the remainder of the compoſition, after which give it the requiſite heat cautiouſly.

ARTICLE

ARTICLE IV.

Formulæ for Fine Injections.

THE rules given for mixing the colours with the liquified compoſition, in the preceding article, are to be followed in every formula of this; and though the following ingredients are much more fluid than the former, they ſhould, notwithſtanding, poſſeſs the ſame degree of heat, that the Injection may paſs into the capillary veſſels with ſreedom, and not chill the coarſe Injection which is immediately to follow it.

RED.

Brown ſpirit varniſh [h],

[h] The varniſhes, mentioned in this article, are by meaſure.

White

White ſpirit varniſh, of each, four ounces[i];
Turpentine varniſh, one ounce;
Vermillion, one ounce.

YELLOW.

Brown ſpirit varniſh,
White ſpirit varniſh, of each four ounces;
Turpentine varniſh, one ounce;
King's yellow, one ounce and a quarter.

WHITE.

Brown ſpirit varniſh,
White ſpirit varniſh, of each four ounces;
Turpentine varniſh, one ounce;
Beſt flake-white, two ounces.

LIGHT BLUE.

Brown ſpirit varniſh,
White ſpirit varniſh, of each four ounces;

[i] Theſe varniſhes are commonly ſold in the colour-ſhops.

Turpentine varnifh, one ounce;
Fine blue fmalt, one ounce and a half;
Beft flake-white, one ounce and a quarter.

DARK BLUE.

Brown fpirit varnifh,
White fpirit varnifh, of each four ounces;
Turpentine varnifh, one ounce;
Blue verditer, four ounces.

BLACK.

Brown fpirit varnifh,
White fpirit varnifh, of each four ounces;
Turpentine varnifh, one ounce;
Lamp-black, half an ounce.

The green Injection is omitted here, the verdigrife being a faline fubftance, will not mix with the fpirit varnifhes.

ARTICLE

ARTICLE V.

Formulæ for Minute Injections.

THE Size which conſtitutes the principal part of theſe formulæ is made in the following manner.

Take the fineſt and moſt tranſparent glue, one pound, break it into pieces about the ſize of a nutmeg; put it into an earthen pot, and pour on it three pints of cold water, let it ſtand twenty-four hours; ſtirring it now and then with a ſtick; then ſet it over a ſlow fire for half an hour, or until all the pieces are perfectly diſſolved; ſkim off the frothy part from the ſurface, and ſtrain it through a fine canvaſs cloth, or, what is better, a flannel; it will then be fit for the addition of the colouring ingredients.

Some make their Injecting-Size with Iſinglaſs, but I am not acquainted with any advantages it has over the glue; excepting, that in the white Injection, it may admit of a greater delicacy of colour, but being much dearer, it is not ſo generally uſed as the glue. The cuttings of parchment alſo make a more delicate Size than glue. Theſe are merely mentioned for ſuch who may chooſe to uſe them by way of experiment, or otherwiſe. Whichever is uſed, the quantity of the colouring ingredients ſhould be in the ſame proportion.

RED.

Size, one pint;
Vermillion, three ounces and a half.

YELLOW.

Size, one pint;
King's yellow, two ounces and a half.

WHITE.

WHITE.

Size, one pint;
Beſt flake-white, three ounces and a half.

BLUE.

Size, one pint;
Fine blue ſmalt, ſix ounces.

GREEN.

Size, one pint;
Cryſtallized verdigriſe, two ounces;
Beſt flake-white,
Gamboge, of each eight ſcruples.

BLACK.

Size, one pint;
Lamp-black[k], one ounce.

[k] The lamp-black ſhould be moiſtened with a little ſpirits of wine, previous to its being mixed with the ſize, otherwiſe there is ſome difficulty in mixing it; but much ſpirit will coagulate the ſize.

It may not be an uſeleſs redundancy, once more to ſay, how requiſite it will be to take all poſſible care, to have the colours well levigated for theſe Injections, as the ſucceſs of every experiment made with them, depends principally upon this circumſtance; and without ſuch precaution, every purpoſe of the Anatomiſt will be defeated, even in the moſt experienced hands.

The minute Injection, in a moiſt ſtate, will keep but a very little while;—in hot weather, not more than a few days; for which reaſon there ſhould not be more made, at one time, than will be ſufficient for the preſent purpoſe.

The only way to preſerve it, is to ſuffer it to get perfectly cold, then cut it into ſlices of about half an inch in thickneſs, and dry it in a current of cold air: or it may be, whilſt hot, poured into earthen plates to about the ſame thickneſs, and dried as before. It will be

neceſſary

neceſſary previouſly to rub the plate with an oiled cloth, to prevent the Injection from ſticking: when thus dried, it may be kept for any length of time; and to prepare it again for uſe, it is to be broken to pieces, and managed as directed in the firſt part of this article, for making the Injecting Size.

ARTICLE VI.

Injecting the Blood-Veſſels with Coloured[1] Fluids.

THE Arteries having no valves, excepting where they make their exit from the heart, are very favourable for Injecting; and as it ſeems to be the

[1] The terms Coloured Fluids, or Coloured Injections, are uſed to diſtinguiſh them from the mercurial, which cannot be coloured by any mode yet diſcovered.

laſt

laſt act of life to contract theſe veſſels, we always find them entirely emptied of the blood, and have the choice to inject them in what direction we pleaſe, either according to, or againſt, the courſe of circulation; but no doubt we ſhall prefer the former; from the larger, into the ſmaller branches.

Veins in general are unfavourable for Injecting, on account of the valves, which prevent any fluid paſſing in a direction contrary to the natural courſe of circulation, and in them are almoſt univerſal; therefore, we are under the neceſſity of injecting from the ſmaller veſſels, which, conſequently, cannot be leſs than will admit the ſmalleſt pipe: on this account we are prevented making ſo minute and beautiful an Injection of the veins as may be made of the arteries. Yet this inconvenience does not exiſt in all parts of the body, for ſome veins, having no valves, admit as minute and beautiful a diſplay as the arteries.—Amongſt theſe

may

may be ranked the Uterus, Kidneys, Liver, Lungs, Spleen, Pancreas, Mefentery, Coronary Veins on the furface of the heart, the internal veins of the head, Placenta;—in fhort, all the Thoracic and Abdominal Vifcera, are without Valves.

As the Veins are always more or lefs obftructed by the blood impelled into them from the arteries in the laft functions of life, they fhould be wafhed out by injecting warm water feveral times through them; this may be conveniently done in extremities feparated from the trunk of the body, where the largeft part of the vein is cut off, and forms a free out-let to the water; but, where it can have no fuch exit, it cannot be conveniently done.

In fome inftances, the minute Injection thrown into the arteries, will return freely by the veins; and where this happens, they will, of courfe, be as minutely injected as the arteries.

In

In injecting with quickfilver, this circumftance more frequently happens, an inftance of which is feen in filling the veffels of the hand[m].

ARTICLE VII.

Injecting, Diffecting, &c. an entire Subject, to trace and exhibit the Arteries.

FOR this purpofe, adult fubjects are feldom ufed, on account of the difficulty in completely filling the veffels with Injection; the time and labour that is neceffary to diffect and prepare them; the length of time they would take in drying; the proportionate hazard of their being injured by putrefaction; the expence which attends the injecting, var-

[m] See the article upon injecting the hand with quickfilver.

nishing, and casing them, when finished; the inconvenience of handling and turning about so large a subject, to inspect the course of vessels on future occasions, &c. Therefore, the bodies chosen for what are generally termed blood-vessel subjects, are, from the earliest infancy, to about the age of fourteen years; and a thin emaciated subject should always be preferred, as it takes much less labour in the dissection, and does not retain, when dry, any of that disagreeable greasiness on the surface, which is so frequent where there is much adeps, as we commonly find under the cutis of children. If the subject is anasarcous, the cellular membrane will dry with greater transparency, and hence is favourable for this purpose.

To inject the whole arterial system, there must first be made an incision through the integuments, the whole length of the sternum, then with a saw divide the sternum longitudinally into two equal parts; introduce a dissecting knife under the divided bone on each ſide, ſeparate it from the mediaſtinum, and lay open the thorax, by bending back the two portions of the ſternum and cartilages; an inciſion is to be then made into the pericardium and left ventricle of the heart, through the latter of theſe the curved, or aorta pipe (ſee Plate I. fig. 8) is to be introduced into the aorta aſcendens, and ſecured by a ligature made on the veſſel (ſee Plate I. fig. 11); then proceed to heat the body by immerſing it in hot water, and inject according to the rules preſcribed in Article II. When the veſſels are injected, lay the body in cold water, with the face downwards; the intention of this is, that the Injection ſhould be chilled as ſoon as poſſible, to prevent the colouring matter from ſubſiding partially to the ſides of the veſſels, and that if the Injection ſhould remain long enough in a fluid ſtate, the colour may be depoſited in the anterior part of the veſſels.

The next part of the proceſs is the diſſection,

tion, and the uſual method of conducting it, is firſt to open the abdomen, from the inciſion already made in the thorax, longitudinally to the pubis; then remove the abdominal and thoracic viſcera in the following manner:—The ſtomach and inteſtines, by cutting the meſentery cloſe to the latter, ſo as to leave the meſenteric arteries as long as poſſible; the liver is to be next carefully diſſected away, leaving as many of the ramifications of the hepatic artery as may be conveniently done; and the kidneys may be removed in the ſame way, though ſometimes they are dried entire in the ſubject; the ſpleen will, of courſe, be removed with the ſtomach; all the veſſels left in the abdomen ſhould be carefully freed from the ſurrounding cellular membrane, adeps, and peritoneum, that they may be rendered as viſible as poſſible. The urinary bladder is ſometimes (more particularly in the male) inflated and preſerved in its natural ſituation; the rectum, cellular membrane, &c. ſhould be removed from the pelvis, and the internal pudendal artery (of confe-quence, in the operation of Lithotomy) brought into view, running on the inner fide of the branch of the ifchium. Care fhould be taken in diffecting the abdominal vifcera, to preferve the fpermatic arteries, a very flender veffel coming off from the aorta, in general, a little below the emulgents, and are continued downward, through the abdominal ring to the teftes. In the female they run to the broad ligaments of the uterus. The thoracic vifcera will be removed with much lefs difficulty and labour than the abdominal, as this cavity contains only the heart, lungs, and œfophagus. The heart and lungs, in the common way of fixing the pipe, receive no Injection, and are therefore to be entirely removed, as alfo the œfophagus[n]. The fame idea is to be purfued in clearing the thoracic veffels as the abdominal, to render them as confpicuous as poffible; and to free the inter-

[n] The heart and pulmonary veffels injected and preferved in fitu, will be the fubject of another article.

coftal

coſtal veſſels from the obſcurity occaſioned by the ſurrounding adeps and pleura; theſe ſhould be entirely ſtripped off.

The divided ſternum is uſually bent back on each ſide, to ſhew the internal mammary arteries, coming off from the ſubclavians; for this purpoſe, the cartilages of the ribs ſhould be cut partly through on the inſide, to ſuffer the ſternum to lay back as deſcribed. The ſubclavians, carotids, &c. going off from the arch of the aorta, ſhould be diſtinctly ſeen, and their ramifications traced over the head; in doing which great care, time, and patience, are neceſſary to make a good preparation. The cutis ſhould be carefully raiſed, making it an invariable rule, never to raiſe more on this, or any other part of the body, than, from time to time, may be neceſſary for carrying on the diſſection, otherwiſe, the parts expoſed to the air will become dry, and difficult of diſſection. In removing the cutis, great care ſhould be taken to keep the edge of the knife cloſe to its inner ſurface.

In

In diſſecting the blood veſſels, they will ſufficiently guide the diſſector, if he traces them from the larger branches to their ramifications: to point out the courſe and ſituation of each, would far exceed the plan propoſed, and be a uſeleſs enlargement. The diſſecting ſciſſors and forceps are the inſtruments, with which moſt of this part of the diſſection is performed, after the cutis is raiſed. The cheeks and lips ſhould be kept in their natural form by placing inſide of the mouth a little tow or wool. In the next place, the extremities are to be diſſected;—firſt, the arm, by raiſing the integuments as before mentioned, and tracing the veſſels from the axilla to the extremities of the fingers; and in the lower extremities, from the groin to the toes; ſeparating and raiſing the muſcles carefully from each other, freeing the ſurfaces of them every where from the adeps and cellular membrane, but not to ſeparate any of them from their attachments; except in ſome parts of the body, where the courſe of the veſſels cannot be exhibited without it;

it; as on one ſide of the neck, the ſterno maſtoideus, and other muſcles, paſſing over the carotid artery and tranſverſe proceſſes of the vertebræ, may be removed, and the cervical artery traced from the ſubclavian, through the proceſſes to the occiput. The pectoral muſcles ſhould alſo be raiſed from the thorax, and turned back, to ſhew the axillary veſſels and external mammaries. The glutæi muſcles ſhould be elevated or partly removed, to ſhew ſome large branches going into them from the internal iliacs.—The cutis being removed from the poſterior part of the trunk, the muſcles on each ſide of the ſpinous proceſſes of the dorſal and lumbar vertebræ are to be taken away, without any regard to order of diſſecting, as it is merely to reduce the thickneſs of the part, and promote its drying in a leſs ſpace of time, ſo as to avoid putrefaction. The brain may be removed by an opening made in the cranium, as hereafter deſcribed, in the article for injecting and preparing the head for the blood veſſels.

The

The diffection being finifhed, the next circumftance to be attended to, is the fufpending the body (which fhould be done by a cord from the fummit of the cranium through a hole made for the purpofe) in fome fituation where there is a free current of cool air. The mufcles are then to be feparated to a moderate diftance from each other, and fupported by fmall pieces of wood, in a fituation which may be beft adapted to fhew the courfe of the veffels;—the great object of the preparation. The thorax and abdomen are in like manner to be kept open; in thus feparating the mufcles, thorax, and abdomen, regard fhould be had to the natural figure and fituation of parts, not to diftort them more than is neceffary to fhew the veffels. The mefenteric and other arteries entering the abdominal vifcera, are to be placed in proper pofitions. The legs and arms are to be put in fuch points of view as are moft favourable for fhewing the arteries of confequence in operations, or which we

may

may wiſh frequently to inſpect. The attitude moſt favourable for this purpoſe, and which occupies the leaſt room (a circumſtance deſirable to hoſpital ſtudents, who frequently convey preparations in caſes to remote parts of the country) is to elevate one arm with the hand over the head, the palm inclining forward; this poſition is moſt favourable for ſhewing the axillary veſſels, as well as the brachial, ulnar, radial, &c. The other arm may hang perpendicularly with the palm directly forward. The inferior extremities may be ſuffered to remain in their natural ſituation, as no benefit can be derived from ſo unnatural a ſeparation as is commonly given them; neither is there any advantage in ſeparating the fingers and toes in ſo diſagreeable a manner as many do.

Whilſt theſe preparations are drying, they ſhould be frequently attended to, to keep the parts in their proper poſitions. If, through unfavourable weather for drying, or by the ſubject having been long under diſſection, putrefaction ſhould take place, and a dark coloured clammy mucus exude from the ſurface of the muſcles, it may be waſhed off with ſoap-lees and a ſoft painter's bruſh. When the preparation is perfectly dry, it ſhould be varniſhed without delay.

ARTICLE VIII.

Injecting and Preparing the Head for the Blood-Veſſels, &c.

THE head being ſeparated from the body, by a tranſverſe ſection, about the ſixth or ſeventh vertebræ, the injecting it, is a ſimple and eaſy operation; for this purpoſe, a pipe ſhould be fixed in each carotid artery; or a double pipe may be uſed on this occaſion to throw the Injection into both at the ſame time. The jugular veins are alſo to be filled in like manner.

manner. The cervical arteries and veins ſhould be ſecured by ligatures, to prevent the eſcape of the Injection.

The arteries and veins are to be injected with different colours; for the former, red is uſually employed; and for the latter, yellow. The diſſection is to be performed according to the rules laid down in the preceding article. It will be neceſſary to remove, with a fine ſaw, a portion of the jaw bone, to ſhew the courſe of the internal carotids; the ſection may be made immediately poſterior to the laſt dens molaris; and on the ſame ſide, the muſcles, &c. ſhould be diſſected away between the tranſverſe proceſſes of the cervical vertebræ, to ſhew the courſe of the cervical artery aſcending perpendicularly through them: on the other ſide of the head, the muſcles ſhould only be raiſed, and cleared from all the ſurrounding adeps and cellular membrane; and ſo placed, as may beſt ſhew the courſe of all the veſſels.

The external parts of the head being finiſhed, various ſections may be made about the ſummit of the cranium to exhibit veſſels, ſinuſes, membranes, &c. of the internal part, according to the intention of the Anatomiſt : this is to be done with a ſaw, except the membranes, which may be divided by a knife or ſciſſors. Sometimes a perpendicular ſection is made about half an inch to the right, or left, of the ſagittal ſuture, and carried down to within about an inch of the orbit, anteriorly, and as far as the lambdoidal ſuture, poſteriorly ; then the ſaw paſſed horizontally through the upper edge of the temporal bone, ſo as to meet the extremities of the firſt ſection, by which an elliptic portion of the cranium will be removed ; ſometimes it is made on each ſide the ſagittal ſuture, by which the ſinuſes and proceſſes of the dura-mata, &c. will be ſeen in their natural ſituation when the brain is carefully waſhed away, being firſt cautiouſly broke down with the fingers. Sometimes a horizontal ſection is made through the whole ſummit of the cranium. But as uſeful a ſection as can be made to ſhew the internal parts, is perpendicularly through the whole head and cervical vertebræ, beginning about a quarter of an inch on one ſide of the ſagittal ſuture, juſt ſo as to eſcape the longitudinal ſinus, and ſeptum naſum; then incline the ſaw toward the centre of the foramen magnum, and through the middle of the vertebræ. The frontal ſinus may be laid open, by removing a portion of the external table, with a ſmall trephine. If the preparation is made merely for the external veſſels, then no ſection is required, and the brain may be extracted, in the following way:—make one or two perforations with a trephine, any where in the poſterior part of the cranium; break down the texture of the brain with a ſtick, extract a ſmall part, then pour in water, and ſtir it about ſo as to mix it with the brain, which will eaſily waſh away; the putting in of a few large ſhot with the water, and ſhaking them about in the manner of

waſhing

waſhing bottles, will greatly aſſiſt in deſtroying the brain and cleanſing the part.

ARTICLE IX.

Injecting Extremities for tracing by Diſſection, and exhibiting the Blood-Veſſels.

THE ſuperior extremities are to be removed from the trunk of the body, by raiſing the clavicle from the ſternum, and paſſing the knife under it to the articulation, including the greater part of the pectoral muſcle; thence diſſect under the ſcapula, ſo as to remove with the arm, the clavicle, ſcapula, and ſubſcapularis muſcle. The Injection is to be performed by fixing a pipe in the axillary artery, which is divided in ſeparating the arm from the thorax; and another in either

ther of the veins on the back of the hand; ſome chooſe to put a ſecond pipe into another of theſe veins, always as near the fingers as poſſible. The veins ſhould be waſhed out with water; the Injection is to be effected according to the general rules laid down in Article II. and at the time of the operation, an aſſiſtant ſhould ſtand ready to ſtop the Injection, as it flows out of the axillary vein, either by a looſe ligature previouſly placed round the veſſel, or by preſſure.

The lower extremities are to be ſeparated from the body, by firſt removing the contents of the abdomen, or, at leaſt, opening its cavity, ſo as to afford an opportunity to hold the inteſtines, &c. out of the way of the knife; then make a ſection through the ſymphiſis pubis, and the ligaments, connecting the illium and ſacrum, ſo as to remove with each, one ſide of the pelvis. The pipes for the purpoſe of Injection, are to be fixed, one in the iliac artery, and the other, in one of the veins of ſufficient ſize,

ſize, any where about the foot, and as near as poſſible to the toes. The diſſecting, drying, varniſhing, &c. are deſcribed in their proper Articles.

ARTICLE X.

Injecting the Blood-Veſſels of the Gravid Uterus, and preſerving the Preparation in Spirits.

THE Gravid Uterus may be injected either in its natural ſituation, or after it is removed from the body. In the firſt, the proceſs of injecting will be the ſame as for the arteries and veins of an entire ſubject: but, as it is not always deſirable to inject the whole ſubject, the uterus alone being the object of experiment, the Injection may run partially, by fixing the pipe for the arteries in the trunk of the aorta,

aorta, or what will be ſtill better*, in the ſpermatic arteries, generally coming off from the aorta below the emulgents, and entering the broad ligaments on each ſide of the uterus; and one in each hypogaſtric artery, entering juſt above the cervix uteri. For the veins, one is to be placed in each of the ſpermatic veins, accompanying the ſpermatic arteries, and another in each of the hypogaſtric veins, accompanying the hypogaſtric arteries, on each ſide. The arteries may be filled with red, and the veins with yellow. If the part is removed from the body, before any Injection is thrown in, all the divided veſſels ſhould be ſecured by ligature, to prevent its eſcape. An attention to this part of the proceſs is particularly neceſſary in theſe preparations, the veſſels being numerous and

* Since the printing of the preceding page, I have conſidered the impropriety of injecting the uterus by the aorta; not from a want of a natural communication of veſſels, but the diſtance the Injection would have to paſs, by which its force would be too much diminiſhed, to fill the uterine veſſels with tolerable minuteneſs.

 large.

large. The branches of the hypogaſtrics diſtributed on the vagina, will require peculiar care. The preparation being injected, the ſurrounding cellular membrane and adeps may be diſſected away, to render the veſſels as conſpicuous as poſſible. The ligamentum rotundum may alſo be diſſected, to ſhew the arteries and a vein running through it in a beautifully convoluted direction.

The further proceeding with the diſſection will vary according to the kind of preparation it is intended for:—If for a wet preparation, to ſhew the poſition, &c. of the child in utero, an oval portion of the uterus ſhould be removed oppoſite to that part where the placenta is attached, which may always be known by the group of large veſſels externally viſible; this ſection ſhould be ſufficiently large to give a full view of the fœtus, when a correſponding portion of the chorion and amnion is alſo removed; the liquor amnii is to be poured off, and the fœtus carefully cleanſed

cleanſed of the ſabaceous ſubſtance depoſited on the ſkin; then lay the preparation in water for a few days, changing it daily until the bloody colour is thoroughly extracted; then place it in a veſſel upon its ſide, with the open part of the uterus upward, and the fœtus in its moſt natural poſition; in this ſituation pour on a ſufficient quantity of ſpirits of wine to cover it; let it lay about eight or ten days to harden, after which it may be placed in a glaſs jar with clean ſpirits, properly ſuſpended, with the fundus uteri upward, and encloſed as uſual. The various little circumſtances in regard to the diſſection, which neceſſarily follow, may vary according to the purpoſe of the Anatomiſt; though not eaſily deſcribed, yet little or no difficulty will be found in ſupplying this deficiency.

ARTICLE XI.

Injecting and preparing Placentæ.

THE injecting a single Placenta is the most simple process of this kind of preparation.

They generally have only one vein, and two arteries in the umbilical chord; but sometimes more, as two veins and four arteries; the veins are always so large as to admit with ease a pipe of almost any size; the arteries are much less, and require pipes nearly of the smallest size; and some difficulty attends their introduction, by these vessels so contracting, as to greatly lessen their diameter, as well as from the lubricity of the gelatinous matter which surrounds them; but this difficulty is in a great measure avoided, by introducing

ducing the point of a diffecting fciffors, and flitting them down for about half an inch; then fpreading the artery open upon the left fore finger, and keeping it fo by preffure with the thumb, by which the pipe may be carried in without difficulty ;—a ligature fhould be paffed round each pipe with a needle, and fecured, as fhewn in Plate I. Fig. 11. but confiderable care is required in doing this, not to puncture the veffels, as thereby the Injection would efcape ; to avoid this I have only fixed a pipe into each artery, frequently feparated to a confiderable diftance by the interpofition of the vein, which in this cafe I have not regarded puncturing ; thus have firft injected the arteries, then by putting a pipe into the vein, and making the ligature below where the needle had probably wounded it, injected it afterwards. It will generally be found unneceffary to inject by both, or all the arteries, as the anaftomofing branches form fuch a communication, as to admit the Injection thrown into one artery to readily

readily fill the other; yet it is always proper to have two pipes fixed, in caſe they ſhould not thus communicate, or any other accident ſhould happen to one, that recourſe may be had to the other; whilſt injecting by one artery, the pipe in the other ſhould remain open until the Injection flows through it, and then immediately ſtopped by an aſſiſtant, yet ſo as not to interrupt the operation. The veins are moſt commonly in this, as well as in other preparations, injected with yellow, and the arteries with red. The veſſels ſhould always be previouſly waſhed, by injecting them ſeveral times with warm water; and a placenta for this purpoſe ſhould always be entire, both with reſpect to the membranes and the fleſhy part. The knots or coils frequently found in the funis, will not obſtruct the Injection.

The injecting double and other placentæ is done in the ſame manner, in reſpect to the proceſs; but a greater number of

colours

colours are required for diſtinguiſhing the ramifications of the ſeveral veſſels from each other.

The parenchyma, or fleſhy parts are then to be carefully diſſected from the veſſels by the ſciſſors and forceps. The gelatinous matter that ſurrounds the veſſels in the umbilical chord will always dry tranſparent, and need never be removed: the rough external membrane, or tunica decidua, ſhould be carefully peeled off from the other membranes, to render them more beautiful when dried. The preparation ſhould then be macerated in water for about twenty-four hours, to cleanſe it from all the blood; after which the membranes are to be carefully filled with wool, previouſly oiled, to prevent its ſticking to the preparation; in doing which, care ſhould be taken to put a ſufficient quantity under the umbilical chord, to keep it at a conſiderable diſtance from the membranes; the chord ſhould be coiled round the placenta within the

the membranes, imitating its poſition in utero; and the whole membranes diſtended ſo as to reſemble the form of the ovum. It often happens that the membranes are rent in various directions, ſo as to injure the preparation; this circumſtance (though it ought always to be guarded againſt) may be remedied, by ſpreading out their edges, and laying them over each other, ſo as to pin them together. After being diſtended, it ſhould be placed upon a cloth in a current of air, to dry as ſoon as poſſible, when the pins are to be carefully removed. The external membranes will very ſoon loſe their moiſture; but the funis, containing a much larger quantity, in proportion to its ſurface, and being deprived of the circulating air by the ſurrounding wool, not ſo ſoon: in order to haſten it, when the membranes are dried, a part of the wool may be removed to admit the air to the inſide, taking great care not to tear them, which is much more eaſily done now, than in their wet ſtate. To finiſh the preparation, nothing

more

more is neceſſary than to give it two coats of varniſh on each ſide, to increaſe its ſtrength and tranſparency; and when well managed, it is one of the moſt beautiful that is made, and ſhould be defended from injuries, by being kept in a glaſs caſe.

ARTICLE XII.

A dry Preparation of the Gravid Uterus, with or without the Blood-Veſſels injected.

A Dry preparation of the Gravid Uterus, and its appendages, may be made with or without the blood-veſſels injected; it is not very common, unleſs among the teachers of Anatomy or Midwifry. The uninjected uterus is eaſily prepared, when removed from the body with the fallopian tubes, ovaria, vagina, external labia, &c.

Firſt diſſect away the ſurrounding adeps and cellular membrane, make a ſimple inciſion longitudinally in the body of the uterus, and remove the whole ovum; then extract the bloody colour by maceration in water; afterwards fill the body of the uterus as full as poſſible with curled hair[p], and ſew up the divided parts; the vagina ſhould alſo be diſtended in the ſame way, but the fallopian tubes with cotton, which, on account of their ſmallneſs, require a ſofter material. The preparation ſhould be ſuſpended, or placed in the moſt natural poſition, in order for drying, and when completed, the hair and cotton being previouſly removed, it is to be done over with oil varniſh.

For making an injected preparation of theſe parts, ſee the rules laid down in Article X. page 53, reſpecting that part of the proceſs, previous to any other diſſection.

[p] Curled hair is that commonly uſed for ſtuffing the ſeats of chairs, and may be had at the Upholſterers.

ARTICLE

ARTICLE XIII.

Injecting and preparing the Heart in Situ with the Head, adjacent Blood-Veſſels, and Thoracic Duct.

A Heart for this purpoſe ſhould be choſen as free as poſſible from fat: this is more frequently the caſe in young than in old ſubjects. Inexperienced ſtudents will often fix upon an old emaciated body, with a view to procure a heart without adeps; but they are generally miſtaken: it is neceſſary that pupils, engaged in making anatomical preparations, ſhould bear in mind the following circumſtance, that the adeps of young, growing animals, is, for the moſt part, placed exterior to the muſcles, but in the aged, is removed to the internal parts, and depoſited on the thoracic and abdominal viſcera.

First make a longitudinal incifion through the integuments from the trachea, to the extremity of the enfiform cartilage, and then with a faw divide the fternum in the fame direction; detach the clavicle from it, and lay open the thorax, by bending back the divided portions, firft diffecting them from the mediaftinum, and cutting the infide of the cartilages partly through, about three inches from the fternum, taking care not to divide the mammary artery, coming from the fubclavian, and running under the clavicle, down the infide of the cartilages of the ribs, near the fternum, on each fide. The abdomen fhould alfo be opened, and the vifcera diffected away, to give room for fixing the pipe into the aorta, immediately above the cœliac artery, diftributed to the fto-mach, &c. this will fill the arteries in general; but in order to fill the corona-ries of the heart, an affiftant is to make a preffure with his finger and thumb upon the left ventricle, immediately below the femilunar valves, whilft the Injection is thrown into the aorta, or brachial artery: this preſſure ſhould be made in ſuch direction, as not to cloſe the orifices of the coronaries going off juſt above the valves. The left ſide of the heart and pulmonary veins, may be filled by a pipe introduced into one of theſe veins, entering the left auricle; ligatures may be made on each brachial artery, juſt above the elbow; or a twiſted tourniquette may be applied very tight, to prevent its running into the whole of the upper extremities: but the waſte of the Injection would hardly be an object in this caſe. The arteries may be injected by one of the brachials, making a ligature on the aorta, juſt below the diaphragm. The veins and pulmonary artery may be injected[q], by fixing a pipe in the vena cava aſcendens,

[q] Previous to injecting the veins, they ſhould be cleanſed, by repeatedly ſyringing them with warm water, from wherever the pipes are fixed, which is to make its exit through a ſmall puncture made with a lancet, about a quarter of an inch in length in the apex of the right auricle.

below

below the liver (ſo that the liver is not to be removed with the abdominal viſcera); one in each brachial and cephalic vein; and what are not filled by theſe, are to be injected by ſuch as are coming from different parts of the head and face. If the vena azygos, ſituated rather on the right ſide of the ſpine, in the thorax, ſhould not be injected, it may be filled by a ſmall pipe fixed in its inferior part; and laſt of all, the thoracic duct running between the aorta and vena azygos (which is not very eaſily diſcovered by perſons unaccuſtomed to diſſections, owing to its ſmallneſs and tranſparency) ſhould be filled from the receptaculum chyli. The veſſels being all injected, the diſſection is the next part of the buſineſs: firſt remove the lower part of the body by a ſection, carried between the ribs to the laſt dorſal vertebra; then amputate the arms a little above the elbow; the other part of the diſſection is the ſame as deſcribed under the head Injecting, Diſſecting, &c. an entire ſubject, to trace and exhibit the

arteries

arteries (ſee Article VII.) excepting the lungs, the principal ramifications of which only, are to be left.

The diſſection being completed, the parts are to be placed in a ſituation the moſt advantageous for exhibition. When perfectly dry, the preparation is to be done over two or three times with oil varniſh; and as this, when well made, is of conſiderable value, it ought to be preſerved in a glaſs caſe.

ARTICLE XIV.

Injecting a Fœtus, to ſhew the Courſe of Circulation when in Utero.

THIS is a preparation which requires no great ingenuity, though in making it, the moſt dexterous Anatomiſts frequently fail of ſucceſs, owing chiefly to

coagula

coagula obſtructing the veſſels. For this purpoſe, we can only make choice of ſuch children as were dead born, or died ſoon after birth; the former are to be preferred: for in theſe the lungs having never been called into action, the pulmonary arteries are not ſo dilated and pervious; for which reaſon the Injection will probably paſs with greater freedom through the Ductus Arterioſus[r] and Foramen Ovale[s].

In order to proceed with the Injection, carefully diſſect the vein from the arteries in the umbilical chord, which ſhould be preſerved three or four inches in length from the abdomen, and not ſuffered to get dry; when ſeparated, fix a middle ſized pipe in it, taking care not to include the arteries in the ligature; then inject warm

[r] Ductus Arterioſus is a canal paſſing from the pulmonary artery to the aorta, and becomes obliterated ſoon after birth.

[s] Foramen Ovale is an opening from the right auricle to the left, which becomes cloſed after the birth of the child.

water

water repeatedly, until it returns freely by the arteries in the chord; in doing this, no great force ſhould be uſed at firſt, until the veſſels become a little cleared of the coagula, or there will be a danger of rupturing them; afterwards inject air, to expel the water more perfectly; then throw in the coarſe, coloured Injection with tolerable freedom, till it flows out of the arteries; on ſeeing which, ſtop the arteries by a ligature previouſly placed looſe on them for this purpoſe; and when the veſſels are ſufficiently filled, remove the ſyringe. After the body is cold, proceed to the diſſection, by firſt removing the head cloſe to the baſis of the ſkull, the arms with the ſcapulæ and pectoral muſcles, the lower extremities at the articulation, with the acetabulum, the whole of the integuments, muſcles of the back, parietes of the abdomen, anterior part of the thorax, and all the thoracic and abdominal viſcera, excepting the heart. In removing the liver, care muſt be taken to avoid injuring the Ductus

Venosus[t]. Preserve the injected vessels in the trunk of the body and neck; also the whole chain of vertebræ from the skull downward; the posterior portions of the ribs, and the entire pelvis; then carefully clean away all the cellular membrane, and what obscures the course of the vessels: place the preparation in a proper position for viewing to the best advantage, particularly the Ductus Arteriosus, and Ductus Venosus; when thus placed, lay it in a situation most favourable for drying; after which it should be varnished, and secured by a glass or case from accidental injuries, to which it is very liable.

[t] The Ductus Venosus, is a canal of communication between the vena portarum and the hepatic veins, near their termination in the inferior cava.

ARTICLE

ARTICLE XV.

Injecting and preparing the Penis.

FOR the purpoſe of an Injection, the adult penis is always preferred; it ſhould be removed from the body, for the convenience of conducting the proceſs with the greater facility; in ſeparating it, the knife is to be carried cloſe to the pelvis, to which it is connected by its two crura: the precaution of diſſecting cloſe to the pelvis, is to guard againſt wounding the crura, which, if neglected, might afford ſome trouble when injecting it, by the eſcape of the fluid. The diſſection is to be continued toward the bladder, and the penis ſeparated by a tranſverſe inciſion juſt before the proſtate gland; in doing this, the teſtes need not be removed, but a ſection of the ſcrotum ſhould be made in the direction of the septum, to allow room for removing the penis; which being accomplished, the next part of the process will be to wash out the blood, which is always found, more or less, in the corpora cavernosa: this is performed by first fixing a middle sized injecting pipe into one of the crura, through a small incision made for that purpose, and then injecting warm water, which is to be pressed out again; and this should be repeated as often as the water returns bloody. Then find the orifice of the large vein, situated on the dorsum of the penis, in the groove, formed by the pecten, or septum penis, and advancing from the glans to the os pubis, called the vena magna ipsius penis [a]. It will be necessary to distinguish this, from a vein in the integuments, called vena tegumentorum; the former is deeper seated, and not movable with the integuments, as is the case with the latter. A probe is to be introduced into the vena

[a] See the 47th and 48th Table of Cowper's Anatomy.

magna,

magna, as far as the glans, in order to break down its valves, which would otherwise obstruct the Injection; then fix a pipe in it, and cleanse it from grumous blood, by injecting warm water, and pressing it out again, as directed for cleaning the corpora cavernosa; being thus far prepared for the Injection, immerse it for about an hour in hot water, and fill the corpora cavernosa with coarse yellow Injection, and the vena magna, glans, and corpus spungiosum with red; after which the integuments may be entirely dissected away; the preparation is then to be dried and varnished, or preserved in spirits of wine, without any thing further being done after the Injection.

ARTICLE XVI.

Injecting the Testes.

THE testes designed for this purpose, should be removed from the body with considerable care; the spermatic chord, which is formed by the three vessels, the artery vein, and vas deferens, is to be divided as high as possible, and no where wounded. The artery may be filled with fine and coarse red Injection, and the vein with coarse yellow; the vas deferens, or excretory duct, should always be filled with quicksilver, as, on account of its smallness and prodigious length, it cannot be filled with any of the other Injections; even quicksilver requires considerable time to make its way through all its windings: it should remain suspended to the injecting tube,

tube, under water for ſome time[w], that it may inſinuate itſelf as far as poſſible. The Injection of the vas deferens ſhould follow that of the other veſſels. The extremities of all the veſſels ſhould be afterwards cloſed with ligatures; then the ſurrounding cellular membrane, &c. diſſected away; and by laying the preparation in water for two or three days, the blood will be more effectually extracted, the colour of the Injection appear much brighter, and conſequently be better ſeen; this being done, it may be ſuſpended in the air, till the body of the teſtes is perfectly dry, and then preſerved in oil of turpentine.

Before the yellow Injection is thrown into the vein, that veſſel muſt be repeatedly filled with warm water, in order to clear away all the grumous blood, which, by being retained, and drying on the colour, would have a diſagreeable effect.

[w] See Plate II.

ARTICLE XVII.

Injecting the Blood-Veſſels of the Meſentery.

IN injecting the meſenteric veſſels, ſeparated from the body, care is to be taken to have all the extremities of the divided veſſels previouſly ſecured; this done, find one of the largeſt arteries and veins near the root of the meſentery; into which fix proper ſized pipes, and inject them with any two colours which afford a good contraſt. The Injection will run into every part of the meſentery and inteſtines with great freedom, from their numerous anatomoſis, and into the veins, equally free with the arteries, on account of there being no valves in this part.

For injecting the lacteals in the inteſtines, ſee the Article on that particular ſubject.

ARTICLE

ARTICLE XVIII.

Injecting of Bones, and rendering them tranſparent, to ſhew their Vaſcularity.

BONES are injected, either to ſhow their natural vaſcularity in their healthy ſtate, or the diſtenſion of the veſſels in the ſtate of inflammation; this muſt always be done with the minute Injection: there is no poſſibility of filling the veſſels of a ſingle bone, but by injecting at leaſt the whole extremity, and the arteries only; for the veins cannot be minutely injected, becauſe of the valves, except thoſe of the head, which have ſometimes been minutely filled by the jugulars.

An extremity for this purpoſe being removed from the body, a ſuitable ſized pipe is to be properly fixed into the principal artery, and the part thoroughly heated in hot water; then proceed to inject according to the rules prescribed in Article II. To prevent any of the Injection escaping from the vessels, divided in the removal of the part from the body, a ligature may be made just below the incision, with any kind of cord, and tightened by a twisting stick, in the manner of a common tourniquette: care should be taken not to compress the artery through which the Injection is to pass; this is to be avoided by placing the pipe below the ligature. It must be remembered, that the object of this experiment, the bone, is frequently situated at a considerable distance from the surface; and that the part must be thoroughly heated before the operation is attempted, and therefore should lay several hours in the hot water, as by neglect of this, the whole intention will be defeated; the surface of an extremity will feel sufficiently heated whilst the centre remains, but very little, if at all affected; and again, if the Injection is not made thoroughly fluid, it will equally tend to fruſtrate the purpoſe of the operator.

After the part has been properly injected, and ſuffered to become cold, all the ſurrounding parts may be removed from the bone as clean as poſſible, and then laid in clean water for a few days, changing it daily, until the blood is fully extracted; it is then to be immerſed in a weak acid liquor, made of one ounce of the muriatic acid, and one quart of water, in a glaſs veſſel; in which liquor it is to lay two, three, or four months; the acid, thus diluted, will gradually unite with, and diſſolve the earthy part of the bone, and not injure the animal fibres, or deſtroy the fine vaſcular organization; but as the acid becomes neutralized by the earth of the bone, it will be neceſſary to add a little more from time to time, to keep up its original ſtrength. This proceſs ſhould never be haſtened, by the addition of two much acid, for that will deſtroy the animal fibres, and ruin the preparation; an unpleaſant circumſtance, when every thing has previouſly gone on well. The bones ſhould always be ſuffered to lay in the liquor a ſufficient length of time to complete the proceſs of removing the earthy part, or otherwiſe they never can be made ſo tranſparent, nor of courſe will they ſhew their beautiful vaſcularity to ſuch advantage. When this proceſs is effected, they will become ſoft and flexible. It ſhould be then taken from the liquor, and ſuſpended in the air till perfectly dry; then immerſed in a glaſs veſſel filled with fine oil of turpentine, when it will immediately aſſume a beautiful tranſparency, and ſhew innumerable minute veſſels paſſing through its moſt ſolid parts, in as great abundance as any of the ſoft or fleſhy parts of the body. The veſſel being cloſed according to the directions given in the proper Article, it ſhould be kept from the heat of the ſun, which is very liable to burſt veſſels filled with oil of turpentine.

ARTICLE XIX.

A minute Injection of the Cutis, Inteſtines, and other Abdominal Viſcera, to ſhew their Vaſcularity.

FOR this purpoſe, very young ſubjects are generally choſen; and the eaſieſt and moſt common mode of injecting the cutis, or viſcera, is by the aſcending aorta, as for an entire ſubject (ſee page 38); with this difference only, that the minute Injection is to be uſed in this caſe: if the cutis is the object of the experiment, ſuch part of it as is intended for preſervation, after it is injected, muſt be laid in clean water, and changed every day, as long as it imparts a bloody tinge, and then is to remain in maſceration, without changing the water until the cuticle will eaſily peel off; by the removal of which, the vaſcularity is is much more beautifully exhibited: after the removal of the cuticle, proceed with regard to its preſervation, either by placing it in its reſent ſtate, in a veſſel of ſpirits of wine, or by drying, and placing it in oil of turpentine, or preſerving it by varniſh.

With reſpect to the abdominal viſcera, ſuch parts as are to be preſerved, muſt be treated in a manner ſimilar to the cutis, by cleanſing and preſerving them in ſpirits of wine, or oil of turpentine, or by varniſhing; but it is to be remembered, that ſuch only may be preſerved in turpentine, or by varniſhing, as are thin, and capable of being previouſly dried, as the ſtomach, inteſtines, urinary bladder, &c. the more bulky parts, as the liver, ſpleen, kidneys, pancreas, &c. cannot be preſerved in turpentine, unleſs thin ſections of them are made, ſo as to render them capable of being dried without putrefaction.

Portions of the peritoneum, pleura, perioſteum, and dura muta, may alſo be dried

dried and preſerved in oil of turpentine, or by varniſhing.

ARTICLE XX.

Injecting and preparing the Head, to preſerve its natural and healthy Appearance.

YOUNG children are the moſt proper ſubjects for this purpoſe; the head is to be ſeparated from the body, as low as the fifth or ſixth cervical vertebra; then thoroughly heated in hot water, and injected by the carotid arteries only, with the double pipe (ſee Plate I. Fig. 9.) previouſly ſecuring the vertebrals: for this preparation, red minute Injection is always to be uſed; and, if thrown in with freedom, and as much force as will be prudent, conſidering the danger of rupturing the veſſels, it will paſs ſo perfectly into the cutaneous veſſels, as to give the natural and healthy complexion. When the

the part is become cold, remove the pipes, and ſuffer it to lay in clean water, not only to extract the blood, but to promote putrefaction, ſo that the cuticle will eaſily peel off, which is to be removed from all ſuch parts as are not covered with hair; this gives a brightneſs to the complexion, exhibits the vaſcularity of the cutis, and villi of the lips. If the cuticle be removed from ſuch parts as are covered with hair, the hair will come off with it, and occaſion an unnatural appearance. In the putrefaction, attention ſhould be paid to the earlieſt period, when the cuticle will peel off, otherwiſe the colour of the cutis will be liable to change, and disfigure the preparation. The globes of the eyes will never retain their natural appearance in preparation, owing to the cryſtaline humour and tranſparent cornua becoming opaque; for which reaſon they ſhould be removed, and the head ſupplied with artificial[w] ones of glaſs.

[w] Artificial eyes are ſold by the wax figure makers, or by the beed-makers.

The

The preparation being thus far finiſhed, it is to be preſerved in ſpirits of wine, either entire, or in two parts; if the latter, a ſection is to be made perpendicularly through the middle, or rather a little on one ſide of the forehead, noſe, mouth, chin, trachea, &c. and, poſteriorly, through the cranium, ſagittal ſuture, occiput, and middle of the cervical vertebræ; the brain may then be eaſily removed, when the larger portion will afford a good view of the internal cavities, membranes, &c. The deſign in dividing the head a little on one ſide of the middle, is to preſerve (in the largeſt portion) the falciform proceſs of the dura mater, ſeptum narium, &c.

This ſection ſhould be made, firſt with a knife, through the ſoft parts; the bones will require a ſaw; and for the internal membranes, ſciſſors will be more convenient.

OBSERVATIONS.

It is to be always remembered through this work, that where Injections with coloured fluids, to trace and exhibit the blood veſſels by diſſection are treated of, or where the minuteſt vaſcularity is not the object of experiment, the fine and coarſe Injections are both to be uſed; firſt, a portion of the fine, forced into the ſmaller branches by the coarſe, which is immediately to follow it. For corroded preparations, the coarſe only is to be uſed, as the fine is much too fluid; and as it is neceſſary they ſhould be made with an Injection which has a firm body, ſufficient to ſupport their weight even in warm weather. Caſes wherein the extreme vaſcularity of parts is to be exhibited, the minute or ſize Injection only is to be uſed. It will be more particularly neceſſary to bear theſe Obſervations in remembrance, as they are not repeated in every article.

MERCURIAL

MERCURIAL INJECTIONS.

ARTICLE XXI.

General Obſervations on injecting with Quickſilver.

QUICKSILVER is often uſed for Anatomical Injections, on account of its minuteneſs, its permanent fluidity, and not being ſubject, like other fluids, to ſpontaneous evaporation; but if there could be a method of rendering it a ſolid, flexible body, after it is thrown into the veſſels, and had we the art of communicating to it different colours, it would become much more extenſively uſeful. The continuance of fluidity, whilſt in the veſſels, is one of the greateſt objections to its uſe; as on this account it is impoſſible to diſſect with any freedom among veſſels filled with it; for by making the leaſt wound in theſe, the whole will be liable to eſcape, eſpecially where there is a communication by collateral branches, unleſs immediately ſecured. Its ſpecific gravity is alſo another conſiderable objection to its uſe; for although it is ſo uſeful a circumſtance in the act of injecting, yet by the weight of the preparation, it is very apt to ſtrike ſo forcibly againſt the ſides of the glaſs in which it is kept, as to rupture the veſſels: for theſe reaſons it is but ſeldom uſed, where the other uſual Injections can be employed.

When injecting with quickſilver, it will be neceſſary to bear in remembrance, that the force of the Injection depends upon the perpendicular height of the column, and not its diameter; and thence ſhould be careful not to raiſe it to a greater height than the veſſels are able to bear.

In making quickſilver Injections, the principal ingredients, and the firſt to be

 obtained,

obtained, are time and patience, and not lefs fo, an uniform fortitude againft difappointments; for it will not unfrequently happen, that with the greateft care, a moft promifing preparation will be inftantaneoufly deftroyed by fome trivial accident, when it has been almoft completed.

Preparations of this kind fhould never be made upon a bare table, but on a broad difh, or the injecting Tray made particularly for that purpofe; otherwife we may wafte much more quickfilver than is ufed, and the price of the article renders it an object of fome confequence with thofe, who are in the frequent practice of ufing it in this way. The Tray which I have invented for this purpofe, is reprefented in Plate III. The fhape therein defcribed, is not adapted to the injecting of legs, arms, or the trunk of the body; for thofe larger preparations, others upon the fame principle may be conftructed of fuitable dimenfions.

EXPLA-

EXPLANATION OF PLATE II.

Repreſenting the Injecting Tube, and its Appendages, for the Purpoſe of filling the Lymphatics, Lacteals, &c. with Quickſilver.

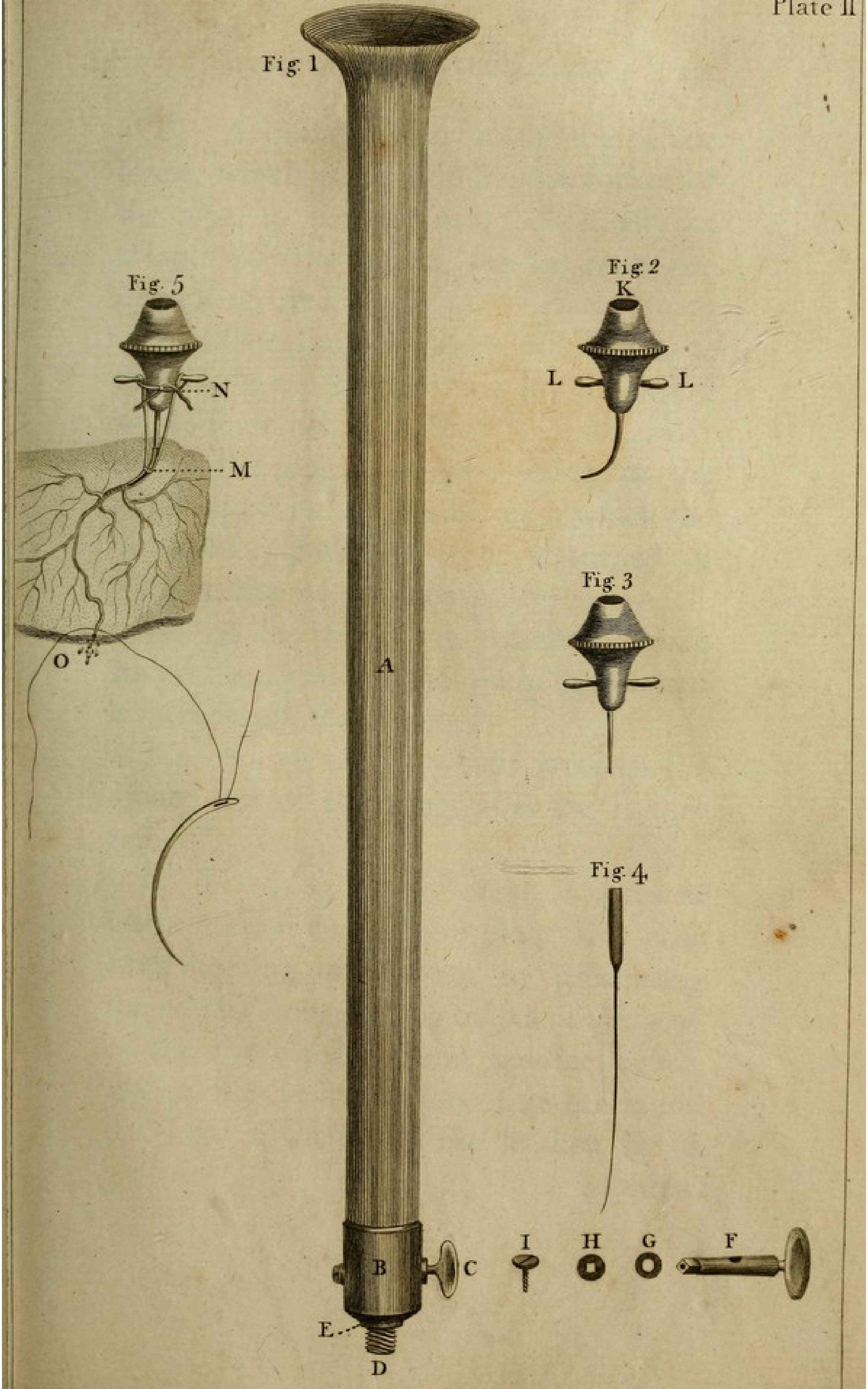
Fig. 1. A. The glaſs tube fixed in its ſteel cock: the tube here repreſented is ſeven inches in length; but for different purpoſes, they are made from five to twenty inches; ſome veſſels requiring a much higher column of quickſilver than others.

B. The cock, for the advantage of retaining or diſcharging the quickſilver at pleaſure, by turning the handle of the plug C in a tranſverſe or longitudinal direction.

D. A ſcrew at the bottom of the cock, adapted to the ſocket of the pipes; the ſcrew is to fix the pipes with greater ſecurity to the cock, than the common method, which is only upon the principle of a plug.

D. A

Plate II



T. Pole delin.   W. Darton & Co. sc.

D. A leather collar at the top of the ſcrew, which is preſſed by the ſocket of the pipe, to prevent more effectually an eſcape of the quickſilver between the threads of the ſcrew.

F. The plug of the cock taken out; this, by its tapering, always fits cloſe, and works ſmoothly in the cock. In the middle of the plug is a perforation, in the direction of its handle, through which the quickſilver paſſes, when it is turned in the direction of the tube.

G. A leather collar, which is placed round the ſmall end of the plug, after it is introduced into the cock.

H. A ſteel collar, which receives the ſquare end of the plug, after the leather one.

I. The plug ſcrew, which is ſcrewed into the ſmall end of the plug: this confines the plug in the cock, by preventing the collars from ſlipping off; and the head of the ſcrew preſſing on the ſteel collar, that preſſes the leather one between it and the ſide of the cock, the leather, by its

ſoftneſs

ſoftneſs and elaſticity, cauſes the plug to move ſmoothly.

Fig. 2. The curved pipe, which ſcrews on to the end of the cock D, in order for uſe, which ſcrew is adapted to the ſocket of the pipe K.

L. L. The croſs-pins, for the purpoſe of paſſing the ligature round, to prevent the pipe from ſlipping out of the veſſel, when introduced.

The advantage of its curvature is, to fill with the greater facility, veſſels lying horizontally, as on the ſurface of a table, whilſt the tube is kept in a perpendicular direction.

Fig. 3. A pipe which only differs from the above in its being ſtraight; this is intended for filling veſſels in a perpendicular direction, particularly when the tube is to be ſuſpended in the injecting Tray, with the preparation under water, for a conſiderable length of time (ſee Plate III).

Fig. 4.

Fig. 4. A ſlender piece of ſteel, called the clearer; it has its upper part flat, to anſwer the purpoſe of a handle; its uſe is to clear the pipes of any thing which may obſtruct the paſſage of the quickſilver; this is done by paſſing the point through the ſocket of the pipe to its extremity, or as far as it will go, and moving it backward and forward ſeveral times.—From its elaſticity, it will anſwer equally well for the curved, as for the ſtraight pipe.

Fig. 5. Repreſents a curved pipe fixed in a blood veſſel, and ſecured by a ligature, for the purpoſe of filling it with quickſilver.

M. The firſt knot made with the ligature, paſſed round the veſſel, below the orifice, by means of a needle, for the purpoſe of compreſſing it equally on all ſides of the pipe, to prevent the eſcape of the quickſilver.

N. The ſecond knot made with the ligature, after it has been turned over the croſs-pins, to prevent the pipe ſlipping out of the veſſel.

O. The orifice of a veſſel, divided in removing the part from the body, with the quickſilver eſcaping in globules; under which is a ſmall ligature paſſed, by means of a needle, in order to cloſe the out-let by a knot; this ſhews the manner of ſecuring the quickſilver in the veſſels, during the proceſs of injecting, or before the Injection commences.

Every part of the cock, pipes, and clearer, muſt be made of ſteel, as any other metal would be emalgamated by the ſolvent property of the quickſilver. Care ſhould be taken always to wipe over the metallic parts with an oily cloth, after each time of uſing this inſtrument, or they will otherwiſe ſoon be deſtroyed by ruſt.

ARTICLE

ARTICLE XXII.

Injecting the Lymphatics with Quickſilver.

THE Lymphatics are a ſyſtem of veſſels of modern diſcovery, intended to abſorb from all parts of the body, the ſuperabundant fluids depoſited by the exhalants, or otherwiſe; the action of theſe conſtitutes that power of the conſtitution, by which morbid affections are often ſuddenly removed, without any direct external evacuation. They are ſmall delicate tranſparent veſſels, appear knotted, or irregular, from the abundance of their valves, and are found ariſing from every part of the body. In order to diſcover theſe veſſels, make an inciſion in the cutis, and remove a part of it as far as the cellular membrane, where they ariſe plentifully, yet from their tranſparency, may ſo elude the eye, as to require a magnifying glaſs to diſcover them.

The ſubjects moſt favourable for injecting, are thoſe who have died anaſarcous, as in ſuch the lymphatics are ſomewhat enlarged, and more evident. This is one of the moſt delicate preparations, requiring the greateſt dexterity of any part of experimental anatomy. It will be, in general, requiſite to conſider the courſe of circulation through theſe veſſels, which are, above all others, moſt plentifully ſupplied with valves, and from which cauſe the quickſilver will, in moſt inſtances, only paſs in the natural courſe of circulation. It is to be remembered, that theſe veſſels are ariſing from all the remote parts of the body, and directing their courſe towards the Thoracic Duct, where they terminate in its lower extremity, called Receptaculum Chyli, ſituated anteriorly on the ſpine, below the diaphragma; and this empties itſelf into the left ſubclavian vein; ſo that to inject the lymphatics of an extremity, or any other part, it is neceſſary to ſearch for thoſe moſt remote from the Thoracic Duct; and then with the point of a lancet, make an orifice in one of them, ſufficient to introduce the pipe, which is to be kept in that ſituation by the finger, or rather by means of a ligature; and when the cock is turned, the quickſilver will be ſeen to flow up the lymphatic, though after the firſt entrance of the quickſilver, the uniformity of the ſtream will prevent our being able to judge whether it continues to flow or not, unleſs by looking into the glaſs tube, where we may readily perceive, that it is either gradually ſinking, or perfectly ſtationary; and this is the only criterion of its real ſucceſs: if the mercury ſinks too faſt, it indicates a rupture in the veſſels; as long as the column continues to leſſen gradually, we are to hold the pipe in its ſituation, and when it ceaſes to flow any longer, ſecure the mercury by a ligature, and withdraw the pipe.

Should

Should there be any out-let to the mercury, through a collateral lymphatic, it is to be immediately ſecured by a needle and ligature, as ſhewn in Plate II. fig. 5. When the mercury has ceaſed to flow, the pipe removed, and the veſſel ſecured, then proceed to trace the courſe of the veſſel, by a moſt cautious diſſection, with a pair of diſſecting forceps and finely pointed ſharp ſciſſors, taking great care not to wound, in the ſmalleſt degree, the veſſel containing the mercury; but ſhould ſuch an accident happen, immediately ſecure the orifice, by preſſing it between the finger and thumb, until it can be more ſecurely ſtopped by a fine ligature, made above and below the orifice, and as near to it as poſſible, that the rupture may appear trivial. Sometimes when they have loſt a conſiderable portion of the mercury, they may be diſtended, by a ſecond introduction of the pipe into the ſame, or a communicating collateral branch; but in this ſyſtem of veſſels, there is not ſo frequent anaſtimoſis as in in the arteries and veins. As the diſſection for the lymphatics is neceſſarily very ſlow and tedious, from the great care required in performing it, it will be proper to prevent the parts getting dry, by expoſure to the air after they have been opened: the beſt method of preventing this, is to open as little as poſſible at once, and when left, to cover it over with a wet cloth, three or four times folded. When the injected veſſels are cleared of the ſurrounding adeps, cellular membrane, &c. and exhibited to the beſt advantage, let them be dried in a ſituation where the air has free acceſs, and the rays of the ſun excluded; when dry, the preparation ſhould be varniſhed, and ſecured from accidents, by being kept in a glazed caſe.

ARTICLE

ARTICLE XXIII.

Injecting the Parotid Gland with Quickſilver.

THE Parotid Gland is ſituated poſterior to the maſſeter muſcle, and anterior to the lower part of the ear; it extends from the zygomatic arch to the angle of the lower jaw; its duct paſſes over the maſſeter, and through the buccinator into the mouth.

This gland ſhould be injected in ſitu, on account of the numerous branches which it is giving off on all ſides, and which are ſo tranſparent, as to eſcape the eye of a common diſſector, unleſs they are rendered more viſible, by being firſt filled with quickſilver. In conducting this operation, raiſe the cutis on the ſide of the face, from the ear to the mouth, and from

from the temporal muſcle to the neck, taking care to keep the knife cloſe to the ſkin, that it may not wound the gland; then with the utmoſt caution, diſſect away the adeps and cellular membrane, from the maſſeter muſcle, in ſearch of the duct, a tube of about two inches in length, and the ſize of a crow quill, eaſily eluding the ſearch of an inexperienced ſtudent: when diſcovered, make an opening into it with the point of a lancet, ſufficiently large to introduce the point of the ſteel injecting pipe, as diſtant from the gland as poſſible; and when introduced, confine the duct upon it by a ligature, with a ſingle knot, that it may ſerve, when the pipe is withdrawn, to ſecure the quickſilver in the gland; and that if any accident ſhould render it neceſſary to relax or remove it, it may be done with the leſs difficulty, or without danger of injuring the duct. When the gland has received as much of the quickſilver as it can contain, the pipe withdrawn, and duct ſecured, proceed with all poſſible care to diſſect it from its ſituation, remembering a flight wound in the gland would be likely to deftroy it; in this procefs, the numerous branches going off to the furrounding parts, fhould be fecured by a very fmall curved needle and fingle ligature, after which they may be divided with fafety; when the gland is thus removed from its fituation, lay it in a difh, and take away as much of the furrounding ufelefs parts as poffible, without endangering it; then lay it in clean water for a day or two, to extract the bloody colour; after which it is to be fpread upon a piece of pafteboard, and placed in the air until perfectly dry; then remove it from the pafteboard, and preferve it in a glafs veffel of fine oil of turpentine.

ARTICLE

ARTICLE XXIV.

Injecting the Lymphatics on the Surface of the Liver, with Quickſilver.

PROCURE the liver of an anaſarcous ſubject, take a portion of it about the ſize of a hand, upon which the lymphatics are moſt viſible; they are ſmall, and almoſt imperceptible whitiſh lines, running plentifully on the ſurface; the part to be injected ſhould be laid in a diſh, or the injecting Tray, to catch the quickſilver, which would otherwiſe be loſt; then with the point of a lancet, puncture one of the largeſt of them, ſufficient to introduce the pipe of the injecting tube with eaſe; the curved pipe ſhould be uſed for this purpoſe, that its point may ſtand horizontally, correſponding with the direction of the veſſel, whilſt the upper part of the tube is inclined obliquely toward the ſhoulder of the operator, as a pen is held in the act of writing; the column of quickſilver in the tube may be raiſed to about five or ſix inches; when it begins to flow, it will be neceſſary to prevent its eſcape from the veſſel, by preſſing the finger gently upon the orifice, or by a ligature upon the pipe, taking care not to obſtruct the flow of the quickſilver; if, when a ſmall portion has paſſed into the lymphatics, it ſeems inclined to ſtop, it will then be neceſſary to force it forward, by a gentle preſſure with the edge of a ſteel ſpatual, urging it in that direction in which it ſeems moſt inclined to run; by this the valves will be broken down; being in this viſcus particularly weak, ſo that we may inject without regard to the courſe of circulation; when the quickſilver is pretty uniformly diſtributed over the ſurface, remove the pipe, and ſecure the orifice as uſual; then cut the injected portion of liver, from that part which is not intended to be preſerved, taking care to keep the knife at a ſufficient diſtance from the injected lymphatics, as wounding them would occaſion the eſcape of the quickſilver, and greatly injure, if not ruin, the preparation, remove alſo from the under ſide of it, as much of the liver, as will leave it not more than half an inch in thickneſs; then pin it out ſmooth upon a piece of paſteboard, with the injected ſurface outward, and ſuſpend it in a current of air, until it is perfectly dry; then take it from the paſteboard, make its edges even, and preſerve it in a glaſs veſſel of fine oil of turpentine. When the preparation is dried without putrefaction, there is a lively and beautiful contraſt of colour between the quickſilver and the dark brown of the liver; but this preparation will be ſtill improved by the peritonæal veſſels being injected with a bright red (ſee Article XIX).

ARTICLE

ARTICLE XXV.

Injecting the Lymphatics on the Surface of the Lungs, with Quickſilver.

THE Lungs of an anaſarcous ſubject are to be preferred for this purpoſe, as the lymphatics on theſe are much larger, though not ſo eaſily diſcovered as thoſe of the liver; nor can they, as in the liver, be injected contrary to the circulation of the lymph, on account of the valves being much firmer, and not ſo eaſily broken down; for this reaſon, the mercury ſhould be injected from the inferior part of the lungs, when it will paſs with facility toward their root. The lymphatics of this viſcus, take a direction different from thoſe of the liver, and run in a circuitous direction. What further regards the introduction of the pipe, the manner of inject-

ing,

ing, drying, preſerving, &c. portions of the lungs, need not differ from what has been ſaid in the preceding article reſpecting the liver.

ARTICLE XXVI.

Injecting the Veins in the Kidney of a Cat, with Quickſilver.

THE Veins in the kidney of a cat run very ſuperficial, and branch out in a manner peculiarly beautiful, which is the only inducement to making this preparation. The manner of injecting it is very ſimple; nothing more is neceſſary than to fix the ſtraight pipe of the quickſilver injecting tube into the vein by a ligature, and inject with a ſhort column; it ſhould be ſuſpended in water, that it may have time to inſinuate itſelf into all the

ſmall

ſmall ramifications; then remove the pipe, and ſecure the quickſilver in the vein, as uſual; diſſect away the ſurrounding cellular membrane and adeps, and preſerve it in ſpirits of wine.

Theſe veſſels may be injected with coloured minute Injection, to give the ſame appearance; but a very ſmall ſyringe and pipe ſhould be uſed for the purpoſe.

ARTICLE XXVII.

Injecting the Arteries and Veins of the Hand, with Quickſilver.

FOR this purpoſe, a hand ſhould be choſen the moſt emaciated, ſuch as are generally found upon aged perſons, who have died of ſome lingering diſeaſe, and upon women rather than men. The

The fore arm ſhould be ſeparated by a tranſverſe ſection, about three inches above the wriſt, and the ſteel pipe fixed in the radial artery, with a ligature; then pour the quickſilver into the tube, and conduct the proceſs as before deſcribed; as ſoon as they get filled, it will begin to flow out of the other veſſels, where the ſection is made; then let the arteries be firſt ſecured, by taking hold of them with the diſſecting forceps, whilſt an aſſiſtant ties them with a ligature, and afterwards the veins in the ſame manner; if they cannot be perfectly ſtopped by this means, apply a ſtrong cord round the arm, a little below the inciſion, and tighten it in the manner of a common twiſted tourniquet; but care ſhould be taken not to make the compreſſion with the cord ſo great as to obſtruct the quickſilver from paſſing in; this may be eaſily regulated; for a deſcending column in the tube will overcome a much ſtronger reſiſtance than the aſcending column in the veſſels of the hand, on account of the greater perpedicular height

 of

of the former. When all the veſſels are ſecured, the hand ſhould be properly ſuſpended in water (ſee Plate III.) with the tube and column of quickſilver, ſo as to continue the Injection for a day or two, to give it full time to paſs into the minute veſſels; then remove the pipe, ſecure the artery by a ligature, and twiſt the cord tighter: the preparation is to remain in water, till putrefaction takes place, ſo that the cuticle may be eaſily peeled off, otherwiſe the hand would not dry; and if it ſhould with the cuticle on, it would tend, in a great degree, to obſcure the injected veſſels. The preparation is then to be hung in the air, and, when dry, ſhould be carefully varniſhed, and fixed on a pedeſtal of Plaſter of Paris, and ſecured from the duſt by a glaſs cover.

Theſe preparations, when well managed, are very beautiful; for the quickſilver paſſing from the arteries into the veins, afford a moſt elegant diſplay of the veſſels, and there is no other way by which

which the veins of the hand can be readily injected with minuteness.

The reason why I have not mentioned securing the divided vessels before the Injection was attempted, is, that the quicksilver, by passing out, may have an opportunity of removing from the vessels any coagula which might tend to stain the quicksilver, and mar the beauty of the preparation.

ARTICLE XXVIII.

Injecting the Female Breaſt with Quickſilver.

IT requires no ſmall ſhare of time and patience, to make a complete preparation of this kind. The manner of conducting the operation is, firſt, to remove the breaſt from the ſubject, by an inciſion carried round its baſis, ſo diſtant as to avoid wounding the lactiferous tubes, which will be more evident, and much better adapted to this purpoſe, if they have been recently diſtended with milk. Next examine the nipple for the excretory ducts, and introduce a briſtle into each, about ten or fifteen in number; afterwards withdraw one of them, and cautiouſly introducing the ſtraight pipe, diſtend the tubes with quickſilver: when completely filled, ſecure its orifice by replacing

replacing the briſtle, then withdraw the next, introduce the pipe, and diſtend the tubes as before, and ſo on until they are all injected, and the orifices of their ducts ſecured by a ligature, embracing the whole nipple, when the briſtles may be withdrawn; for it muſt be remembered, that the lactiferous tubes do not anaſtomoſe, that is, the tubes terminating in one excretory duct, have no communication with thoſe belonging to another; which circumſtance renders it always neceſſary to inject by each duct ſeparately.

As ſometimes, notwithſtanding all the care that can be taken in removing the breaſt, ſome ſmall tubes branching into the ſurrounding adeps, at a conſiderable diſtance, will be divided, through which the quickſilver will eſcape on the poſterior ſurface; theſe muſt be ſecured by a ligature, whenever they occur in the courſe of the operation; this being effected, carefully diſſect away all the adeps, cellular membrane, &c. from the poſterior ſide, fide; the integuments are alfo to be removed, and the adeps fituated between them and the lactiferous veffels: this will require great care not to wound them. The part fhould then be macerated, to free it as much as poffible from blood, taking care to avoid putrefaction, which would weaken the veffels, and occafion the efcape of the quickfilver: after which, let it be expofed to a current of air, to dry as foon as poffible; when effected, preferve it in fine oil of turpentine, which will give it a tranfparency, and render the diftribution of the lactiferous tubes very vifible.

ARTICLE

ARTICLE XXIX.

Injecting the Lacteals with Quickſilver.

THE Lacteals are an extremely delicate and tranſparent ſet of veſſels, which ariſe from every part of the inteſtines, and paſs through the meſentery towards its root, in order to convey the chyle from the inteſtines to the thoracic duct; in the human ſubject, they are very ſimilar to the lymphatics, and like them, numerouſly ſuppled with valves, which prevent their being injected contrary to the courſe of the chyle. They are more viſible in ſubjects that have died ſuddenly, ſoon after eating a full meal, being then diſtended with the chyle, produced by the aliment recently taken in. They are to be injected in the following manner:—Take a ſmall portion of the inteſtine

teſtine and meſentery, and make an inciſion in one of the moſt conſpicuous Lacteals, as near as poſſible to its origin in the inteſtine; then introduce the point of the injecting pipe, and conduct the operation agreeable to the rules before deſcribed in the preceding articles; when the quickſilver flows out of any of the divided veſſels, they are to be ſtopped by an aſſiſtant (ſee Plate II. fig. 5); when as many of the Lacteals are filled as will receive the quickſilver from this orifice, introduce the pipe into another, and repeat the proceſs as before, and ſo on until as many of them are filled as can be; then inflate the inteſtine, and ſuſpend it in the air to dry, or if there ſhould be any orifice through which the air may eſcape, let it be diſtended with wool; the part being perfectly dried, the wool ſhould be removed, or the air evacuated, by cutting off the two ends of the inteſtines, as alſo to give acceſs to the oil of turpentine, in which it is to be kept; or it may be preſerved by varniſhing, both inſide and out.

The

The inteſtines of the turtle are very ſavourable for preparations of this kind, as in them the Lacteals are much larger in proportion to the animal, than in the human ſubject, and ſometimes may be injected contrary to the courſe of the lymph. The Lacteals in fiſhes have no valves.

The beauty of theſe preparations will be much increaſed by the arteries being alſo injected with the fine and coarſe red Injection, and the veins with yellow.

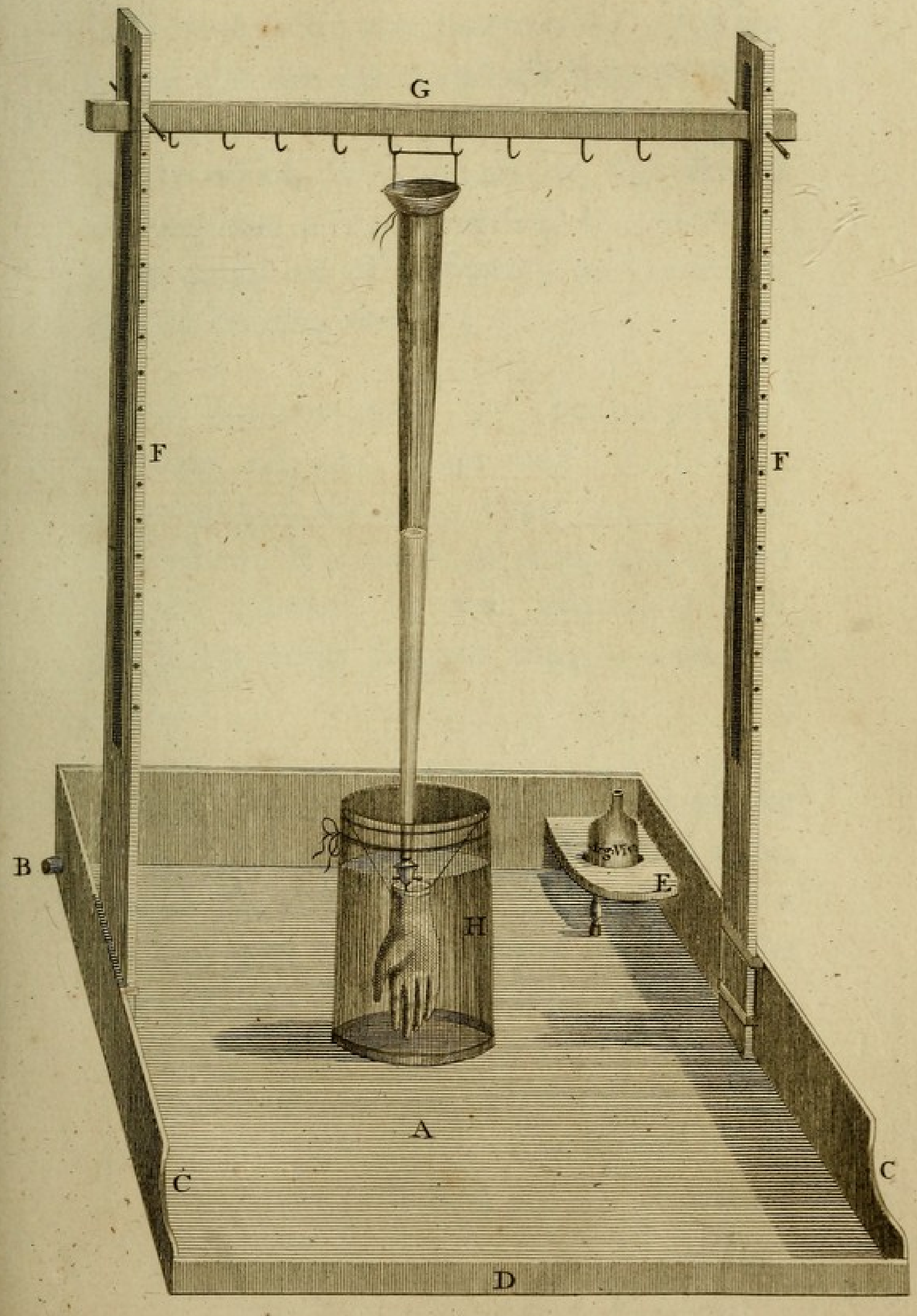
EXPLANATION OF PLATE III.

Reprefenting the Injecting Tray and its Appendages, for the Purpofe of facilitating the Procefs of Quickfilver Injections, and preventing the Lofs of Quickfilver, which is conftantly fuftained in the old Method.

A. The Tray; this fhould be made of boards, about three quarters of an inch in thicknefs, and of fuch wood as will be the leaft likely to warp; which will be more effectually prevented by the feveral parts being joined together with fcrews; and by painting it three or four times over, it will prevent the wood abforbing the water, and more effectually fecure it from warping: every joint fhould be made perfectly water-tight, and the infide painted black; as this is much more favourable for feeing the fine parts of white membranes laying upon it, and the quickfilver flowing through the minute ramifications of their veffels. The machine being made in this

 form,

Plate III



form, is intended to be occaſionally filled with water, for the purpoſe of injecting broad and flat parts, which require to be ſo managed as to prevent their drying, and to which the common jar, repreſented in the plate, is not adapted, as placentæ, large portions of meſentery and inteſtine, female breaſts, &c.

B. An iron pipe, for the purpoſe of drawing off the water and quickſilver, remaining in the Tray after the Injection is finiſhed; it is made of iron, that it may not be affected by the quickſilver. It needs no other ſtopper than a common cork.

C. C. The right and left ſides of the Tray, cut down to form a reſt for the arms, whilſt the hands are employed upon a preparation at the bottom of it. The front D, is alſo made conſiderably lower than the ſides, for the more convenient management of the preparation. The bottom of this Tray, ſhould be about twenty inches ſquare; the front about three inches high, and the ſides four and a half: the clear dimenſions on the inſide, are here meant.

E. A ledge in one corner, for the convenience of fixing the bottle containing the quickſilver: it has a hole ſufficiently large to receive the bottle, which is let through, and ſtands on the bottom of the Tray, to preſerve it from any accident, which it is very liable to from its weight.

F. F. Two uprights; the foot of each fixes in two ſquare ſtaples, within the right and left ſides of the Tray, and ought to be about twenty-four inches high.

G. The croſs-bar; the ends of which ſlide up or down in the mortiſe of the uprights, and are fixed to any height, by means of pins paſſing through them, and the ends of the croſs-bar, to keep them

them ſteadily fixed to each other. In the lower edge of this is fixed ſeveral ſmall hooks, from which may be ſuſ-pended one or more injecting tubes, as repreſented in the plate.

H. Is a glaſs jar containing water, in which is immerſed a hand; with the quick-ſilver injecting pipe fixed in the artery, as in the proceſs of filling the veſſels. The hand is ſuſpended by a ſtring from the edge of the jar.

CORRODED

CORRODED PREPARATIONS.

ARTICLE XXX.

General Obſervations on corroding, varniſhing, and preſerving Injected Preparations.

PREPARATIONS injected for the purpoſe of corroſion, ſhould always be carefully handled, leſt the Injection be incautiouſly broke, which in their finiſhed ſtate, having no ſupport from the ſurrounding veſſels, will fall to pieces; this would be an unpleaſing circumſtance, after every thing elſe has been ſucceſsfully conducted. The part, when injected, ſhould be immerſed in an acid liquor, compoſed of three parts of muriatic acid and one of water, in a glaſs veſſel of ſuitable conſtruction (ſee Plate IV.) for about three, four, or ſix weeks, as may be required, until

until its texture be entirely deſtroyed, and reduced to a ſoft pulpy ſtate; it is then to be removed from the acid, by taking hold of the ſtrongeſt part of the Injection in the largeſt veſſels, and lay it in a baſon filled with clean water; in that ſituation direct a gentle ſtream of water upon it, ſufficient to waſh away the pulpy ſubſtance; when it is nearly cleanſed in that way, take it out, and hold it by the large trunk under the ſtream, by which it will have a better opportunity of paſſing through the interſtices than before; but this ſhould not be done until it be tolerably cleared from the pulpy part, as the weight of it would be in danger of breaking off the veſſels by which it was held, eſpecially with the additional weight and preſſure of the water falling on it. The ſtream for waſhing Corroded Preparations, ſhould always paſs through a cock, as by that means it can be exactly regulated to what ſize or force we pleaſe; a ſtream formed in almoſt any other way, is liable to variations, and a ſudden unexpected increaſe

increaſe of water would alſo greatly endanger the preparation. The injecting ſyringe with a ſmall pipe may be uſed for this purpoſe, where a ſtream cannot be obtained through a cock, and in ſome reſpects will anſwer better, as by that a ſmall ſtream may be directed to any part particularly requiring it. If the pulp does not readily waſh away, it ſhould be laid in the acid liquor again for a week or ten days more, and the waſhing repeated. When it is perfectly clean, it ſhould be ſuffered to lay in water for a few hours, to take off all the acid which may adhere to it, and afterwards ſuſpended in the air to dry; for this purpoſe, always avoid uſing thread, or any thing of that kind likely to cut through the veſſels, eſpecially if the preparation is of conſiderable weight, or the Injection ſoft; for many valuable preparations have been loſt by their falling, when ſuſpended by ſuch means: for this purpoſe then, tape is preferable, or a ſlip of ſoft cloth paſſed through a diviſion of the largeſt trunk of the veins or arteries,

moſt

moſt likely to ſuſtain its weight. When there are no ſtrong veſſels favourable for this purpoſe, it may be carefully laid on a bed of wool, covered with a piece of fine ſoft linen, to prevent the wool entangling with the extremities of the veſſels; on this it is to remain till perfectly dry, then varniſhed according to the directions to be given in their proper place.

These preparations require great care and much time to complete them, and when finiſhed, are of all others moſt liable to be demoliſhed by trivial accidents; it is therefore expedient to defend them as much as poſſible from injuries; for this purpoſe they are to be fixed upon pedeſtals of Plaſter of Paris; a hole is to be made in the top of the pedeſtal, large enough to receive the trunks which ramify through the gland, or other part prepared; then this hole ſhould have a proper quantity of fluid plaſter poured into it, the preparation immediately placed in the pedeſtal, and held in a proper poſition, until the plaſter has become hard enough to ſupport it. Theſe pedeſtals are then commonly fixed with glue on a mahogany ſtand, and covered with a glaſs veſſel; but this method is not a ſufficient ſecurity, unleſs the glaſs cover is cemented down, as its occaſional removal will endanger the preparation: for perſons who have not made them are not always ſatisfied with looking, but every now and then trying their ſtrength by the finger, at the expence of deſtroying its moſt beautiful parts; neither does the moveable cover ſufficiently exclude the duſt. The moſt effectual method of preſerving them from accidents, duſt, and officious hands, is, to fix them in box frames, which may be oval or ſquare; the ovals are the neateſt but the moſt expenſive, they may be glazed in front, or front and back. The glaſs ſhould be let in upon an outſide rabbet[x], and confined by ſlips of paper being paſted along the outſide of the ſame rabbet, extending over the edge

[x] A term uſed amongſt mechanics, to imply a channel in the edge of a board, &c.

of

Plate IV

Fig. 1

Fig. 2

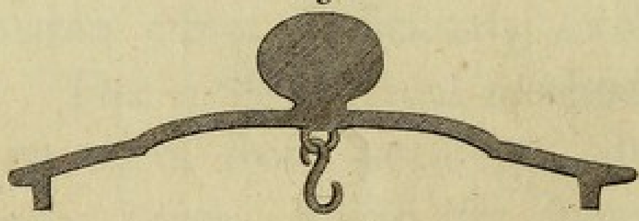
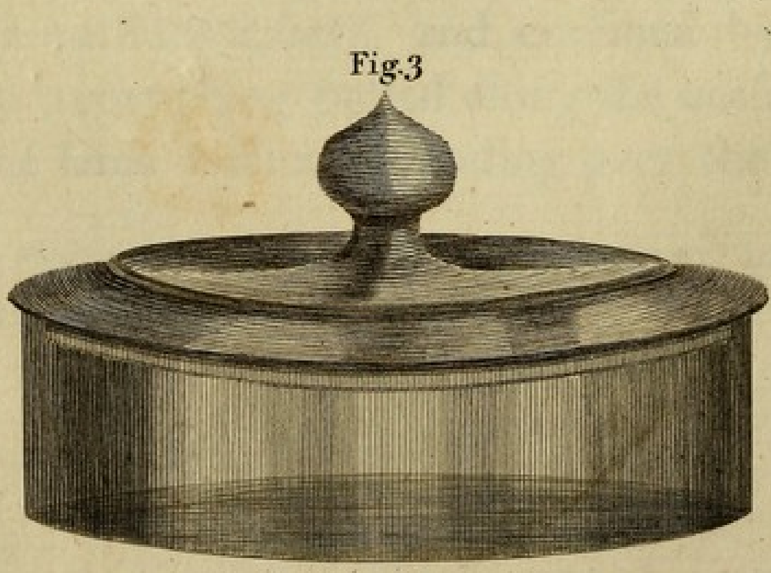


Fig. 3



T. Pole, delin. W. Darton & C°. sc.

of the glaſs. Theſe frames ſhould be lined with white paper, or any coloured paper, if neceſſary, to be contraſted to the colour of the Injection; the outſide is generally blacked.

Theſe preparations when thus finiſhed, ſhould be kept from the rays of the ſun, and heat of the fire; which, if the Injection is not very hard, will be likely to ſoften it, ſo that the branches will become flexible, and bend by their own weight.

EXPLANATION of PLATE IV.

A Repreſentation of two Kinds of Veſſels, for corroding Injected Preparations.

Fig. 1. The covered Goblet intended for hearts, livers, lungs, kidneys, ſpleens, and ſuch parts, which ſomewhat approach to the ſpherical form: it may be made of any ſize, adapted to the preparations above mentioned; the glaſs cover is intended to prevent the evaporation of the acid, which would otherwiſe take place. In the centre on the inſide of the cover, ſhould be made a glaſs loop, to receive a hook, for the purpoſe of ſuſpending ſuch preparation as will admit of it.

Fig. 2. A ſection of the Cover, ſhewing the loop and glaſs hook: there ſhould be in reſerve ſeveral hooks of different lengths, for if too long, the preparation will reſt upon the ſides, or bottom of the veſſel; and if too ſhort, it would not be completely immerſed in the acid liquor, ſo that hooks of different lengths will be required for different preparations. It is only in ſome caſes the hook can be uſed at all, and they are ſuch, whoſe veſſels bifurcate, before they are loſt in the part to be corroded, ſo as to admit the hook to be placed in the angle, as in the trachea, and ſometimes the kidneys. It is neceſſary it ſhould be made of glaſs to withſtand the action of the acid.

This invention is to prevent the fine extremities of the veſſels from being broken or bent.

Fig. 3. The glaſs corroding Baſon. This veſſel is broad and ſhallow, with a flat bottom, particularly intended for corroding placentæ, as well as ſome other preparations ſimilar in their figure, or for the containing a number of ſmaller parts, without their lying one upon another, by which they would receive conſiderable injury.

Theſe veſſels, as they are not intended for ornament, or exhibiting the preparations, may be made of common green glaſs, which will render them of a much lower price than if made of white flint.

ARTICLE

ARTICLE XXXI.

Injecting and Corroding the Heart and Veſſels of the Lungs.

FOR this purpoſe, thoſe of young ſubjects ſhould be choſen, on account of the inconvenient ſize of adult parts.

The firſt part of the proceſs is to remove as much as poſſible the coagula from the cavities of the Heart and adjacent blood veſſels, that it may not obſtruct the paſſage of the Injection. The right ſide of the Heart and pulmonary artery, may be injected by either of the venæ cavæ, fixing a pipe in one of them, and ſecuring the other by a ligature: its left ſide and the pulmonary veins may be injected by the aorta deſcendens, ſecuring by ligature

ture the ſubclavian and carotid arteries. The Injection by the aorta will be retrograde to the circulation; but we find that, in the dead ſubject, the valves do not ſo completely perform their office, as in the living, and that the Injection will in general readily paſs into the Heart, though contrary to the natural circulation; but to avoid any riſque, they may be perforated or broken down by ſome proper inſtrument introduced into the aorta. The air cells are next to be injected by the trachea; this is to be done with great care, for if the Injection is forced beyond a certain degree, it will form extravaſations on the ſurface. The two ſides of the Heart, and the air-cells ſhould be injected with different colours, which when finiſhed, the parts placed in a natural poſition, and the pipes removed, the preparation may be put immediately into the acid liquor for corroſion, and finiſhed according to the rules already laid down.

ARTICLE XXXII.

Injecting and Corroding the Heart.

A Heart for the purpoſe of Corroſion, need not be choſen free from fat, as is directed in moſt other injected preparations of this viſcus; for in the preſent caſe the heart and veſſels are to be deſtroyed by the acid liquor.

The mode of conducting the proceſs is, firſt, the Heart being taken out, waſh its cavities very clean, taking care that there be no coagulum left: more care is required in this reſpect, than any other preparation of the Heart. Drain out the water thoroughly, and fix a pipe in the ſuperior cava, to inject the right ſide, and another in one of the pulmonary veins, to inject the

the left ſide of the Heart; then ſecure the mouths of all the other veſſels by a ligature, and inject the two ſides of the heart with two different coloured Injections; when cold, remove the pipes, and put the part into the acid liquor for Corroſion, which, when completed and the preparation waſhed, gives the exact model of the internal parts of the heart and the large adjacent blood-veſſels. This preparation ſhould be varniſhed and preſerved under a glaſs cover from duſt and other injuries.

ARTICLE XXXIII.

Injecting and Corroding the Liver.

FOR the purpoſe of making a complete corroded preparation of the liver, it will require four pipes, and as many different coloured Injections. The

 veſſels

veſſels by which this viſcus is to be injected, are, the hæpatic artery coming off from the cæliaca, the vena portarum, the vena cava aſcendens, and the ductus hæpaticus, through which the bile is conveyed to the gall bladder. The vena cava on the ſuperior ſurface of the liver, ſhould be ſecured by a ligature, after the blood is waſhed out as clean as poſſible. The Injection is to be conducted according to the general rules; when this proceſs is finiſhed, remove the pipes, and put the liver into the acid liquor for Corroſion, before the Injection becomes cold and brittle, and never let it be handled till it is perfectly corroded; then let it be waſhed clean, and when dry, varniſhed and fixed upon a proper pedeſtal, ſecuring it from duſt, and other injuries by a glaſs cover.

ARTICLE

ARTICLE XXXIV.

Injecting the Spleen for Corrosion.

A Spleen chosen for the purpose of Corrosion, should always be very recent, as its texture is soon broken down by putrefaction. This is to be injected by the artery and vein only, having no excretory duct. If the spleen is very fresh, it will shew the extremities of the veins uniformly rounded. The process of corroding, cleaning, varnishing, &c. are described under their proper heads.

ARTICLE XXXV.

Injecting Kidneys for Corrosion.

A Kidney for a succefsful experiment of this kind, should be in a perfectly sound state, and free from any calculi.

The general intention of injecting the Kidneys of the human subject; as well as of other animals, is for Corrosion, as the ramifications of their vessels cannot be so well shewn in any other way. This is one of the most simple operations of the kind. There are three orders of vessels to be injected: the arteries, veins, and urinary duct. The artery is distinguishable from the vein, in this as in most other parts of the body, by its greater thicknefs and elasticity; and also by being generally (in its

its healthy ſtate) ſmaller than the vein, which veſſel it bears the greateſt reſemblance to; and the duct, by the enlargement near its entrance into the kidney, it being ſituated more inferiorly, and in general is much longer than the vein or artery; but this laſt depends upon accidental circumſtances. Proper ſized pipes being fixed into the veſſels, proceed according to the general rules, to fill each with a different coloured Injection; and after removing the pipes, immerſe the kidney in diluted muriatic acid (ſee page 122) for five or ſix weeks, or until the texture of every part of the kidney is ſo thoroughly deſtroyed, that it may be entirely waſhed away by a gentle ſtream of water.

Kidneys for the purpoſe of injecting, ſhould be removed from the body with care, that neither the part itſelf, or its veſſels, may be in the leaſt degree wounded; as by ſuch an accident the Injection will eſcape. Neither ſhould we be ſolicitous to remove the ſurrounding adeps and cellular membrane,

brane, more than may be juſt ſufficient for fixing the pipes, on account of the numerous ſmall branches which are frequently going off from the emulgents into the ſurrounding ſubſtance.

A variety of beautiful and elegant preparations may be made of the kidneys of different animals. The ſheep's is very ſimilar to the human in figure and ſtructure; the hog's is more extended than the ſheep's; the dog's ramify different from either, and the veſſels more ſuperficial; the horſe's varies much in its external figure, but makes a noble and beautiful preparation; the cow's differs in figure and ſtructure from either of the former; the tyger's has an order of ſuperficial veſſels, beautifully ramifying from the trunk of the emulgent, in a radiated direction over thoſe deeper ſeated. Thus by collecting from different animals, we may form a moſt pleaſing collection.

ARTICLE XXXVI.

Injecting and Corroding Placentæ.

A Placenta chosen for this purpose, should have large vessels, and the substance of it should be entire and not torn, so as to admit the Injection to escape; particular care should be taken that the arteries and veins are washed very clean from blood, and the water forced out of them again, by throwing in repeatedly, a syringe full of air: the vessels should be particularly well injected for the purpose of Corrosion; for if there are only one or two breaks or separations of the Injection in any of the larger branches, by means of blood or water remaining in the vessels, or by any other cause, it will render it unfit for this particular purpose; and in such case it may be made a different preparation of, as defcribed in Article XI. and with this view the membranes ought always to be preferved until it is feen how we fucceed with the Injection; which is to be performed in the fame manner as directed in the above article. If the Injection has fucceeded, then place the umbilical chord in fuch a pofition, as will be leaft inconvenient when the preparation is finifhed, for it cannot well be placed after it is corroded. It fhould be then put into the acid liquor before the Injection becomes cold and liable to break; to guard againft this, let it be handled as little as poffible. We fhould not attempt wafhing it until it is completely corroded, and then handled with the greateft caution; for this is a preparation of all others moft liable to be deftroyed by the fmalleft accident; to guard more effectually againft which, it fhould not be taken out of the veffel in which it is corroded, until it is completely wafhed; for the hands cannot eafily fupport uniformly fo broad a body;

body; ſo that the weight of ſuch parts as are not properly ſupported, will be liable to break the veſſels, the ſurrounding fleſhy parts having loſt all their ſtrength, by being reduced to a pulp.

ARTICLE XXXVII.

A Corroded Preparation of the Penis.

NOTHING more need be ſaid upon the ſubject of injecting the Penis for Corroſion, than what is already given in Article XV. as the Injection will in every reſpect be the ſame; when this is done, the part is to be put in the muriatic acid, until all the cuticular and membranous parts are fully deſtroyed; then it is to be removed from the acid, and waſhed as other corroded preparations, taking particular care not to break the vena magna, or any of its branches.

ARTICLE XXXVIII.

Injecting the Pancreas for Corrosion.

THE duct is all that can be readily injected in this viscus; it may be found entering the duodenum with the ductus communis, but in some instances a little below it; the part being carefully removed from the body, fix a pipe of the proper size in the duct, and conduct the Injection as usual.

To this gland we have no proper artery or vein, it being supplied only by branches from the splenic vessels; for which reason it is difficult to preserve by Corrosion more than the excretory duct, unless we inject and corrode the splenic vessels with it.

PREPA-

PREPARATIONS BY MACERATION.

ARTICLE XXXIX.

Preparing the Cancelli of Bones.

PREPARATIONS of this kind are made from the cylindrical bones; generally the os femoris, being the moſt complete oylinder; and the middle portion of the bone only ſhould be uſed, where the Cancelli is the moſt delicate; this part ſhould be cut into portions of about two inches in length, with a fine ſaw; the bone ſhould be ſo ſteadily fixed as not to injure the Cancelli by the jarring of the ſaw; then lay the pieces in clean water to macerate for two or three months, or until the oil has all eſcaped from the cavity; then dry them, and the reticulated delicate ſtructure of the Cancelli will appear beautifully diſtributed through the cavity. Theſe preparations ſhould always be made of recent bones, and handled with great care, as by a fall the beauty of the preparation will probably be deſtroyed.

ARTICLE XL.

Separating and Preſerving the Chirotheca, or Cuticle of the Hand, and Podatheca, or Cuticle of the Foot.

THESE preparations are eaſily made; and for this purpoſe, the hands and feet of infants only ſhould be uſed, on account of the cuticle being more equal in its thickneſs, and eaſily managed. For this purpoſe, we generally ſeparate the hand by a tranſverſe ſection half way, between the wriſt and elbow; and the foot half way between the ancle and knee; then

then lay them in clean water: if it becomes bloody, let it be changed daily, until it receives no more colour; afterwards ſuffer them to remain until putrefaction takes place, to ſuch a degree as will entirely looſen the cuticle, when it may be eaſily ſlipped off, by graſping the arm or leg with one hand, where the ſection is made, ſo as to draw down the cuticle with the other, in the manner we frequently ſlip off a ſtocking; it ſhould then be thrown into clean water to waſh it, and get out the folds it is thrown into in ſlipping it off; then remove it carefully from the water, by taking hold of the fingers or toes, ſo that the water may run out, otherwiſe its weight will tear it to pieces; afterwards put it in a glaſs, half filled with diluted ſpirits of wine (one part ſpirits and two of water) and by means of a tube introduced carefully to the inſide of the preparation, pour in more of the diluted ſpirits, and diſtend it ſo as to give it a natural figure, and by this means fill the glaſs. Theſe preparations being ſo light and

and delicate, ſcarcely require any ſuſpenſion; and when they are ſuſpended, will frequently, by turning the glaſs about, tear from the thread.

ARTICLE XLI.

Preparing the Air Veſſels of the Lungs by Maceration.

THE ramifications of the bronchea may be exhibited in a preparation made by Maceration; for this purpoſe, the lungs of a dead-born child ſhould be procured for the purpoſe; but thoſe of a ſlink calf will be found to anſwer better than any other. This proceſs is very ſimple, though in ſome reſpects not very agreeable to the olfactories, like many more of our anatomical employments: firſt, macerate the lungs in water, until they

they become ſufficiently putrid to break down the texture of the blood veſſels, cellular membrane, &c. which ſhould be waſhed away with the finger and thumb, whilſt the preparation is held under water, changing the water frequently, as it becomes thick and turbid with the pulpy matter which waſhes off, that it may be ſeen when the ramifications of the bronchea are ſufficiently ſreed from all ſurrounding matter; then put it into ſpirits of wine, diluted with an equal quantity of water.

ARTICLE

ARTICLE XLII.

Cleaning and Preparing Bones in general.

AS much of the fleſhy parts ſhould be taken from bones intended for preparation, as can conveniently be done; but it is not neceſſary they ſhould be ſeparated from each other, more than is required for the convenience of placing them in a veſſel, for the purpoſe of maceration, as in this proceſs it will readily take place. The bones are to be laid in clean water, of ſuch a depth as entirely to cover them, which water ſhould be changed every day, for about a week, or as long as it becomes diſcoloured with blood; then permit them to remain without changing, till putrefaction has thoroughly deſtroyed all the remaining fleſh and ligaments; this will require from three to ſix months, more or leſs, according to the ſeaſon of the year, or temperature of the atmoſphere, &c. In the extremities of the large cylindrical bones, holes ſhould be bored, about the ſize of a ſwan's quill, to give the water acceſs to their cavities, and a free exit to the madullary ſubſtance. As by evaporation the water will diminiſh, there ſhould be more added, from time to time, that none of the bones, or any part of them, may be ſuffered to remain uncovered, as by expoſure they would acquire a diſagreeable blackneſs, and loſe one of the greateſt ornaments of a ſkeleton—a fine, white, ivory complexion. It will be neceſſary, in order to preſerve the ſkeleton as clean as poſſible, eſpecially in London, and other large cities, where the atmoſphere abounds with particles of ſoot and other impurities, to keep the macerating veſſels always cloſely covered; as from neglect of this, the water will acquire ſo much of it, as to blacken the bones. When the putrefaction has deſtroyed the ligaments,

&c. the bones are then fit for cleaning; this is done by means of ſcraping off the fleſh, ligaments, and perioſteums; afterwards they ſhould be again laid in clean water for a few days, and well waſhed; then in lime water, or a ſolution of pearl-aſh[y], for about a week, when they may be taken out to dry, firſt waſhing them clean from the lime or pearl-aſh. In drying bones, they ſhould not be expoſed to the rays of the ſun, or before a fire, as too great a degree of heat brings the remaining medullary oil into the compact ſubſtance of the bones, and gives them a diſagreeable oily tranſparency; this is the great objection to boiling of bones, for the purpoſe of making ſkeletons, as the heat applied in that way has the ſame effect, unleſs they are boiled in the ſolution of pearl-aſh, which, ſome are of opinion, is one of the moſt effectual methods of whitening them, by its deſtroying the oil. Bleaching

[y] Solution of pearl-aſh for this purpoſe is made in the proportion of two ounces of pearl-aſh to a gallon of water.

is of all methods the moſt effectual, where it can be done to its greateſt advantage, that is, in a pure air; and more eſpecially on a ſea ſhore, where they can be daily waſhed with ſalt water.

ARTICLE XLIII.

Making the Natural Human Skeleton.

NATURAL Skeletons are made without any ſeparation of the bones from each other, in which the natural ligaments remain; theſe are generally made of very young ſubjects: but the ligaments when dry, not having their natural flexibility, is an inconvenience in this kind of ſkeleton, as the different kinds and extents of motion cannot be ſhewn in the ſeveral articulations.

In making theſe, we are firſt to remove from the bones, the cutis, muſcles, tendons, viſcera, and every thing except the connecting ligaments and cartilages, which ſhould be carefully avoided; this may be done without any regular order of diſſection: neither in this part of the proceſs, need any attention be paid to making the bones clean. The brain may be removed, through an opening in the large fontanel, if the ſubject is very young, if not, a perforation may be made with the trephine for that purpoſe. This being done, lay it in clean water, changing it every day, as long as it receives any tinge of blood from the ſkeleton; then let it remain until putrefaction has ſo far advanced as that the ſoft parts may eaſily be ſeparated from the bones, when it may be diſſected away with a knife, ſciſſors, and forceps, taking care not to injure the ligaments: this being done, lay it in water for a day or two, to get it perfectly clean from any colouring matter; then remove it into clean lime water, or ſolution of pearl-aſh,

for

for two or three days, to take off any greaſineſs, and give it a more beautiful white; when it has laid long enough, waſh off, with clean water, all the lime that adheres to the ſurface. When the preparation is thus cleaned and whitened, hang it up to dry, or dry it in a frame, calculated to preſerve the poſture we wiſh it to be fixed in. It will be neceſſary to remove the arms from the trunk, and when cleaned, to fix them on by a ſlender annealed iron wire[z].

It muſt be remembered, if the preparation is ſuffered to remain too long in the water, the ligaments themſelves will be deſtroyed by putrefaction, and the intention defeated.

[z] Wire rendered ſoft and pliable, by being made red hot, and ſuffered to cool again.

ARTICLE

ARTICLE XLIV.

Cleaning and Separating the Bones of the Head.

A Diſtinct article ſeems here neceſſary, as in the preceding, on preparing the Artificial Skeleton, the manner in which the bones of the head are ſeparated is not deſcribed, it being effected in a way peculiar to itſelf, and with a view to aſcertain the variety of bones which form the head, their number, names, proportionate ſize, figure, relative ſituation, &c.

To clean theſe bones, make numerous inciſions through the ſcalp and other ſoft parts, and macerate the head in water, changing it every day, until it no longer receives a bloody tinge; then ſuffer it to remain

remain until putrefaction has proceeded ſo far, as that the fleſhy parts and perioſteum will eaſily ſeparate; theſe ſhould be ſcraped off with a knife: the brain will readily waſh away, by the foramen magnum, if its texture is firſt broke down with a ſtick, introduced through that aperture. The head being perfectly cleaned in this way, muſt be filled with dried peas, well ſhaken in, ſo that as many may be introduced as poſſible; in this ſtate it is to be laid in water, ſo that by wetting and ſwelling the peas, the moſt uniform preſſure may be applied to the internal ſurface of the craneum, which will gently ſeparate the principal bones at the ſutures; after which the other ſeparations may be eaſily effected by the hand. But it ſhould be remembered, that in old perſons, the ſutures are generally obliterated, when a firm oſſific union takes place, very unfavourable for this purpoſe; ſo that a head, whether prepared with this intention, or to be preſerved entire, to ſhew the ſeveral bones and ſutures, ſhould be from a ſubject of

about

about twenty years of age, at which period the bones are the whiteſt, and the ſutures moſt perfect; beſides, the teeth are often in very good condition, which is a great ornament to the entire preparation.

The bones ſhould be whitened, if neceſſary, as deſcribed in Article XLII.

ARTICLE XLV.

Cleaning and Preparing Diſeaſed Bones.

DISEASED and healthy bones are cleaned much in the ſame way; but particular care is neceſſary in reſpect to the former. The ſurrounding ſoft parts are to be removed with the greateſt caution, and the edge of the knife is not to be carried ſo deep as to injure the fine ſpungy parts of the bone, which in ſome diſeaſes proceed

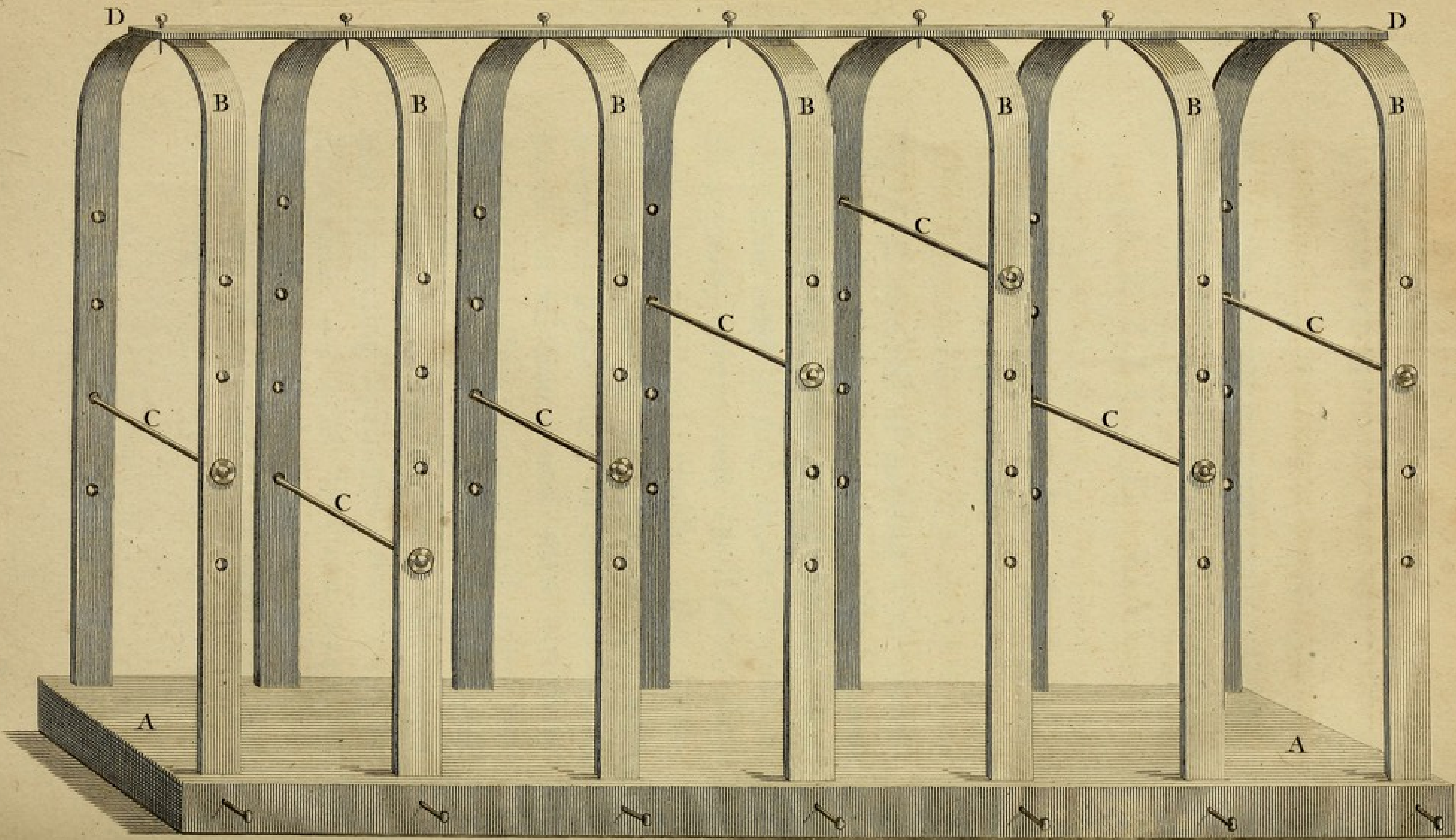
proceed a confiderable diftance from its original line; then macerate them, changing the water daily, as long as it is reddened; after which, let them lay till the flefhy parts are entirely deftroyed by putrefaction; this procefs will take up in fome cafes, five, eight, or ten months, efpecially if the weather is cold; then wafh away the foft parts by a ftream of water, in the manner of cleaning corroded preparations. The bones being perfectly cleaned, whiten them in alum water, or the folution of pearl-afh (fee page 150) and then dry them.

Thefe preparations require confiderable care, as they are eafily crumbled to pieces; therefore fhould always be enclofed in a glafs veffel, to prevent their being handled, or expofed to duft.

ARTICLE XLVI.

Natural Skeletons of Fiſh, Quadrupeds, Birds, &c.

THE method of making theſe ſkeletons is ſo ſimilar to that of the human natural ſkeleton (ſee Article XLIII.) that very little need be ſaid on the ſubject; in all animals, except very ſmall ones, they may be managed exactly the ſame. Mice, ſmall birds, &c. may be put into a box, of proper ſize, in which holes are bored on all ſides; and then buried in an ant-hill, when the ants will enter numerouſly at the holes, and eat away all the fleſhy parts, leaving only the bones and connecting ligaments; they may be afterwards macerated in clean water for a day or two, to extract the bloody colour, and to cleanſe them from any dirt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they may have acquired; then whitened by lime or alum water, and dried in frames or otherwiſe, as may be moſt convenient. In country places, I have ſometimes employed waſps for this purpoſe, placing the ſubject near one of their neſts, or in an empty ſugar caſk, where they reſort in great plenty; they perform the diſſection with much greater expedition, and equally as well as the ants. I have ſeen them clean the ſkeleton of a mouſe in two or three hours, when the ants would require a week.

EXPLANATION OF PLATE V.

Repreſenting the Skeleton Cradle.

This machine is intended for drying natural ſkeletons, or ſubjects prepared for the blood-veſſels, more particularly of quadrupeds, in any poſition; it consists of a plank, bows, rods, and lath.

A A. The Plank.
B B B B B B B. The Bows.
C C C C C C C. The Rods.
D D. The Lath.

These Machines may be made of different dimensions, and the number of bows according to the length of the plank. The plank should be made of considerable thickness, the bows of some elastic wood, and each end fixed in the plank, near the edge, by a mortise and tennant, confined by a moveable iron pin, which goes through the edge of the plank into the feet of each of the bows, to keep them in their places, as shewn in the plate; these should be made to take in and out at pleasure, as more or less of the bows may be required on different occasions. The bows should be placed about six inches from each other; and in the perpendicular part, on each side, are to be made

made ten or twelve holes, at equal diſtances from each other, large enough to paſs the wooden rods, as repreſented in the plate[a]. The lath is of equal length with the plank, and is fixed on the top, in a tranſverſe direction to the bows, to each of which it is fixed by a wooden pin paſſing through it and the centre of the bow, for the purpoſe of keeping them ſteady, and at their ſtated diſtance from each other.

The ſize of theſe machines may vary, according to the intention or purpoſe of the Anatomiſt.

The manner of placing quadrupeds in the cradle, for the purpoſe of drying them in any particular poſition, is to faſten the feet upon the plank, by a few ſmall nails or tenter-hooks driven into the plank; then ſuſpend the body, head and tail, by

[a] N. B. The holes in the bows repreſented in the plate, are not cloſe enough to each other, by about one half.

cords,

cords, from the lath, or by rods, placed ſo that the ſpine may reſt upon them. If one or more of the feet are required to be elevated, it ſhould be put in that poſture, and ſupported by one of the rods.

The Human Skeleton requires but very little ingenuity to keep it in a proper poſition, as ſuſpending it by the head, every part will fall almoſt into its natural poſture; but this machine may be uſeful to preſerve any other attitude, which may be deſired, by a very little contrivance.

No further deſcription will be neceſſary reſpecting the management of blood-veſſel ſubjects, as the ſame remarks will apply in both caſes.

PREPA-

PREPARATIONS BY DISTENTION.

ARTICLE XLVII.

Obſervations on diſtending hollow Preparations by Spirits of Wine.

THE intention of diſtending preparations by ſpirits, is either to give them their natural figure, or to exhibit more fully the parts of which they are compoſed, or occaſionally ſome morbid or preternatural appearance. The parts moſt commonly prepared in this way, are the lungs, inteſtines, urinary bladder, biliary cyſt, corpora cavernoſa, and ſpongeoſa of the penis, chirotheca, podatheca, ovæ, hydatids, &c. theſe when diſtended, are to be immerſed in ſpirits for a few days or a week, when they will acquire a conſider-

able

able degree of hardneſs, and be diſpoſed to keep the form given them by the Diſtention; after which, any part may be removed, or opening made, to ſhew their internal ſtructure, or peculiar appearance, for which the part may have been preſerved; the preparations are then to be properly ſuſpended in a glaſs veſſel of clean ſpirits.

It is to be remembered, that the rectified ſpirits of wine only is uſed for theſe purpoſes, on account of its ſtrength, perfect tranſparency, and being perfectly free from all colour.

ARTICLE

ARTICLE XLVIII.

General Obſervations on diſtending hollow Preparations with Air, Hair, Wool, Cotton, &c. for Drying.

THERE are many parts which require to be diſtended, in order to drying them in their natural form, ſuch as bladders, hydatids, inteſtines, large blood veſſels, &c. and where the nature of the caſe will admit of it, air is always the beſt, as the Diſtention is more uniform; but for Inflation it requires that the part ſhould be entire, or nearly ſo; if it ſhould have ſmall holes, they may be ſecured by paſſing a pin through the edges, and making a ligature round the pin; the pin prevents the ligature from ſlipping off, without including a conſiderable portion of the preparation; the points of the pins ſhould always be cut off as ſoon as the ligature is made, with a pair of nippers, to prevent their making more holes in the neighbouring parts, when it may be cautiouſly diſtended: if it ſhould be injected, ſometimes the Injection is ſo hard as to break into innumerable pieces, eſpecially in very cold weather, to prevent which, it may firſt be put into warm water to ſoften it, and render it more ductile.

When parts requiring Diſtention, for the purpoſe of drying them in their natural form, will not admit of inflation; ſuch as are large, or of conſiderable ſubſtance, as dropſical ovariæ, large arteries, anenreims, uterus, &c. they may be diſtended with curled hair, ſuch as is commonly uſed for ſtuffing chair bottoms, and may be had of the Cabinet-Makers; for more delicate preparations we may uſe wool or cotton, which ſhould be ſufficiently oiled [b], to prevent it ſticking to the

[b] The oil ſhould be put upon the wool before it is carded, as carding is the beſt way of diſtributing it equally.

part: in this condition they may be hung up in a current of air to dry; afterwards the hair, wool, or cotton, ſhould be removed as clean as poſſible, and the preparation varniſhed.

ARTICLE XLIX.

Diſtending hollow Preparations with Plaſter of Paris.

PARTS may be diſtended with Plaſter of Paris, where either its removal is not afterwards neceſſary (as is generally intended, when quickſilver, tallow, &c. are uſed) or where the quantity required is ſo large as to render it too expenſive to diſtend with Injection, as in caſe of diſtending the bladder, ſtomach, dura mater of the brain, inteſtines, &c. The intention of filling ſuch parts with Plaſter, is, in ſome inſtances, merely to give their natural figure in others, a ſufficient firmneſs and reſiſtance for the convenience of making models, to ſhew their external figure. Plaſter is particularly convenient, where winding canals prevent the uſe of wool, hair, &c. or where the part is ſo thin as to aſſume a rough, irregular, and unnatural ſurface, from the unequal Diſtention of the latter; and it may be uſed with leſs inconvenience than any other fluid material, when the parts have been lacerated and ſewed together again, being leſs diſpoſed than air to eſcape between the ſtitches. Thin injected preparations are alſo diſtended with it, to ſhew the diſtribution of blood-veſſels upon the white ground; but the various purpoſes for which this material may be employed, every man's own ideas will ſuggeſt, when he becomes a little familiar with its uſe.

For the purpoſe of diſtending preparations, it ſhould be mixed particularly well,

ſo

ſo as not to be lumpy, and rather thinner than for the common purpoſe of caſting, ſo that it may run freely into all parts; and if it is to paſs through fine tubes, as in diſtending the lungs, the mixture ought to be ſtrained through a cloth with open threads ſuitable for the purpoſe; but it ſhould all be done as quick as poſſible, or it will ſoon harden, and fruſtrate the intention.

Previous to pouring in the Plaſter, the part ſhould be made as clean as poſſible from blood, air, or water, and whatever elſe may disfigure it: the Plaſter ſhould be mixed in a glazed veſſel, and poured through a paper funnel into the part; the objection to the common tin funnel, is, that the Plaſter, when hard, does not eaſily come off, and ſoon deſtroys it by ruſt: when there is a ſufficient quantity introduced, ſecure the orifice by a ligature, and if the mixture has not paſſed equally, move it with the hand, and gently ſhake it, ſo as to make it run into all

parts

parts before it loſes its fluidity. In diſtending the lungs, and ſuch parts where the tubes through which it is to paſs, are very ſmall and numerous, it is neceſſary to force the Plaſter with a pipe and bladder, in the manner of injecting clyſters; but in this operation, two circumſtances ſhould be attended to; firſt, to exclude all the air from the bladder before we inject, and ſecure it by a ligature; in the next place, always to have enough of the Plaſter mixed to completely fill the part without mixing a ſecond quantity, as ſo much time would elapſe, that the firſt quantity injected would begin to harden before the ſecond is thrown in, by which the ſecond would not paſs, and the part be partially and imperfectly filled: but this inconvenience would not follow a ſecond mixture, where there are one or more large open cavities, having no immediate communication with each other, as in the heart.

ARTICLE

ARTICLE L.

A dry Preparation of the Penis, with the internal Organs of Generation, Urinary Bladder, &c.

FOR this preparation, the penis, urinary bladder, proſtrate gland, and veſiculæ ſeminales, a portion of the ureters, and vas deferens ſhould be removed from the body, without wounding the parts to be preſerved: what regards the Injection of the Penis, is given in Article XV. But if the blood-veſſels are injected in ſitu, the preparation will be more complete, as thoſe in the urinary bladder, &c. will then be filled. The fluids contained in the veſica urinaria, and veſiculæ ſeminales being preſſed out, theſe cavities may be inflated; the former by the

the ureters, both of which ſhould be diſ-tended; the latter by the vas deferens; or theſe may be diſtended by quickſilver, until the preparation is dry, and then evacuated by puncture: this being done, the preparation ſhould be ſuſpended, with the ſeveral parts in their natural relative ſiutations, and when dry, be properly varniſhed.

ARTICLE LI.

A Preparation of the Penis, to ſhew its Internal Structure.

FIRST inject the arteries of the penis with coarſe red Injection, by pipes fixed into the internal pudendal arteries, running on the inner ſide the branch of the iſchium, both to the right and left; then remove the penis from the body, as directed

directed in page 71, and the further procefs, in refpect to injecting, is as there defcribed, with this difference only, that quickfilver is to be ufed inftead of the coarfe Injection; this being finifhed, macerate it in water until the cuticle will peel off, then the part is to be fufpended in the air until thoroughly dried; after which, with a fharp knife, remove two lateral portions of the penis, extending from the glans to the extremities of the crura, fufficient to give a full view of the internal parts; two lateral portions are in like manner to be removed from the glans. Thefe apertures will give a free exit to the quickfilver, and better exhibit the internal parts; the preparation becoming tranfparent when immerfed in oil of turpentine, its cellular ftructure, and the ramifications of the arteries through the corpora cavernofa, will be very evident.

ARTICLE LII.

A Dry Preparation of the Heart, to ſhew its Cavities, Valves, Chordæ-Tendineæ, &c.

A Heart for this purpoſe ſhould be choſen free from fat; it is not neceſſary to preſerve any conſiderable length of veſſels; the cavities, &c. are all to be well waſhed out, and the part macerated in water for ſeveral days, or as long as may be, without weakening the veſſels by putrefaction, that when finiſhed, it may be as tranſparent as poſſible. When it has been macerated for a ſufficient length of time, tie up the extremities of the veſſels, firſt fixing a pipe in the ſuperior cava, entering the right auricle, to fill the right ſide of the Heart, and another in one of the pulmonary veins, entering the left auricle, to fill the left ſide; then inject with melted tallow, after which it is to be ſuſpended in the air until perfectly dry; but it is neceſſary to remember, that the internal parts remaining moiſt long after the external appear dry, it will be ſafeſt to let it hang for ſeveral weeks, even in very drying weather. The next part of the proceſs is to cut off the extremities of the veſſels, and make ſuch openings into the auricles and ventricles, as will afford the beſt view of the internal parts; then place it at a proper diſtance from the fire, and in ſuch poſitions as may be beſt adapted for melting and draining out the tallow from the cavities and veſſels; this ſhould be carefully and thoroughly done, taking care not to put it ſo near the fire, as to injure the preparation; afterwards it is to be varniſhed with the white ſpirit varniſh, this more readily drying on greaſy ſurfaces.

ARTICLE LIII.

Preparations of the Lungs in Spirits of Wine, or Oil of Turpentine, to ſhew their Air-Cells and Vaſcularity.

THE air-cells in the lungs of amphibious animals, are much larger than in thoſe of others, and therefore the moſt beautiful preparations of this kind are made from the lungs of the ſea turtle; and theſe will be much improved, by filling the pulmonary arteries and veins with red coloured minute Injection; afterwards immerſe the part in a veſſel containing ſpirits of wine, ſufficiently large to receive the expanded lungs without compreſſion; and whilſt in the veſſel, inject into them by the trachea, ſuch a quantity of the above ſpirits, as will fully dilate them,

without

without danger of rupture; this is to be confined in the cells by ligature on the trachea; let the preparation remain for a few days, after which, with a long and very ſharp knife, make a longitudinal and even ſection, by which the largeſt branches of the bronchiæ may be equally divided; this will give the ſpirits a free opportunity to eſcape from the cells. It ſhould not be handled or preſſed more than is abſolutely neceſſary, as preſſure will tend to cloſe up the cells; it is then to be ſuſpended in a glaſs veſſel of rectified ſpirits; in this way it affords not only a view of the air-cells, but alſo of the extremely minute vaſcularity.

The lungs of any other animal may be prepared in this way; but thoſe of the amphibious kind are generally preferred for the reaſons firſt mentioned.

When the lungs are to be preſerved in oil of turpentine, the proceſs is varied in the following manner: the pulmonary arte-

ries

ries and veins being injected as before, the bronchiæ may be diſtended with quickſilver, if they ſhould be very ſmall; but the larger kind would require a much greater quantity than they could ſuſtain the weight of without rupturing: this is to remain in the air-cells until they are thoroughly dry, which requires a conſiderable length of time; and to prevent putrefaction, they ſhould be previouſly laid in ſpirits of wine for a few days. When dried, make a ſection longitudinally, as before deſcribed, to permit the quickſilver to eſcape, then preſerve the part in a glaſs veſſel of oil of turpentine.

Lungs too large for Diſtention by quickſilver, may be filled with air, though this is apt to eſcape from the veſſels when diſtended to too great a degree; if they will retain the air, it is much the moſt convenient mode of filling them for the purpoſe of drying; when effected, make a longitudinal ſection, as before deſcribed, and preſerve the portions in ſine oil of turpentine. Longitudinal and tranſverſe ſlices of the lungs thus dried, ſhew the cells in different ways. The lungs thus prepared, and preſerved in oil of turpentine, are rendered tranſparent, by which their vaſcularity is much more eaſily ſeen.

ARTICU-

ARTICULATION.

ARTICLE LIV.

Of Articulating the Human Adult Skeleton.

ARTICULATION, in this ſenſe, is the artificial union of bones, ſo as to admit the ſeveral kinds, and the ſame extent of motion in each joint, as performed by the living animal.

The human adult ſkeleton only is the ſubject of this article; but the ſame rules equally apply to the bones of quadrupeds, &c.

Having previouſly cleaned and whitened the bones according to the directions already

already given in Article XLII. let them be thoroughly dried, then arranged upon a table, or ſome convenient place, to facilitate the proper application of them, and to avoid errors in the Articulation.

Firſt, the lower jaw is to be fixed in its natural ſituation by ſlender wires paſſed through its condyloid proceſſes and each temporal bone, ſo as to bring the articulatory ſurfaces into contact; the wires ſhould be ſo looſe as to admit the motions of the jaw, but as without ſome other ſupport, the anterior part would drop, and give an unnatural appearance, it is to be kept in its ſituation by a ſpiral wire, in the form of a bell-ſpring, having one end faſtened to the os ſphenoides, and the other to the middle of a wire ſtretched from one angle of the jaw to the other; this will act as a ſpring to keep the jaw in its natural poſture, and at the ſame time admit of occaſional depreſſion: ſome uſe a flat ſteel ſpring, with one end riveted to the os ſphenoides, and the other preffing upward under the fymphyfis of the jaw; but in this cafe an horizontal fection of the cranium muft be made, to carry the rivets through the fphenoid bone, and the portion of the cranium thus divided, may be faftened in its fituation by means of a brafs tea-cheft hinge, fixed by rivets on the pofterior part of the head, fo as to admit the upper portion to be raifed for occafionally infpecting the internal parts.

The firft cervical vertebra, called the Atlas, is then to be fixed by means of wires paffed through it and the bafis of the occipital bone, in any way that may beft confine it in its natural fituation, as no motion is here required between this and the parts to which it is thus united. A ftrong wire is then to be placed acrofs the aperture, fo as to form in its anterior part a circle fufficient to admit the end of the little finger; through this circle the upper extremity of the large wire is to paſs, upon which are ſtrung the other vertebræ.

In the next place, all the cervical, dorſal, and lumbar vertebræ are to be ſtrung in their proper order upon the wire, which ſhould be about the ſize of a ſmall gooſe-quill; and is to be incurvated according to the natural direction of the ſpine; this muſt paſs through the centre of the body of each vertebra, by means of holes bored for the purpoſe; its lower extremity is to enter the ſacrum, and be confined by a pin driven from its inner ſurface about an inch from the top, ſo as to paſs into a hole previouſly made in the wire to receive it. Between the bodies of the ſeveral vertebræ, for about ten or twelve joints above the ſacrum, are to be interpoſed thin circular pieces of cork, to imitate the natural cartilaginous ſubſtance, which ſeparates from each articulatory, ſurface, in the previous maceration of the bones; otherwiſe the ſpine would look unnatural, and the ſkeleton be conſiderably ſhortened:

theſe pieces of cork ſhould be about three-eighths of an inch thick anteriorly, and thoſe parts ſloped off in the form of a wedge, which lie next to the ſpinous proceſſes: this thickneſs is adapted to the interſtices of the lumbar vertebræ; but ſhould leſſen gradually as they advance upward, until they are ſcarcely the eighth of an inch; they ſhould be made larger than the circumference of the bodies of the vertebræ, and when the ſpine is completely articulated, the edges ſhould be cut away to reduce them to a proper ſize; after which they may be covered over, and any remaining inequalities filled with a compoſition of flour and water, ſlightly coloured with a ſmall quantity of burnt umber[b]: this ſhould be mixed to the conſiſtence of ſoft Glaziers putty, and the parts to which it is to be applied previouſly wetted, that it may ſtick the better. The joints being thus filled, the ſpine will have a much neater and more natural appearance. The upper extremity of the wire paſſed through

[b] A colour well known amongſt Painters.

the

the vertebræ, is to be left ſufficiently long to go through the circle made by the wire in the atlas, and through the foramen magnum, above the ſuperior part of the cranium, in which ſituation it muſt be confined by a nut ſcrewed upon the top of the wire cloſe to the bone: but when the horizontal ſection is made, and the ſuperior portion fixed by a hinge, another method ſhould be obſerved; in this caſe the large wire upon which the vertebræ are ſtrung, is only to extend about an inch and a half into the cavity of the cranium, and having a ſmall hole near its upper end, a ſlender wire is to be brought through a hole in the ſummit of the cranium, and faſtened to it; in the upper end of this ſlender wire ſhould be formed a loop or ring for the purpoſe of ſuſpending the ſkeleton when finiſhed. The wire paſſed through the cranium being pliable and yielding, will permit the ſuperior portion to be moved up and down at pleaſure.

The

The ribs are all to be united to the tranſverſe proceſſes of the dorſal vertebræ, by ſlender wires paſſed through their poſterior extremities, and thoſe proceſſes, in ſuch manner as will beſt confine them in their natural ſituation, without regard to preſerving any motion: in doing this, it will be found moſt convenient to articulate the lower ribs firſt, on each ſide, and ſo advance upward; for as the ribs are pointing obliquely downward, they will incommode the perſon, and there will be a danger of their being broke if this rule is not obſerved.

When the ribs are thus articulated to the ſpine, their anterior extremities are to be ſupported with narrow ſlips of Sadlers ſkirt-leather, in imitation of their natural cartilaginous appendages, by which they are connected to the Sternum; theſe ſlips will vary greatly in reſpect to their length, as thoſe coming from the tenth or eleventh rib will require to be in ſome ſubjects eight or nine times as long as thoſe connecting the firſt and ſecond: but the peculiar

peculiar figure of theſe, their various lengths, &c. will be eaſily underſtood by referring to a good drawing or plate, giving an anterior view of the ſkeleton. The manner of fixing theſe to the ribs, is to make a perpendicular ſlit with a ſaw, in the extremity of each rib, about half an inch deep, then cut the ends of the leathern ſlips ſufficiently thin to enter the ſlits, in which they are to be ſecured by glue, or by a pin paſſed anteriorly through the extremity of each rib, ſo as to go through the ends of the leather: theſe pins are to be cut off cloſe to the bone on each ſide; the other extremities are to be fixed in the ſternum, by holes made in both edges oppoſite to each other, in the parts to which the natural cartilages were attached; into theſe holes the extremities of the ſlips are to be introduced, and faſtened by glue or pins, in the ſame manner as they are fixed to the ribs. The ſlips are to be covered over with the paſte before mentioned, to give them a more agreeable appearance.

The

The Clavicles are to be articulated with the ſternum by means of a ſlender wire paſſed through each in any direction, ſo as to confine them in their natural ſituation, though ſome articulate them in the ſame manner as the bones of the fingers, hereafter deſcribed. Their ſuperior extremities may be articulated to the acromia of the ſcapulæ in the ſame manner as to the ſternum; but, as little motion is required in thoſe parts, I think it is as well to connect them by wires only.

The Scapulæ being articulated to the clavicles, may be looſely connected with the trunk by means of ſlender wires paſſed through their inferior angles and the ribs, ſituated immediately anterior to that part, and the ſuperior angles may be connected to the ſecond ribs in like manner; for as they have no natural articulation with the bones of the trunk, otherwiſe than by the clavicle, theſe connections are neceſſary to preſerve their proper ſituations, and give them a degree of ſteadineſs, which will more

more effectually fecure them from accidents.

The Bones of the Pelvis may be articulated in the following manner; the two offa ilei, to the lateral edges of the os facrum, by means of two ftrong wires paffed through the outfide of the pofterior part of the ileum from fide to fide, fo as to pierce the thick part of the facrum, one about an inch, or an inch and a half above the other; and upon the ends of each wire is to be placed a nut, half an inch in diameter, and fecured by a fcrew, or rivet. The fymphyfis of the offa pubis may be connected in the fame way, by one or two wires paffed through from fide to fide in a lateral direction, and fecured by rivets. A piece of cork a quarter of an inch thick, or not quite fo much, may be placed within the fymphyfis, as a fubftitute for the natural cartilage loft in the maceration: this fhould be covered with the pafte in like manner as the joints of the fpine. The os coccygis fhould be articulated with the lower extremity or apex of the ſacrum by a tin plate and two pins; as the bones of the finger hereafter deſcribed.

The head and trunk being finiſhed, the next to be deſcribed are the Extremities, and the firſt in order are the ſuperior. The humerus is to be articulated to the ſcapula in the following manner: make a longitudinal oblique inciſion with a ſaw, through the head of the bone, about an inch deep, in which a ſcrew (about two inches and a half long) is to be fixed; the upper half of the ſcrew ſhould be made flat, with a hole near the top to receive a wire, which is to be paſſed laterally through the head of the bone, to ſecure it in this ſituation, and admit it to be moved freely upward and downward in the inciſion, in the manner of a fixed lever: the part of the ſcrew projecting from the articulatory ſurface, is then to be ſcrewed into the centre of the glenoid cavity of the ſcapula; but as the bone in this part is of too ſoft and ſpongy

a texture

a texture for the ſcrew to retain its hold in, a ſquare braſs nut muſt be introduced into the ſubſtance of the bone, a quarter of an inch behind the glenoid cavity, ſo as to receive the ſcrew fixed in the head of the radius. This nut is to be introduced by a ſmall mortice cut from the inner ſurface, or that part of the bone next the thorax, and afterwards filled up with the paſte before mentioned. This kind of Articulation will admit every motion performed by the living ſubject, and the extremity may be removed from the trunk at any time, if neceſſary, by ſcrewing it on or off.

The Elbow is one of thoſe joints which are articulated with the tin plate and pins. A circular piece of tin plate, near an inch in diameter, is to be fixed firmly in a longitudinal direction, into the ridge of the ſemicircular notch, formed by the curvature of the olecranon of the ulna: this plate ſhould be fixed in the bone edgeways, and kept in its ſituation by two pins paſſing through it and the bone from ſide to ſide; the projecting part of this tin is to be received into a ſlit, made with a ſaw, in the deep groove in the middle of the lower extremity of the humerus, in which it is to be confined, ſo as to move freely in the manner of a hinge, by means of a pin paſſed laterally through the joint, in the centre of its motion, and through a hole made in the place to receive it.

The upper extremity of the Radius is articulated to the anterior proceſs of the ulna, by a ſmall oblong piece of tin plate, one end of which is firmly fixed in the outer ſurface of the proceſs, in a tranſverſe direction, the projecting end is received into a tranſverſe inciſion in the lateral articulatory ſurface of the radius, made with a ſaw, about a quarter of an inch from its upper extremity, in which ſituation it is to be confined by a pin, paſſing longitudinally in the extremity of the bone, through the tin plate as a centre of motion. The

lower

lower extremity of the ulna is articulated to the radius, in a manner exactly ſimilar to the former; the plate is to be faſtened tranſverſely in the lower extremity of the radius, where it articulates with the ulna, and the projecting end received into a tranſverſe inciſion in the lateral articulatory ſurface of the ulna, and confined by a pin paſſing into its extremity, and through a hole made in the plate to receive it, ſo that theſe two joints may admit of the motions performed by the living ſubject.

The two Bones of the Wriſt, which articulate with the radius, are connected to it by two oblong pieces of tin plate, ſecured by pins as before deſcribed: theſe plates are to be placed in a direction which will admit of flexion and extenſion.

The carpal and metacarpal Bones are to be connected by ſlender wires paſſed through them in any direction, ſo as to confine them in their natural relative ſituations,

tions, without regard to giving any great freedom of motion.

All the bones of the Fingers and Thumbs are to be articulated by ſmall oblong tin plates, of proper ſizes; each plate is to be firmly fixed in the upper extremity[c] of each bone, by a pin paſſing laterally through the bone and tin plate, ſo as to admit of flexion and extention. Theſe plates are all to be let into the extremities of the bones, by ſlitting them to a proper diſtance longitudinally with a ſaw.

The lower Extremities are to be articulated to the pelvis as follows: make a ſlit with a ſaw through the head of the femur, as far as its neck, in a direction longitudinal with the bone, in which a ſcrew, two inches and a half long, flattened one half its length, is to be fixed by a tranſverſe pin, paſſed through the head of the bone laterally into a hole made near the flat

[c] The extremity toward the elbow.

end

end of the ſcrew; the projecting end is to paſs through a perforation in the centre of the acetabulum, and confined by a nut ſcrewed on the end, within the pelvis, not ſo cloſe to the bone as to prevent the femur being moved freely to as great an extent as in the living ſubject.

The lower extremity of the Femur is to be connected to the upper extremity of the tibia, by a ſlip of tin plate, about four inches long, and three quarters of an inch broad; this is to be doubled acroſs its middle, ſo as to bring the two ends even: the inner ſurfaces of the tin are to be cloſely applied to each other, except at the bend, where an open loop is to be formed, for the paſſage of a wire about the ſize of a crow-quill: the two extremities of this tin plate, are to be inſerted perpendicularly into the poſterior edge of the articulatory ſurface of the tibia, ſo as to project from the bone about one inch, that the loop may be ſituated tranſverſely between the two condyles of the femur, when the bones

bones are placed in their natural relative ſituation; they are then to be connected by paſſing a wire tranſverſely and laterally through the condyles, near their poſterior ſurfaces, and through the loop of the tin plate. That part of the plate inſerted into the tibia, is to be ſecured by two pins driven into its poſterior ſurface, ſo as to pierce the plate in two different places.

Another, and I think a better method of articulating theſe bones, is by means of two tin plates about two inches long, to be driven perpendicularly, about half its length, into the centre of the two oval articulatory ſurfaces of the tibia, upon which the two condyles of the femur move. Theſe plates are to be ſecured ſteadily in this poſition, by two pins paſſed laterally through the bone and the plates in two different places; the projecting ends of theſe plates are to be let into the two condyles of the femur, by means of ſlitting them with a ſaw in the direction of their articulatory ſurfaces; then a pin is to be paſſed through the condyles laterally, and a hole made near the upper extremity of each plate for that purpoſe; thus the joint will be in the manner of a Carpenter's rule, and is called the rule joint.

The Patella is to be connected to the ſuperior extremity of the tibia at its anterior edge, by a tin plate about two inches long, and a quarter of an inch broad, which is to paſs upward into the inferior edge of the Patella, and downward into the ſuperior extremity and anterior edge of the tibia, and ſecured by a pin driven into the bones in ſuch a direction as to pierce the tin plate; or it may be connected to the femur in the following manner, and which is a more natural connection: make a ſlit with a ſaw poſteriorly, and perpendicularly in the ridge of the internal ſurface of the Patella, and a correſponding ſlit in the groove in the lower extremity of the femur anteriorly, in which the Patella moves in the living ſubject; then a ſlip of tin plate is to be introduced between the two bones, one end of which is to be ſecured in the Patella by a pin, paſſed laterally through the bone, and a hole previouſly made in the plate; and then in the femur, by a pin paſſed through it in the ſame manner: by this means the Patella may be moved up and down, and is a better imitation of its natural action in the living ſubject.

The Fibula may be connected to the tibia at its two extremities, by two oblong pieces of tin plate, fixed into four perpendicular ſlits, made with a ſaw, through the centre of each articulatory ſurface, and ſecured by tranſverſe pins paſſed anteriorly through the bones and tin plates, as hath been already deſcribed: or as this bone requires no motion, it may be connected by pins only, paſſed laterally through the fibula into the tibia, and ſecured by clinching their points.

The lower extremity of the Tibia is to be united to the aſtragalus, by a tin plate

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let into each by two perpendicular ſlits with a ſaw, and ſecured by two tranſverſe pins paſſed laterally through the Tibia, and another through the aſtragalus, and a hole in each end of the tin plate, ſo as to allow its natural flexion and extenſion.

The Os Calcis may be united to the aſtragalus by wires paſſed from one to the other in any direction moſt convenient, and that may beſt ſecure them in their natural ſituations.

The Scaphoides may be united to the anterior ſurface of the aſtragalus, by wires in like manner; the other bones of the tarſus may alſo be joined by the ſame method, as it will not be neceſſary to give them any motion by a more complicated and troubleſome mode of union, though they are ſometimes connected by tin plates and pins.

The metatarſal bones may be connected to their correſponding tarſals by wires, though ſometimes they are articulated by tin plates, as deſcribed in reſpect to the fingers; a wire ſhould be paſſed tranſverſely through the anterior extremities of theſe bones to connect them to each other, and preſerve them ſteadily in their relative ſituations.

The bones of the toes may be connected to the metatarſals, and to each other, by a wire paſſed through the under part of the thick anterior extremity of the metatarſal bones, longitudinally, and through the centre of the bones of the toes, ſecuring them by a ſmall clinch of the wire at each end; or they may be articulated by tin plates in the ſame manner as the bones of the fingers.

Through the whole of this Article tin plates are mentioned for the articulation of thoſe joints, where flexion and extenſion only are performed to any conſiderable extent, merely becauſe it has been uſually employed for that purpoſe, but there

there are ſome exceptions to its uſe; in the firſt place, it has a roughneſs of ſurface, which prevents the bones moving upon it with ſmoothneſs and facility; it is alſo liable to acquire a ruſt from the iron plate, upon which the tin is only a thin covering; this renders the movement of the bones ſtill more harſh: from theſe conſiderations, I would recommend braſs plates in preference to tin, and theſe ſhould vary in their thickneſs according to the ſize and ſtrength of the joints in which they are employed; as it would, for inſtance, be inconvenient to uſe thick plates in articulating the ſmall bones of the fingers, as a thicker ſaw would conſequently be required, and thereby the bones weakened; and in the elbow or knee joint, where forcible movements may be applied, from the length and ſize of the bones, thin plates would be liable to accidents by bending or breaking. Braſs wires are alſo to be preferred to iron, from their not being ſo liable to ruſt.

MODEL-

MODELLING.

ARTICLE LV.

Of the requisite Properties, &c. of Plaster of Paris for Modelling.

PLASTER of Paris, or Calcined Alabaster, is sold in the shops of this city, of very different qualities and prices, generally in bags, containing fourteen pounds each, at nine pence, one shilling, one and sixpence, and two shillings a bag, according to its quality; that of a middling price is used for making of moulds; the finer sort is for casts, to be poured first into the mould, when properly prepared; after it has formed a layer about half an inch, more or less, according to circumstances, then the coarser sort is to be uſed to fill up the mould, or to give it ſufficient thickneſs. Plaſter of Paris is a very periſhable article, and ſhould be had of proper age from the manufacturers as it may be wanted. The peculiar quality, which renders it ſo convenient for the purpoſes of receiving the impreſſion of both hard and ſoft bodies, is this, that when mixed with water (it being in the form of powder) to the conſiſtence of cream, it abſorbs the water in a few minutes, and becomes a firm ſolid maſs, without diminiſhing its bulk, and conſequently without cracking. If the plaſter is of a good quality, it ſhould, in about ſeven or ten minutes after mixing, become a conſiderably harder and ſtronger body than chalk, and of a perfectly clear white: when the quality is not good, it is much longer in conſolidating, and will not acquire a proper degree of hardneſs; and for a long time it will retain a ſoft paſty feel; and when the maſs has become perfectly dry by the evaporation of the ſuperfluous water, it is very eaſily crumbled to pieces between the finger and thumb:

thumb: this is acquired by its imbibing the moiſture from the atmoſphere, ſo that it ſhould always, when it is kept for any conſiderable time, be put in ſome very dry ſituation, where it may have conſtant warmth from the fire, and in ſuch a place it may keep good five or ſix months.

Plaſter of Paris may be coloured, by adding to it colouring ingredients of almoſt any kind in the form of powder, which ſhould be intimately mixed in a marble mortar, before the water is put to it.

This circumſtance ſhould be attended to, in mixing the plaſter for moulding or caſting, that if it is at firſt made too thick, and begins to ſet[d] too ſoon, and more water be added to thin or dilute it, it will always prove a bad, brittle compoſition; ſo that care ſhould always be taken not to add too much plaſter to the water at firſt.

[d] A term uſed in the art to imply its hardening.

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The ſtrength and hardneſs of the compoſition may be increaſed by the addition of a ſmall quantity of common ſize.

ARTICLE LVI.

General Obſervations on making Models in Plaſter of Paris.

THE art of modelling is both pleaſing and uſeful, and may be employed to a great variety of purpoſes, by the Anatomiſt, Antiquary, and Naturaliſt.

The advantage of uſing this ſubſtance in preference to others, is, that notwithſtanding a ſlight calcination of the alabaſter (of which it is made) reduces it to a pulverable ſtate, it becomes again a tenacious and cohering body, by being moiſtened with water, and afterwards ſuffered to dry; by this means, either a concave, or a convex figure, may be given to it when wet, by a proper mould or model, which it retains by the hardneſs it acquires when dry; and from theſe qualities it is ſuitable to the double purpoſe of making both moulds and models.

The particular manner of making Models (or Caſts, as they are commonly called) depends on the form of the ſubject, to be taken; where there are only ſlightly elevated parts, the proceſs is ſimple and eaſy; likewiſe, whereth ere are ſuch, as form only a right, or any greater angle with the principal ſurface or plan, from which they project: but where parts project in leſſer angles, or form curves, inclined toward the principal ſurface or plan, the work is more difficult. Theſe obſervations apply to moulds made upon hard inflexible bodies; but the caſe is very different with reſpect to thoſe made upon ſoft and yielding ſubſtances, as are all the

the ſoft parts of an animal body, for if a mould is made by pouring the fluid plaſter on ſuch ſubſtances, it may often be freed from the mould, even where the object of the experiment projects in acute angles, from the ſurface upon which it is laid; but when the caſt is made in ſuch moulds, the mould muſt be removed cautiouſly by piece-meals, by reaſon of the caſt not being flexible, as the original it is to imitate.

The Moulds ſhould be made of different degrees of ſtrength, according to the ſize of caſt intended to be made in it; ſmall ſubjects will not require them more than about half an inch thick; large ones will require them an inch, or if very large, an inch and a half; as the large moulds, from the ſize of the pieces, the weight of the caſts, and frequently ſome difficulty in removing them from the models, render them more liable to accidents; and where a conſiderable number of caſts are intended to be made from one mould, it will require particular care that the mould be accurately and ſtrongly made, and as equal in its thickneſs as may be.

ARTICLE LVII.

Making Moulds of Plaſter of Paris on ſoft Bodies, and caſting their Models.

WHEN the original to be copied by a Plaſter Model is ſoft and pliable, it will generally render the proceſs much more ſimple and eaſy, as is the caſe with the viſcera of the body; for in ſuch caſe, let the parts project as they may, this need not be conſidered in conſtructing the mould, for the original yields freely to preſſure, and may eaſily be extracted from the mould, even through an aperture leſs than the bulk of the ſubject;

this

this is particularly the caſe with the inteſtines, or any inflated part.

The firſt ſtep to be taken, is to greaſe the ſurface of the original, to prevent the plaſter ſticking to it: this may be done with olive oil, laid on with a ſoft painter's bruſh; but if the part is naturally ſlippery, this will be unneceſſary, as is the caſe with moſt of the internal parts of the body. Then lay the original on a ſmooth table, or other flat ſurface, previouſly greaſed, or covered with a cloth, to prevent the plaſter ſticking to it; then ſurround the original with a frame, or ridge of Glaziers putty, at ſuch a diſtance from it as will admit the plaſter to reſt upon the table, on all ſides of the ſubject, for about an inch, or ſo much as to give ſufficient ſtrength to the mould; then a ſufficient quantity of fluid plaſter is to be poured as uniformly as poſſible, over the whole ſurface, until it is every where covered to ſuch a thickneſs, as to give a proper ſubſtance to the mould, which may vary in

proportion

proportion to the ſize. The whole muſt then be ſuffered to remain in this condition, till the plaſter has attained its hardneſs; when the frame is taken away, the mould may be inverted, the ſubject removed from it, and when the plaſter is perfectly dry, let it be well ſeaſoned.

For making the Caſts in theſe moulds, the whole of the cavity muſt be firſt greaſed with a mixture of olive oil and lard, in equal parts, and then filled with fine fluid plaſter, and the plain of the mould formed by its reſting on the ſurface of the table, covered to a ſufficient thickneſs with courſe plaſter, to form a ſtrong baſis, or ſupport for the Caſt, if ſuch baſis is requiſite, which is particularly the caſe, where the parts repreſented are thin and membranous, and would not have ſufficient ſtrength of themſelves.

The plaſter being thus poured into the mould, ſuffer it to ſtand until it has acquired its greateſt degree of hardneſs;

then the mould is to be removed, the effecting of which is more or lefs difficult, according to the figure of the Model; if the projecting parts only form right or greater angles with the plain of the bafe or principal furface, the mould may be removed without breaking; but if the parts project in any leffer angles, or form curved lines, inclining toward the general furface or plain, it will be more difficult, and endanger the Model; for in this cafe the mould muft be broken away in fmall pieces, by means of a fmall mallet and chiffel.

Should any pieces of the mould be broken off, it may be cemented, by making the two broken furfaces perfectly wet, and applying them together with a little frefh mixed plafter interpofed; and after it is hardened, the joint may be fmoothed, by paring off the rough plafter which may have been preffed out in fixing the piece. If any fmall holes fhould be accidentally made by the chiffel, they may be thoroughly

thoroughly wetted with water, and then filled up with a little fresh mixed plaster, and smoothed over with the edge of a knife. When the Model is perfectly dry, it will be fit for colouring if necessary.

ARTICLE LVIII.

Making Moulds of Plaster of Paris on hard Bodies.

IT has been already mentioned in the general Observations, that the Mould is simple, and easily made, even upon hard substances, if none of the projecting parts of the figure form acute angles with the plain upon which it is raised; in this case, the subject being greased with a mixture of olive oil and hog's lard, in equal proportions, the plaster may be poured over the whole surface at once, to a proper thickness;

thickneſs; and when perfectly hardened, it may be removed in one entire piece, by ſeparating it from the pattern with the fingers, or by carefully introducing a blade of a knife into the joint, between the mould and original; then the mould is to be dried in any expoſed ſituation, or, if requiſite, it may be done more expeditiouſly by artificial heat; and afterwards ſeaſoned (ſee Article LIX.) when it will be ready for uſe. If the mould is not a very deep concave, the fine plaſter may be poured into it, and managed ſimilar to the making of the mould, ſpreading it equally thick over the whole ſurface. It is always to be remembered, that before the plaſter is poured into the mould, its ſurface muſt be very thinly ſpread over with the oil and lard, by means of a ſmall Painter's bruſh, and this is to be repeated every time a Caſt is made.

When the object of experiment, or what the artiſts call the Pattern, is of an irregular figure, conſiſting of a number of projections, hollows, curves, and angles, the work is more complicated, in respect to constructing the mould, but not so much difference in making the Cast.— To form the mould properly, it will be necessary to view attentively the pattern, and first consider in what way to proceed, that the mould may be composed of as few parts or pieces as possible; that is done by making every piece cover as much of the pattern as may be, without surrounding such projecting parts, or running into such hollows as when the plaster is hardened, will not admit the piece to come off (or what is technically called relieve or deliver) from the pattern without breaking, as, for example, would be the case with the head of the os femoris, if it was entirely enclosed in a body of hard plaster; for the cervix being of less diameter than the head, the aperture in the plaster situated round the cervix, would be two small for the head to deliver, so that the plaster should not exceed an exact hemisphere.

The ſame difficulty would occur by the plaſter running into a hollow, the outer orifice of which is any where of leſs diameter than the internal part; ſo that the mould is to be conſtructed according to the figure of the pattern (ſee Plate VI. Fig. 3). So ſimple a figure as a common, round, or oval calculus may be moulded in three parts only, but to mould an os femoris would probably require ten or twelve pieces, and the joints formed by the junction of thoſe ſeveral pieces, muſt run along the moſt prominent parts of the pattern: a little reflection will be ſufficient to ſhew the neceſſity of following this rule invariably, when the mould is conſtructed of two or more parts, for their more convenient relief and the ſtronger formation of the internal part; for where the inner ſurface projects into any hollow part of the pattern, ſuch projecting ridge or point is the moſt liable to accident; and if divided by a joint running through it, each part being but half the thickneſs and ſtrength it otherwiſe would have been, conſequently will be much more liable to ſuch accidents.

Where there is a neceſſity of internal pieces, for the filling up of any hollows, theſe are to be firſt made, and the outer pieces after the firſt has become hard.

The firſt thing to be obſerved in making a mould upon a hard and dry ſurface, is to have it ſmoothly rubbed over with the mixture of oil and lard, in equal parts; then ſuch hollows as require internal pieces, are to be filled up with a ſufficient quantity of fluid plaſter, and while in a ſoft ſtate fix a wire loop into it, as ſhewn in Plate VI. Fig. 3. The plaſter ſhould be a little raiſed in a pyramidal form round the wire, and when it is hard, the ſurface of it cut ſmooth with a knife, preſerving two or three angular ridges from the loop to the outer edge; that it may fix more ſteadily in the outer piece of the

mould

mould afterwards to be made upon it; then let the outer furface be well greafed, to prevent the fecond piece from adhering; the loop which is left projecting, is to be enclofed in a little Glaziers putty, or fome fuch fubftance, before the fecond piece is laid on; this may prevent an accident by the fecond piece taking hold of the loop, and preferves a hollow place for the cord.—For the formation of the fecond or outfide piece, mix a proper quantity of plafter, proportioned to the extent of furface it is to cover, and the intended thicknefs of the mould; when it is juft beginning to thicken, or affumes fuch a confiftence, as not very freely to run off the furface, begin and fpread it over the internal piece or pieces, and the pattern as far as poffible, fo as not to include more than will fafely deliver; and as the plafter becomes more tenacious, add more on the pattern, until it is of fufficient thicknefs, keeping the edges fmooth and fquare like the edge of a board: the plafter fhould be fpread equally on all parts, and the

beft

beſt inſtrument for doing this, is a Painter's palate knife, or what Apothecaries call a bolus knife; but for this purpoſe it ſhould be choſen not ſo pliable as they are generally made. When the outſide piece is hardened, the edges are to be pared ſmooth, and nearly ſquared with a ſmall pointed knife; in the edges are to be formed with the point of the knife, ſmall conical holes, an inch or more diſtance from each other, according to the ſize of the piece (ſee Plate VI. Fig. 1.) Theſe hollows receive the fluid plaſter in forming the adjoining parts of the mould, and occaſion points correſponding with the hollows, and are intended to preſerve the edges of the different pieces ſteadily in their proper relative ſituations; the third piece is then to be formed in a manner ſimilar to the ſecond, greaſing the edges of the former plentifully with the oil and lard, to prevent the pieces from adhering to each other, and thus the pattern is to be wholly encloſed, and afterwards an aperture cut in a ſuitable

able part of the mould for pouring in the plaſter, and ſmall holes are alſo to be bored through the mould, oppoſite to the wire loops fixed in the inſide pieces, through which a cord is to be conveyed from the loop, to confine ſuch pieces in their proper ſituation during the caſting.

There are frequently occurring, caſes in which the pattern is not to be wholly encloſed in the mould as before; for inſtance, the mould of a pedeſtal is to be left open at the bottom, where the fluid plaſter is to be poured in, alſo the bottom of a buſt where the ſuppoſed ſection of the body is made, likewiſe, when it may be deſigned to model part of the ſubject only, as a face, extremity, &c. In theſe caſes where the mould terminates, there will be, of courſe, an aperture left for the pouring in of the plaſter.

The mould being completely formed, the pieces are to be removed from the pattern or original, and expoſed to the air

air to dry, or dried by artificial heat, and then feafoned according to the rules given in Article LIX. when it will be fit for ufe.

EXPLANATION OF PLATE VI.

A Reprefentation of feveral Moulds in Plafter of Paris, to illuftrate the Method of conftructing them on hard and inflexible Subftances.

Fig. 1. Reprefents the mould of a human calculus, made in three equal parts, and is of the moft fimple conftruction that a mould can be made, to be certain of delivering the caft without difficulty, or hazard of breaking, where the pattern or original is to be completely enclofed, in order to copy every part of its furface. The feveral parts which compofe the mould, fhew alfo the proportionate thicknefs it will require, to give it proper ftrength.

A A A. The

Plate VI.

Fig. 3.

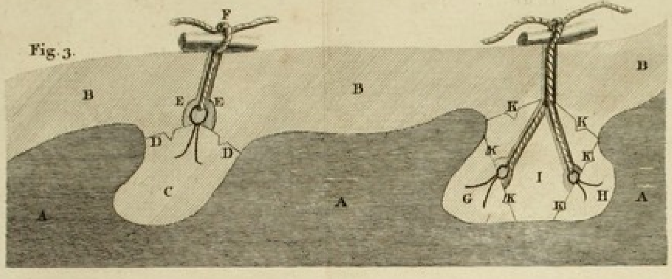


Fig. 1.

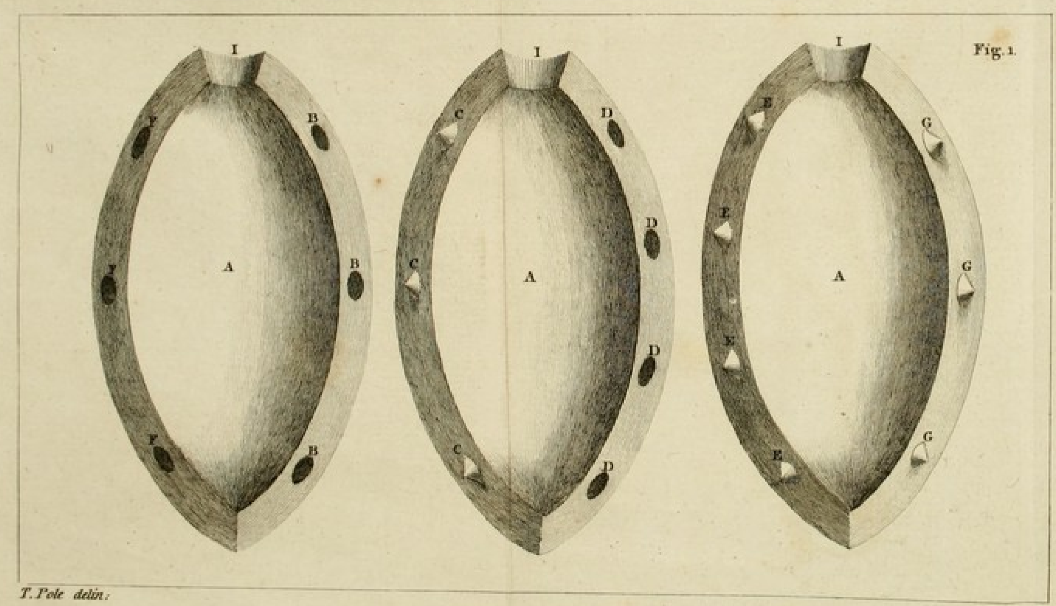
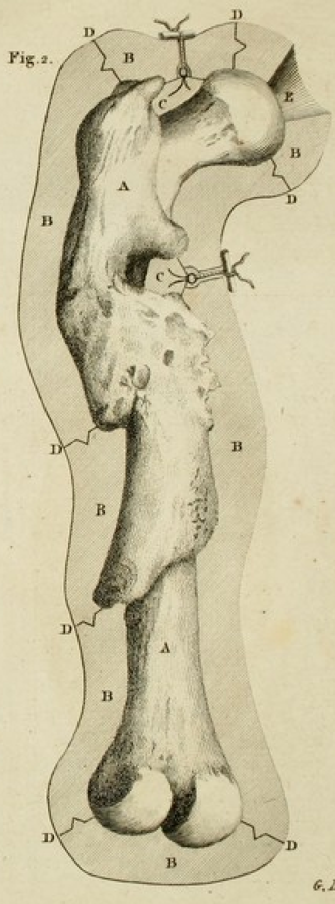


Fig. 2.



T. Pole delin.

G. Barrett sculp.

AAA. The internal concave ſurfaces, which were in immediate contact with the calculus, in the formation of the mould, and receive an exact impreſſion from its ſurface, whilſt the plaſter is in its fluid ſtate.

BBB. Are three holes bored in one edge of the firſt formed piece, with the point of a knife, after the edge had been cut ſmooth; theſe holes are filled with the fluid plaſter in forming the ſecond piece, which, when hardened, become the projecting joints, marked CCC. Theſe points are intended, by entering the correſponding holes, to keep the edges of the mould ſteadily fixed to each other. In like manner the holes DDDD receive the points EEEE, as alſo thoſe marked FFF receive the points GGG, for the ſame purpoſe. When the three parts are properly joined, they form a complete oval cavity. At the upper end of each portion of the mould, is a notch III, which when the parts are joined, form a circular aperture, expanded toward the outer

 ſurface;

ſurface; through this the fluid plaſter is to be poured in, in order to make the caſt; but before this is attempted, the ſeveral parts of the mould ſhould be ſecurely bound together with a cord; without which they would be liable to ſeparate, and ſuffer the plaſter to eſcape.

Fig. 2. A repreſentation or longitudinal ſection of a mould of a diſeaſed femur, to ſhew the manner in which the different parts are joined.

A A. The diſeaſed femur of an irregular figure.

B B B B B B. Are the ſeveral outſide pieces, which encloſe the bone.

C C. Are two inſide pieces to fill up thoſe hollow parts, which would otherwiſe prevent the mould from coming off from the bone without breaking; they are connected to the outſide pieces by the loop and ſtring, the principle of which is better explained in Fig. 3.

D D D D D D D. The ſeveral tranſverſe joints of the mould, ſo formed as to admit every piece to ſeparate eaſily from the

the bone and model, afterwards to be caſt in it. Thoſe joints are to be made upon the moſt prominent parts of the original or pattern. The break or angle in the middle of each joint, repreſents the holes and points, to keep the ſeveral pieces of the mould ſteadily fixed to each other, deſcribed in Fig. 1.

E. A circular aperture where the fluid plaſter is to be poured into the mould; this is always to be formed in one of the joinings; ſo that the projecting piece of plaſter in the aperture may deliver from the mould without breaking, and ſhould be made oppoſite to ſome plain projecting part of the original, which may be eaſily ſmoothed over with a knife, when the ſuperfluous piece is removed from the caſt.

Fig. 3. Repreſents an imaginary ſection of a mould, to illuſtrate the form and uſe of internal pieces, when the pattern or caſt will not otherwiſe deliver.

A A A. The original or pattern.

B B B. The outer part of the mould.

C. an internal piece, which fills up a deep hollow, running in an oblique direction; on which account, had it not been filled by a ſeparate piece, would, moſt probably, be broken off in removing the mould, as it will only deliver in a direction correſponding to its obliquity. In the upper part of this piece is fixed a braſs wire, with its points ſeparated, and incurvated, in order to give it a ſecurer hold; the loop projects above the ſurface, and is to be ſurrounded with Glaziers putty, to prevent the plaſter taking hold of it in making the outer piece.

D D. The upper ſurface of the internal piece.

E. E. Are two lines which deſcribe a vacant ſpace round the wire loop, and a hole bored through the outſide piece, for the paſſage of the cord, which is paſſed through the loop, and brought to the outer ſurface of the mould, over a ſhort piece of ſtick, and ſecured by a knot, F; when, by twiſting the cord, the internal

piece

piece is properly ſecured to the external, during the act of caſting the model; when the plaſter is hardened, and the mould is to be removed, the cord muſt be relaxed by untwiſting, the knot untied, and the ſtick removed; this will leave the outer piece at liberty to be removed with facility, and afterwards the inner piece. The loop and cord afford a convenient hold to withdraw the piece.

G, H, I. Are three internal pieces, which are ſometimes neceſſary to be formed in this way, when the cavity to be filled extends in two oppoſite directions, or is of greater diameter within them at its entrance; the two pieces, G and H, have the wire loop before deſcribed; the cords fixed to theſe paſs through two holes in the middle piece I, obliquely, toward the centre of its upper ſurface, where they meet, and are conveyed together to the outſide of the mould, and faſtened with a ſtick as before deſcribed. The piece marked I, anſwers as a key-piece to the other two, which being

being firſt removed (after the external part) gives room for the other two to be drawn out.

K K K K K K. Are very ſmall holes and points, to keep the ſeveral pieces ſteadily fixed in the proper ſituations, as deſcribed in Fig. 1.

ARTICLE LIX.

Seaſoning of Plaſter of Paris Moulds.

BY ſeaſoning of Moulds, is meant the preparing them for uſe after their firſt formation. The firſt part of this proceſs is to make them perfectly dry, which, if the mould is of conſiderable thickneſs, will require two or three weeks, unleſs it is expedited by artificial heat; when dry, they are to be bruſhed over plentifully

fully with boiled linfeed oil, made more drying by the addition of finely levigated litharge, white vitriol, or fugar of lead. The infide and the joints of the mould fhould be particularly well fupplied with it; if it be large, the outfide need not be attended to, as it would be an unneceffary wafte; very fmall moulds are fometimes boiled in the oil, which fills the pores more perfectly, and gives a greater hardnefs to the plafter. After the mould is fufficiently oiled, it is to be fet afide until perfectly dried; when, if the furface and joints are thinly brufhed over with the olive oil and lard, they will be fit for ufe.

If linfeed oil be ufed inftead of lard, to greafe the mould, in order for cafting, it will occafion the cafts in a fhort time to affume a difagreeable yellow colour.

ARTICLE LX.

Of casting with Plaster of Paris.

CASTING with Plaſter of Paris in moulds made of one entire piece, where the projecting parts form obtuſe angles with the general plane, is very ſimple and eaſy: nothing more is neceſſary than to thinly greaſe the inner ſurface with the oil and lard before mentioned, by means of a Painter's bruſh; and then pour into it firſt a ſmall quantity of plaſter, mixed to proper conſiſtence, to flow into all the minute parts, which may be aſſiſted by ſhaking the mould; then add more, ſo as to cover the whole inner ſurface; and as the plaſter begins to acquire a degree of firmneſs, it may be diſpoſed in any manner we wiſh, when it ſhould be raiſed

to

to a proper and equal thickneſs on the mould, by means of a bolus knife; the edges ſhould be kept ſquare and even, whilſt the plaſter is ſufficiently fluid; but this ſhould always be done as expeditiouſly as poſſible, carefully avoiding any diſturbance to the ſtratum of plaſter in conjunction with the mould. If we continue working the plaſter with the knife for an unneceſſary length of time, whilſt it is hardening or ſetting, it will greatly diminiſh its coheſion, and render the model brittle. When the model has acquired a ſufficient hardneſs, it may be removed from the mould by a careful ſeparation; but where the mould is ſuch as will not admit the delivery of the model, it is to be removed by piece-meals, with a ſmall hammer and chiſel: this will require great caution not to break the body of the model, or chip out pieces from the ſurface; if ſmall pieces ſhould be thus accidently broken off, it may be afterwards repaired by thoroughly wetting the parts, and then filling them with a little freſh mixed plaſter.

For caſting in moulds of a more complete cavity and complicated conſtruction, it will require a different proceſs; the ſeveral parts of which the mould is compoſed, having their internal ſurfaces and edges greaſed with the oil and lard as before, are to be properly put together and bound by a cord round the mould, in ſuch a manner as to ſecure them in that ſituation, and prevent the fluid plaſter eſcaping through the ſeveral joints: ſome fine plaſter is then to be poured in at the open end or aperture, and the mould turned about in all directions, ſo as to give the plaſter repeated opportunities of ſpreading itſelf over the internal ſurface: when this is ſufficiently hardened, pour in more freſh mixed plaſter, and turn the mould about as before, ſo as to ſpread it over the whole of the plaſter firſt introduced, and then the thickneſs of the caſt (varying according to its ſize) may be made up by a repetition of the ſame proceſs, with the cheaper kind of plaſter; this will give a fine ſurface to the caſt, which will look and anſwer as well as if the whole was compoſed of the ſame materials. If the model is to be made ſolid, it may be filled with the courſe plaſter after the mould is ſufficiently lined with the fine as above. When the caſt is hardened, the cord may be taken off, and the pieces of the mould carefully removed. To finiſh the model, nothing more is neceſſary than to ſmooth off the ſeams, and mend any little imperfection in the ſurface, by the means mentioned in Article LXIV.

Where internal pieces are required in the mould, they are to be ſecurely fixed to the external, as already deſcribed, before the ſeveral outer parts are put together for caſting; and the cords, after caſting, are always to be looſened by removing the twiſting ſticks and untying the knots, otherwiſe the caſt or mould will be broken in their ſeparation.

Such ſubjects as will not admit of being caſt entire (as a human figure with its extremities extended) are to be caſt in detached parts, and joined afterwards: the legs and arms may be ſtrengthened, by introducing a ſtick into the centre of the mould, whilſt the plaſter is in a fluid ſtate; but this is only done when the caſt is made ſolid, that is, no cavity left in its centre. In very ſmall ſlender parts a braſs wire may be uſed inſtead of wood; iron wire is apt to ruſt and give a ſtain to the model.

ARTICLE LXI.

Of moulding and caſting Buſts from living Subjects.

THIS is an operation which ſhould be conducted with conſiderable caution, otherwiſe the perſon ſubjected to it may

may be ſuffocated. This branch of the art of modelling will frequently be found very uſeful to thoſe, who wiſh to enrich their anatomical cabinets with rare and extraordinary caſes of diſeaſe, producing conſiderable alterations in the external figure of the parts.

For the purpoſe of making the mould, the perſon ſhould be laid horizontally on the back, with the head raiſed by a pillow to that exact poſition (relative to the body) in which it is naturally carried when the body is erect; then the parts to be repreſented, are to be very thinly covered with fine oil of almonds, by means of a ſoft Painter's bruſh; the face is then firſt to be covered with fine fluid plaſter[e], beginning at the upper part of the forehead, and ſpreading it over the eyes, which are to be kept cloſe, that the plaſter may not come in contact with the globe, yet not cloſed

[e] The plaſter for moulding from a living ſubject will be leſs diſagreeable, if mixed with warm, rather than cold water.

ſo

ſo forcibly as to cauſe wrinkles unnatural to the part; then cover the noſe and ears, firſt plugging up the meatus auditorii with cotton, and the noſtrils by a ſmall quantity of tow rolled up, of a proper ſize, to exclude the plaſter from thoſe cavities; during the time the noſe is thus ſtopped, the perſon is to breathe through the mouth; in this ſtate the fluid plaſter is to be brought down ſo low as to cover the upper lip, obſerving to leave the rolls of tow projecting out of the plaſter; the proceſs being carried thus far, the plaſter muſt be ſuffered to harden, when the tow may be withdrawn, which will leave the noſtrils open and free to breathe through; then the mouth is to be cloſed in a natural and eaſy poſition, and the plaſter advanced to the extremity of the chin: afterwards begin to cover that part of the breaſt to be repreſented, and ſpread the plaſter to the outſides of the arms, and upward, ſo as to meet and join that which is previouſly laid on the face; when the whole of the maſs has acquired its due hardneſs, it is to be be cautiouſly lifted off, ſo as not to break in any part, or give pain to the perſon; which may eaſily be prevented by a little deliberation and care.

The mould being thus conſtructed, let it be dried and ſeaſoned, the caſt or model is then to be made by pouring fluid plaſter over its concave or inner ſurface, and diſtributing it equally on all parts; but the holes in the mould, occaſioned by the tow placed in the noſtrils, ſhould be firſt ſtopped by a little plaſter, placed externally; after the caſt is thus formed, of ſufficient thickneſs in the mould, the latter is to be removed by carefully breaking it into ſmall pieces with a mallet and chiſel. The eyes, which are neceſſarily ſhewn cloſed, are to be carved, ſo as to repreſent the lids elevated, which is performed without difficulty; the noſtrils are alſo to be hollowed out with the point of a knife; the back part of the head, which is not repreſented, on account of the difficulty of moulding parts covered with hair,

being

being always diſpoſed to adhere to the mould, is to be afterwards formed by plaſter from the fancy or ingenuity of the artiſt: the edges of the model are to be neatly ſmoothed off, and then the buſt fixed on a proper pedeſtal.

Some artiſts who are in the frequent practice of taking maſks[f] and buſts, uſe metallic tubes to place in the noſtrils inſtead of the tow: but I have repeatedly uſed tow without any inconvenience; which ever is uſed, they ſhould be introduced ſo as not to diſtort the part where an exact repreſentation of the expreſſion of the countenance is required.

This operation, though it may ſtrike an inexperienced perſon with diſguſt, is performed without much inconvenience to the perſon ſubjected to it, and what perſonages of high rank ſubmit to, as the means of preſerving the moſt accurate and infallible likeneſſes.

[f] So called when the face only is caſt.

ARTICLE

ARTICLE LXII.

A Method of repreſenting the Out-lines of any Figure in Plaſter of Paris.

FIRST draw with a black-lead pencil the ſubject to be repreſented; then take a quire of paper, and lay upon it a ſmooth piece of tin foil, large enough to include the ſketch made with the pencil; lay the drawing on the foil, and with a blunt pointed inſtrument as large as a needle, fixed in a proper handle, trace the drawing over, bearing the point upon it ſufficiently hard to make a deep impreſſion in the foil, which afterwards is to be very lightly rubbed over with olive oil, by means of a fine camel's-hair pencil; then mix a ſufficient quantity of Plaſter of Paris, and pour over it to a proper thickneſs: when it has acquired a proper hardneſs, raiſe it from the foil, and there will appear in a raiſed line a copy of the drawing.

By a little care not to injure the foil, it will ſerve for a conſiderable number of copies. It muſt be remembered, that if the drawing is traced upon that ſide of the paper on which it is made, the plaſter impreſſion will ſhew it reverſed; ſo that to repreſent it according to the original, it ſhould be traced on the reverſed ſide of the paper, and for which reaſon oiled paper is preferable, as in that the drawing may be ſeen on the contrary ſide. This mode of taking impreſſions from foil, is ſimple, eaſy, and expeditious, where a conſiderable number of copies is wanted; and it ſeems probable, that with ſome little improvement, it may become much more uſeful; if a method can be acquired to impreſs deep concaves upon it, in ſuch a manner as to retain the impreſſions, it may be employed in making ſlightly raiſed figures in the manner of baſſo-relievos: this may be aſſiſted by ſpreading the foil on a ſmooth even bed of Glaziers putty, half an inch in thickneſs; the ſurface may be made an exact plain, by preſſing the foil upon it with a ſmooth piece of board; the putty, if not made too ſoft, will receive and retain the impreſſion made by preſſure on the foil with proper inſtruments, much better than if the foil lay on a hard table.

ARTICLE LXIII.

Of making Moulds in Wax on irregular Bodies, and caſting in Plaſter of Paris, without Seams.

THIS is a mode of making Caſts, which I believe has never been practiſed by any other perſon, though it is attended with very little difficulty; nor is that difficulty increaſed by the greater irregularity of bodies upon which the mould is made; but it muſt be remembered, that only ſuch bodies can be modelled in this way as may be readily deſtroyed by acids, therefore any fleſhy or bony ſubſtances are favourable for the purpoſe. The mould is to be made of a compoſition of wax, roſin, and turpentine varniſh; which ingredients are to be uſed in the ſame proportions

portions as for coarſe injection, only omitting the colouring matter, not as hurtful, but unneceſſary. The preparation to be modelled ſhould be placed upon a ſmooth board (made ſufficiently wet to prevent the wax from ſticking to it) in that exact poſition in which it ſhould be repreſented; then gradually pour on the compoſition, liquified by heat, and as it cools on the ſurface, add more from time to time, until every part is covered to a ſufficient thickneſs, to bear handling without bending, which would deform the mould, and conſequently the model: it ſhould be made at leaſt a quarter of an inch thick upon every part; when the wax is perfectly cold, let it be carefully removed from the board, and in its lower part an opening will be left, by a part of the original being in contact with the table or board, through which the whole, or a part of the preparation may be withdrawn, without injuring the mould. If it can by any means be wholly withdrawn, there is no occaſion for corroſion; but if it cannot, it

muſt

muſt be laid in the diluted muriatic acid to corrode it ſo perfectly, that it may be waſhed away with a ſtream of water. The acid is to be prepared in the ſame manner as directed for corroding injected preparations. The preparation being entirely diſſolved, and waſhed away, ſuffer the wax mould to get perfectly dry, then fill the cavity with Plaſter of Paris; when this is hardened, put it into a proper veſſel of water, and ſet it over the fire, in order that the wax may liquify and riſe to the ſurface, which when cold may be removed, and the plaſter model taken out; the water does not break down the texture of the plaſter. The model will not be of a good white, on account of the wax entering the pores on the ſurface, and communicating its colour; but this is a circumſtance of no conſequence, when it is to be painted after nature: if it ſhould be wiſhed to preſerve the model of a better white, white wax, without any mixture, ſhould be uſed.

To

To make a mould of ſome preparations, it may be neceſſary to immerſe them in a veſſel of melted wax until it is cold; but care ſhould be taken that no part touches the bottom or ſides of the veſſel, or floats to the ſurface; as this, however ſmall the points of contact, would form openings in the mould in improper places: when the wax is cold, remove the maſs from the veſſel in its entire form, and make an opening with a knife in the mould, oppoſite to that part of the preparation which is of leaſt conſequence if disfigured; this opening is to give the acid acceſs to the preparation, which is then to be corroded, and the proceſs conducted as before deſcribed.

ARTICLE

ARTICLE LXIV.

Of making Moulds in Putty, and casting with Plaster of Paris.

PUTTY[g] is not adapted to the making of moulds, to afford so accurate an imitation of the original as Plaster of Paris, but may sometimes be used for subjects whose figure will not admit of being moulded in plaster, as is the case where there are numerous projecting points incapable of delivering from a more solid mould, as is sometimes the case with diseased bones. One surface only, consisting of not more than an hemisphere or

[g] The Putty here meant is that kind used by the Glaziers; but with raw instead of boiled linseed oil.—It should be kept under water when not used, to preserve it from drying.

semicylinder,

ſemicylinder, can be repreſented in one caſt; ſo that to exhibit the whole ſurface of a bone it will require at leaſt two caſts.

The manner of conducting this proceſs is firſt to prepare a bed of putty upon a table, of ſuch ſize and ſhape as the original may require; it ſhould be ſquared at the ſides, and its upper ſurface made ſmooth and even; then the original is to be thoroughly wetted and placed upon the putty with that ſide downward intended to be repreſented; in that direction it muſt be preſſed into it, ſo as to include half its circumference, and the edges of the putty round the original ſhould be preſſed cloſe to it, then let it be carefully removed, preſerving the flatneſs of its upper ſurface by the aſſiſtance of a bolus knife. Upon the flat ſurface of the putty, make a rim at a ſufficient diſtance from the impreſſion, when it may be filled with fluid plaſter until it flows over the upper ſmooth ſurface to a proper thickneſs; that on the ſurface of the putty will afford a baſe to the model of a ſufficient ſtrength, if ſuch baſe is needful, which may not always be the caſe. When the plaſter is ſufficiently hardened, remove the putty from the caſt, pick out ſuch pieces as may be left in the interſtices, then cut the edges of the baſe ſquare and even. A repetition of the ſame kind of proceſs with the other ſide or ſides of the original, will give a good repreſentation of the ſubject. Thus I have frequently taken moulds of bones, ſhells, foſſils, &c. None but ſuch things as are tolerably hard and inflexible, can be imitated in this way, on account of the force neceſſary to be made to impreſs them in the putty, which, if they are yielding, will disfigure their ſeveral parts.

ARTICLE LXV.

Of ſmoothing the Surface of Plaſter Models.

THIS is done by means of fiſh-ſkin and Dutch ruſhes, ſuch as are uſed by Cabinet-Makers. When a caſt is taken from a mould, conſtructed of ſeveral parts or pieces, there will be ſmall projecting lines formed by the plaſter running a ſmall diſtance into the joints of the mould: theſe projecting lines, called ſeams, are to be carefully removed with a ſmall knife bent laterally, ſo that the point may not cut the ſurrounding parts; afterwards they may be more neatly ſmoothed by a Dutch ruſh.

The fiſh-ſkin is uſed to take off any more conſiderable roughneſs which may ariſe from a bad mould, or otherwiſe; but as it leaves a ſcratched rough ſurface, it ſhould be finiſhed by the ruſhes.

It frequently happens that there is a conſiderable number of air-holes in the ſurface of a model, owing to ſmall bubbles being retained under the plaſter, when poured into the mould, eſpecially if the plaſter ſhould be too thick; they are to be filled up with a little fluid plaſter with the point of a knife; but the holes ſhould be thoroughly wetted, by means of a ſponge dipped in clean water, immediately previous to the application of the plaſter. Theſe parts are afterwards to be ſmoothed over as before deſcribed.

ARTICLE

ARTICLE LXVI.

Of colouring Models in Plaster of Paris.

THERE are ſeveral kinds of colouring uſed upon Plaſter of Paris, but I do not know any better for anatomical models, than the common oil paint uſed by Sign and Houſe Painters; for this has one conſiderable advantage, in not being injured by waſhing with warm ſoap-water and a ſoft Painter's bruſh: it ſhould be done at leaſt two or three times over where the caſt is deſigned to ſhew any thing which has a natural gloſs, as any internal part from its moiſture, the globe of the eye, &c. When models of this kind are raiſed upon a plaſter ground, or baſe, they may, if neceſſary, have a gloſs, and the ground be painted of a dead colour; this diſtinction may be made by painting the model

model twice over, and the ground but once; or if it is not neceſſary to paint the model twice, it may be varniſhed when dry, with oil varniſh. Where the oil colouring is uſed, any little injury in the caſt or model may be repaired with Glaziers putty, which would not anſwer if water colours were uſed.

With reſpect to the art of imitating nature by colours, this can only be acquired by practice and the exerciſe of genius; it is an art diſtinct from anatomy, yet is very neceſſary for an Anatomiſt to be acquainted with; and was it more regarded as a neceſſary part of education in youth, deſigned for this ſtudy, we ſhould not have had ſo many badly executed anatomical plates, publiſhed by eminent authors; and by this means too many important caſes might have been communicated to the world, which, for want of it, are buried in oblivion.

ARTICLE

ARTICLE LXVII.

Of repairing injured Caſts in Plaſter of Paris.

CASTS in Plaſter of Paris are very liable to accidental injuries; and without ſome knowledge of this kind many valuable caſes may be wholly loſt.

When the caſts have never been oiled or painted, the pieces accidentally broken off may be replaced, by firſt thoroughly wetting the two parts which are to be joined, then ſpreading on each a little fluid plaſter, and applying the ſurfaces, preſſing them cloſe upon each other, and wiping off the ſuperfluous plaſter, which may be preſſed out of the joints: if any pieces ſhould be loſt, the ſpace may be filled up with freſh mixed plaſter; and when hardened, ſhaped with a knife, to imitate the original figure of the part, and afterwards ſmoothed with a Dutch ruſh, if neceſſary. When caſts have been oiled or painted with oil colours, they are not ſo favourable for repairing in this way, except when a fracture happens through a part of conſiderable thickneſs; for that which has once imbibed the oil, is unfavourable for the adheſion of freſh mixed plaſter; thoſe not diſpoſed, on this account, to adhere firmly, may be fixed by means of ſtrong glue; and if ſuch pieces, not very large, ſhould be loſt, the part may be ſupplied with bees-wax, rendered more pliable by the addition of a ſmall quantity of common turpentine: this may be uſed in ſuch a degree of heat, as will facilitate the formation of it according to the original figure of the part; ſhould it get cold and hard during the application, it may be eaſily ſoftened by holding near to it a hot iron of conſiderable thickneſs. Glaziers putty may be uſed for the filling up of any very ſmall chaſms; the part being lightly bruſhed over with boiled linſeed oil, before the putty is laid on, that it may ſtrike the better; when the part is neatly painted, it will be quite unobſervable. If putty is uſed to fill any conſiderable vacuities, it will ſhrink in the proceſs of drying, and give an uneven, unnatural ſurface; for which reaſon wax is recommended in ſuch caſes.

APPENDIX.

ARTICLE I.

Of preſerving Preparations in Spirits of Wine and Oil of Turpentine.

PREPARATIONS of almoſt every part are occaſionally kept in ſpirits, unleſs their ſize renders it impracticable, more eſpecially diſeaſed parts; as by this mode they undergo leſs change of appearance than by any other method of preſervation, and conſequently give the beſt idea of the natural or diſeaſed appearance; but the expenſiveneſs of the glaſs and ſpirits is a great inducement to the making of ſo many dry preparations.

All parts intended for preſervation, previous to their being put into ſpirits, ſhould be macerated in water to extract the bloody colour; and the water changed from day to day, as long as the part will bear it without putrefaction, or until it becomes quite colourleſs; and ſhould be freed by diſſection, from all ſurrounding unneceſſary cellular membrane, adeps, &c. which may obſcure what is intended to be ſhewn. It ſhould be then ſuſpended in ſpirits, in a poſition the moſt favourable for exhibiting its principal parts: if it ſhould be an hollow preparation, as a bladder, hydatid, inteſtine, &c. or if it ſhould have any hollow parts, cavities, or ſinuſes, neceſſary to be ſhewn, ſuch ſhould be diſtended with curled hair, wool, cotton, or the like; ſmall blood-veſſels, ducts, &c. are ſometimes ſhewn by the introduction of briſtles, quills, or bougies. In this way, the ſeveral parts being put into their natural poſition, and ſuſpended in ſpirits for a week or ten days, according to the bulk of the preparation, they be-

come

come much harder and firmer in their texture ; ſo that they will retain their poſi- tion, when the hair, wool, cotton, bougies, &c. are removed, to ſhew the hollow parts which have been diſtended by them. The preparation ſhould then be put into a glaſs of a proper ſize and figure, and filled with ſpirits finely filtered, and encloſed according to the directions given in the following Article.

It will not be always neceſſary to have the ſpirits of the ſame degree of ſtrength, this will depend upon what kind of pre- paration it is intended for ; all thoſe that are thick and maſſy ſhould be put into pure rectified ſpirits ; ſuch as are not ſo, will not require more than one half ſpirits, and the other water ; and ſuch as are very thin, as membranes, only one part of ſpirits and two of water. The ſpirits and water ſhould always be mixed ſome days before it is wanted, and finely filtered from the ſediment, which the mixture will ge- nerally occaſion.

Great care ſhould always be taken that the preparations are not dirtied in the diſſection, which may be avoided by diſſecting them on a clean cloth, and with clean hands; this circumſtance ought to be particularly attended to in wet preparations, as it will be moſt viſible on ſuch, from the whiteneſs occaſioned by the maceration and the ſpirits.

Immerſing preparations in oil of turpentine, is not ſo much for their preſervation, as to render them tranſparent, for the purpoſe of ſhewing ſome organization, as blood-veſſels, lymphatics, lacteals, excretory ducts, &c. and is only ſuited to ſuch as are dried.

The oil of turpentine uſed for this purpoſe ſhould be perfectly colourleſs and tranſparent, and great care taken to ſecure it in the veſſel; for it will be found difficult to prevent its eſcaping and trickling down the outſide of the glaſs, which gives it a diſagreeable ſtickineſs.

What

What peculiar preparations ſhould be kept in oil of turpentine, have been mentioned in their reſpective articles, where particular directions are given for the making of ſuch: the foregoing hints of the general intention in the uſe of this fluid will be ſufficient for the preſent place.

ARTICLE II.

Of encloſing Wet Preparations.

IT is found to be attended with no ſmall difficulty, to encloſe wet preparations in glaſſes, ſo as to prevent effectually the evaporation of the ſpirits, which occaſions very conſiderable trouble, and no ſmall expenſe to keep a large anatomical collection in good order. The method now commonly uſed is to ſuſpend them by a thread, which is brought over the rim of the glaſs,

glaſs, and faſtened to another, round the neck; but the thread ſo placed acts as a capillary ſiphon, and leads the ſpirits out of the glaſs to the neck, where it has an opportunity of evaporating, and therefore is improper.—A better method is to ſuſpend them by means of a glaſs float (as deſcribed in Plate VII. Fig. 6.) inſtead of a cork float, uſed by ſome Anatomiſts, which is apt to colour the ſpirits. When the mouth of the glaſs is ſmall enough, a cork may be fitted to it, and the ſuſpending thread carried through it and ſecured on the top; but ſuch a cork ſhould be choſen as will not be likely to colour the ſpirits, and ſhould not ſtand above the brim. Some place a piece of ſtick acroſs the mouth of the glaſs, and faſten the ſuſpending thread to that; either of which may be uſed according to our convenience or choice: oil has been ſometimes uſed to cover the ſurface of the ſpirits, in order to prevent its evaporation; but this will alſo ſometimes ſtain the ſpirits, or render it turbid, by being agitated together from

time

time to time. The floating globe, where the preparation is not too heavy, is undoubtedly the beſt method, as by it thoſe ſeveral inconveniencies are avoided. The preparation being then properly ſuſpended, the edge of the glaſs is to be covered with mucilage of gum arabic, a wet bladder drawn ſmooth and tight over it, and bound down by fine packthread, wound ſix or eight times round the neck of the glaſs; this being ſuffered to dry, is to be lightly rubbed over with mucilage, and covered with a fine piece of tin foil, cut ſo as to extend but juſt over the edge of the glaſs, and rubbed down to it as cloſe as poſſible; over this a ſecond bladder is drawn tight as before, and carefully bound down by as many regular turns of packthread as will extend from the rim to the bulge of the glaſs; this ſecond bladder ſhould ſmoothly cover the bulge of the glaſs, and be confined in that ſituation by a cord, binding it below until it is dry, when the edges may be cut ſmooth, as ſhewn in Plate VII. Sometimes the tin foil is put on firſt, and the bladders over it; and I think that much the beſt method: care ſhould be taken that there are no holes in the foil or bladders.

There is a mode of ſecuring the ſpirits, which I have found from many years experience, more effectual than thoſe in preſent general uſe, which is to cover the edge or rim of the glaſs, with fine ſoft Glaziers putty; then cover the mouth completely with a piece of flat common window glaſs, cut to the exact circumference of the rim of the veſſel it is deſigned to cover; the putty ſhould be laid on with great ſmoothneſs, ſo as to guard againſt any air-holes; the ſurfaces of the glaſs to come in contact with the putty, ſhould be previouſly rubbed with a little boiled linſeed oil, the glaſs cover ſhould be then carefully applied; over this may be ſtretched a bladder or two, and bound as before deſcribed, covering the bulge of the veſſel: when perfectly dry, the edge of the bladder round the bulge, ſhould be cut even with

a knife,

Plate VII

Fig:1

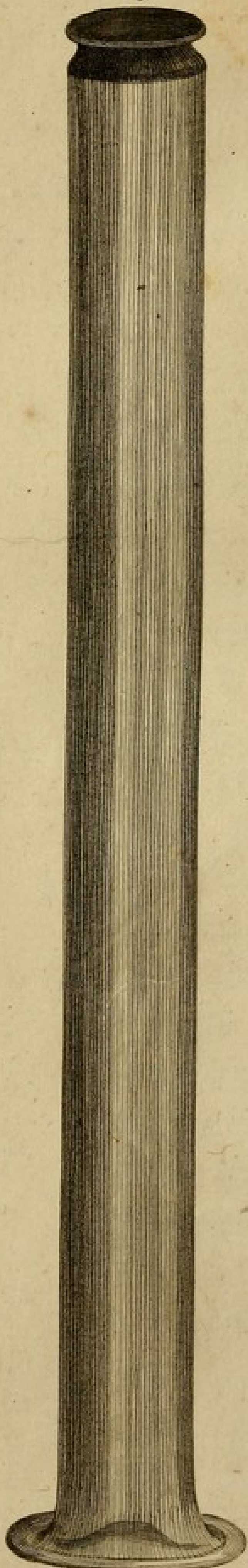


Fig 2

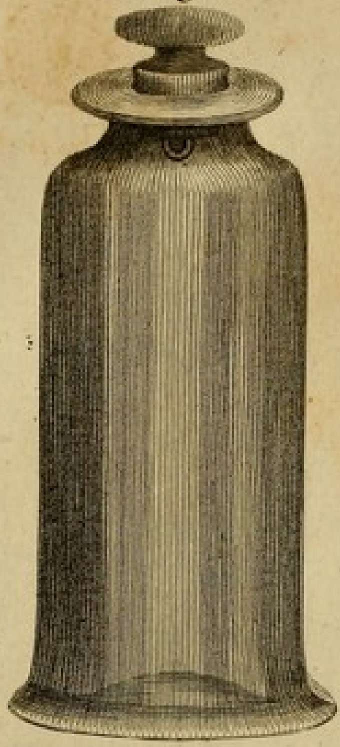


Fig. 3

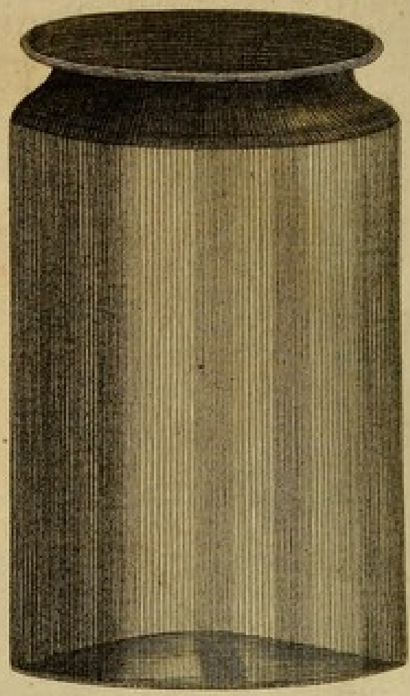


Fig. 5

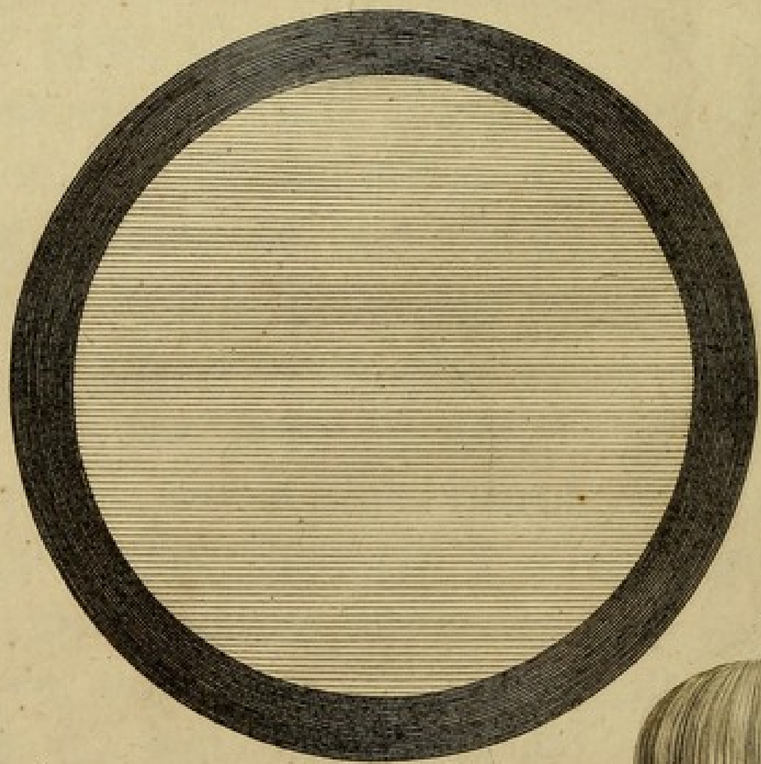


Fig. 6

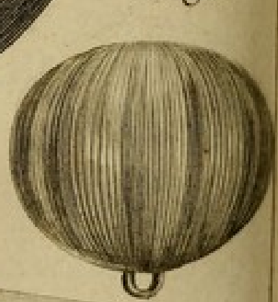
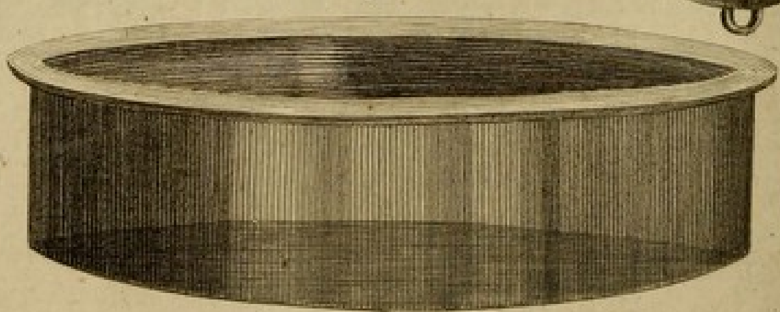


Fig. 4



T. Pole, delin. *W. Darton & C^o. sc.*

a knife, and the bladder covered with a black varniſh[h], to make it more ſecure, defend it from wet, and give it a neater appearance; or the glaſs veſſels may be made with covers, fitted on with putty.

EXPLANATION OF PLATE VII.

The Repreſentation of ſeveral Sorts of Glaſs Veſſels for encloſing Wet Preparations, either for Spirits of Wine, or Oil of Turpentine.

Fig. 1. A tall cylindrical veſſel, adapted to long ſlender preparations, ſuch as bones, portions of inteſtine, nerves, ſpecimens of worms, &c. This veſſel, on account of its height, ſhould have its bottom conſiderably expanded, to give it a ſafer ſtanding, as repreſented in the plate.

[h] Black varniſh is made by mixing as much lamp black with the copal, or oil varniſh, as will make it opaque.

Fig. 2. A veſſel for containing preparations of a flexible kind; for the narrowneſs of the mouth requires that they ſhould be compreſſed into a much ſmaller diameter, in order to get them into the veſſel, which will expand themſelves when ſuſpended in the ſpirits. This has a ground glaſs ſtopper, a method of cloſing preferable to any other, for retaining ſuch evaporable fluids as ſpirits of wine. At the bottom of the ſtopper is a glaſs loop, from which the preparations are to be ſuſpended, to avoid the neceſſity of glaſs floats, or a thread being brought through the mouth to the external air, which always greatly promotes the evaporation of the ſpirits. The bottom of this veſſel is alſo expanded to give it a better ſtanding, but not ſo much in proportion to its diameter as Fig. 1.

Fig. 3. A glaſs jar or veſſel for containing the more bulky and ſolid preparations; the mouth is made wide to receive ſuch as cannot be compreſſed into a ſmall diameter.

Fig. 4. A glaſs baſon for broad and flat preparations, as placentæ, female breaſts, &c. Theſe ſhould be made about three inches deep, and about twelve or thirteen in diameter; the rim of which is to be turned outward, and flattened horizontally, about three eights of an inch in breadth. In making theſe and all other veſſels for ſuch purpoſe, care ſhould be taken that the centre of the bottom is rather hollowed upward, for if they reſt the leaſt upon that part, it will give them a perpetual diſpoſition to move about at the ſlighteſt touch, and always render them liable to accidents.

Fig. 5. A flat circular piece of glaſs, of the ſame diameter as the rim of the baſon, with which the latter is to be covered in the following way. Firſt, oil the rim on its upper ſurface, very thinly with boiled linſeed oil, as alſo the margin of the glaſs cover, as far only as will come in contact with the rim; then lay a line of ſoft Glaziers putty on the rim

as

as ſmooth as poſſible, of ſufficient thickneſs to fill the interſtices between that and the glaſs cover; then lay on the cover, and preſs it down carefully until there is no vacancy left between it and the baſon for the evaporation of the ſpirits, ſmooth off the putty from the edge, and ſet it aſide for a few weeks, to give the putty an opportunity of drying; after which, a margin of black varniſh may be laid on of ſufficient breadth to conceal the putty, as ſhewn in the plate. In this kind of veſſel we view the preparation perpendicularly. It ſhould be remembered, that putty ought not to be uſed if the veſſel contains oil of turpentine, for that being eaſily miſcible with the turpentine, will ſoon incorporate with it, and render the whole muddy and opaque; it is attended with no ſmall difficulty to ſecure oil of turpentine in veſſels covered with glaſs, and ſhould always be avoided, if poſſible; it ſhould be ſecured by the old method, by ſtretching over the mouths of the veſſels bladders and tin foil, as has been already deſcribed, which,

which, when dry, may be cut ſo as to leave a margin, and afterwards black varniſhed.

Fig. 6. A glaſs float, which is intended to float upon the ſurface of the ſpirits, or oil of turpentine, in which preparations are placed, to ſuſpend them in the fluid, and avoid the neceſſity of a thread being brought over the rim of the veſſel. This float is a glaſs globe, blown very thin, with a ſmall loop in the bottom, from which the preparation is to be ſuſpended; theſe are only adapted to ſuch parts as are of no very conſiderable weight; one, two, or more of theſe may be uſed in the ſame veſſel, as occaſion may require. The floats ſhould not be made ſo ſpherical as repreſented in the plate, but more flattened on the ſide oppoſite to the loop, by which they will occupy leſs perpendicular ſpace.

ARTICLE

ARTICLE III.

General Obſervations on drying Preparations.

PARTS of the body deſigned for dry preparations, ſhould always be finiſhed with expedition, that their natural colour may be as little as poſſible altered by putrefaction, unleſs it is a neceſſary part of the proceſs, which is ſometimes the caſe: great care ſhould alſo be taken that they are not dirtied in the preparing, eſpecially if they are fine tranſparent membranes, as it will greatly diminiſh their beauty when finiſhed. The adeps ſhould every where be removed, otherwiſe it will give a greaſineſs to the ſurface very unfavourable for the drying of the varniſh; but to remedy this inconvenience more effectually, when the preparation is dry, it ſhould be waſhed over with ſoap-lees, and ſuffered to

dry

dry a ſecond time; this may be repeated two or three times, if occaſion requires; but if they are not of conſiderable ſubſtance, ſuch waſhing will be generally very inconvenient; and as this is one of the moſt unpleaſant circumſtances in dry preparations, we ought always to make choice, if poſſible, of ſuch parts as have little or no fat about them, unleſs it can be eaſily and entirely removed.

Anatomical preparations ſhould always be dried in the ſhade, where there is a thorough draught of air: on ſome occaſions, as in very damp warm weather, when they may be in danger of ſpoiling from putrefaction, they had better be dried by artificial heat, and may be placed at a conſiderable diſtance from a fire, eſpecially if they are injected with the coarſe or fine injection, otherwiſe it will be ſo ſoftened by the heat as to eſcape from the veſſels at every ſmall orifice: if they are hollow, as bladders, inteſtines, &c. diſtended with air and confined in them by

 ligature,

ligature, or otherwiſe, its rarefaction may burſt and deſtroy them. Membranes and other thin parts which are to be dried flat, may be ſtretched out upon a ſoft deal board with pins, having interpoſed between them and the board a piece of oiled paper, not ſo much oiled, as to leave any greaſineſs on the preparations, but merely to prevent their ſticking faſt to the board.

Dry preparations in general require conſiderable care to preſerve them from inſects[i], duſt, accidents, and the officious hands of thoſe unacquainted with their value, and the trouble of making them :— for this reaſon they ſhould be encloſed in veſſels, or caſed, according to their ſize or figure[k].

[i] See the Article on that ſubject. [k] See Plate VIII.

EXPLA-

Plate VIII

Fig.1

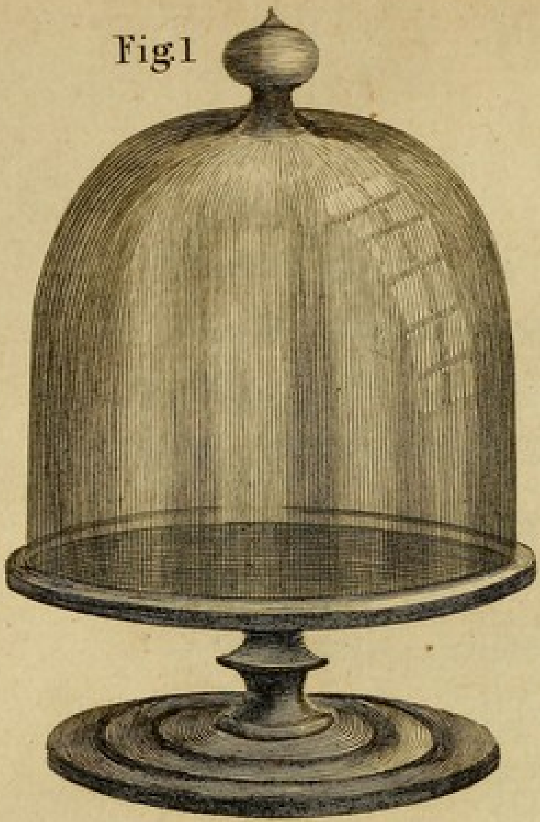


Fig.2

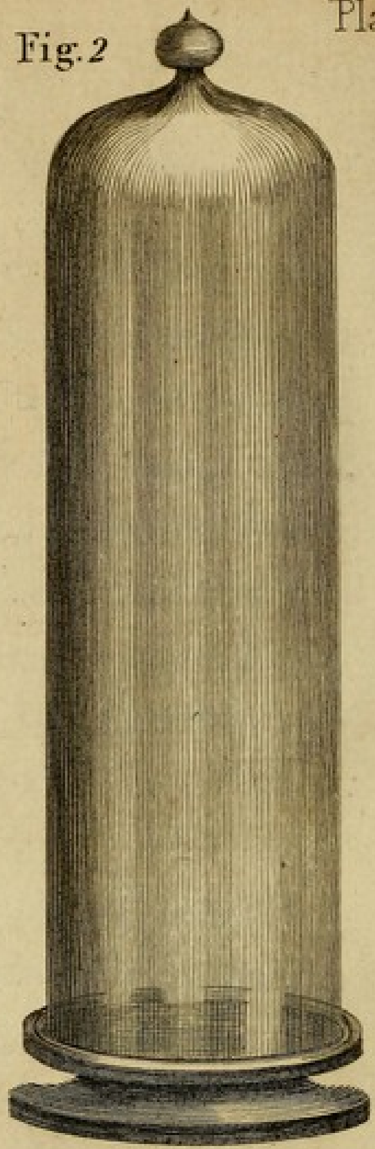


Fig.3

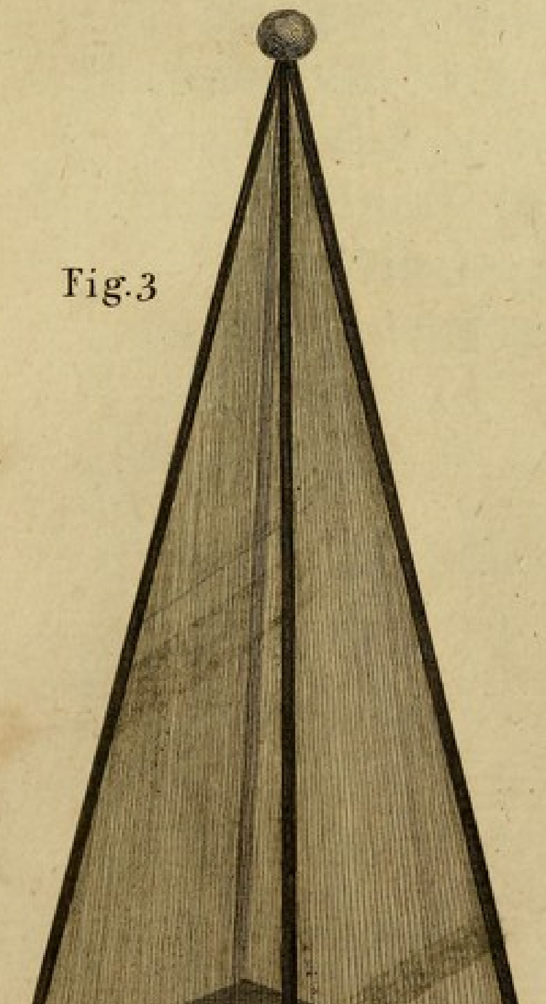
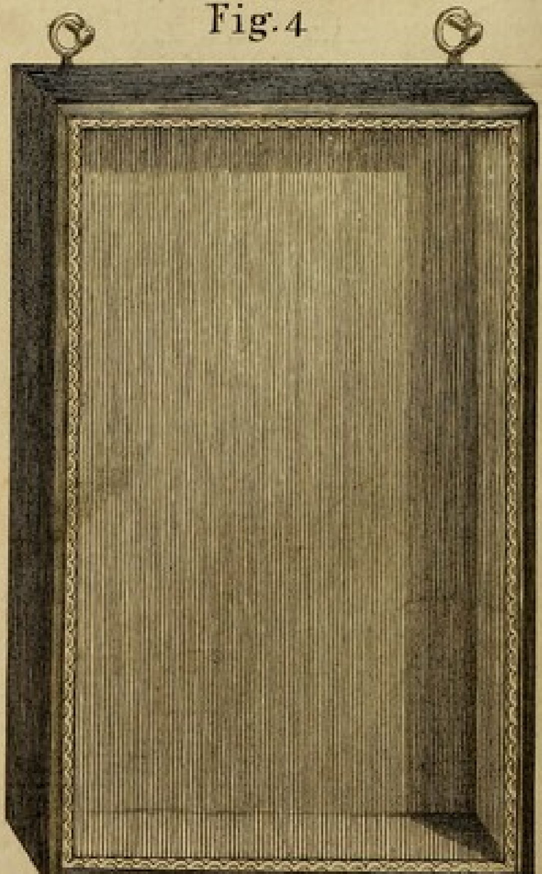


Fig.4



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EXPLANATION OF PLATE VIII.

Reprefenting feveral Cafes, Pedeftals, and Covers, for enclofing dry Preparations.

Fig. 1. A pedeftal and glafs cover for preferving corroded or other preparations approaching to the fpherical figure, as corroded livers, lungs, kidneys, fpleens, &c. or others not corroded, as hearts, heads, ftomachs, bladders, portions of inflated inteftines, &c.—Corroded preparations, and fometimes others, fhould be fixed on pedeftals[1] of Plafter of Paris, and cemented by glue, or mucilage of gum arabic on the centre of the wooden pedeftals here defcribed.

Fig. 2. A pedeftal and glafs cover intended for preparations approaching to the cylindrical figure, as fingle bones, fœtal fkeletons, blood-veffels, extremities, &c.

[1] See Plate IX.

Both theſe pedeſtals are uſually made of mahogany; the cover of the firſt being ſhort, is elevated upon a ſtem; the latter having ſo lofty a cover is made much flatter, that it may have a ſafer ſtanding, and rendered leſs liable to accidents, and ſhould be turned out of one piece of wood; the deep groove between its top and bottom, is for the convenience of lifting it; the covers are always to be made of the fineſt white flint glaſs.—Theſe two patterns exhibit the greateſt contraſt; but they may be made in any intermediate degree of height or diameter, to ſuit the purpoſe of the Anatomiſt, or the preparations they are deſigned to contain.

Fig. 3. A Pyramidal caſe. The frame of this caſe may be made of wood, or of metallic ſubſtance, in the manner of the common glaſs lantern, including four triangular pieces of glaſs; the bottom ſhould be made of wood of a conſiderable thickneſs, as it is ſometimes neceſſary to carry a wire through it to fix a preparation on;

on; and the thickneſs of the bottom is uſeful to preſerve it ſteady, eſpecially if the preparation ſhould be of conſiderable weight. The ball repreſented on the top of this caſe is for the convenience of lifting it. This is principally to contain diſeaſed cylindrical bones; one extremity of which is often enlarged by exoſtoſis, and is to be placed at the bottom of the caſe, and its ſmall extremity toward its apex. Some other preparations may alſo be adapted to this kind of caſe; but upon the ſame principle they may be made of different forms, as the figure of preparations may require: the pyramidal caſe has the advantage of a firm ſtanding on ſo broad a baſis.

Fig. 4. A glazed box caſe. This is made in all reſpects as a common box, with a rabbit ſtruck on the edge for the reception of a glaſs front, which is to be confined in its ſituation by ſlips of paper paſted round the outſide edge, and turned over into the rabbit, ſo as to cover the

glaſs

glaſs about a quarter of an inch: the inſide of the caſe is to be lined with white paper, which, if previouſly damped, in the manner Printers do for printing on, may be paſted in very ſmoothly. The back ſhould be ſo conſtructed as to take out, to remove the preparation occaſionally, or make any alteration in it: it is to be tacked in, and ſlips of paper paſted over the joints to prevent the leaſt duſt getting in; and laſtly, the outſide ſhould be blacked with lamp black, mixed with ſize, or a ſolution of iſinglaſs: this caſe is adapted to ſtand on a ſhelf, or may be ſuſpended on nails or hooks, by ſcrew rings.

The form of theſe caſes may be varied in length, breadth, or depth, according to the figure of the preparations they are intended to contain. Sometimes it may be neceſſary to have glaſs on both ſides, to give a more complete view of the preparation; theſe may be called the double glazed caſes.

The ſingle glazed caſes are the beſt adapted to placentæ, with the membranes

Plate IX

Fig.1

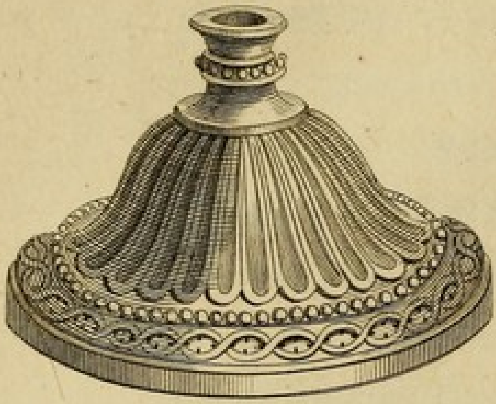


Fig. 2

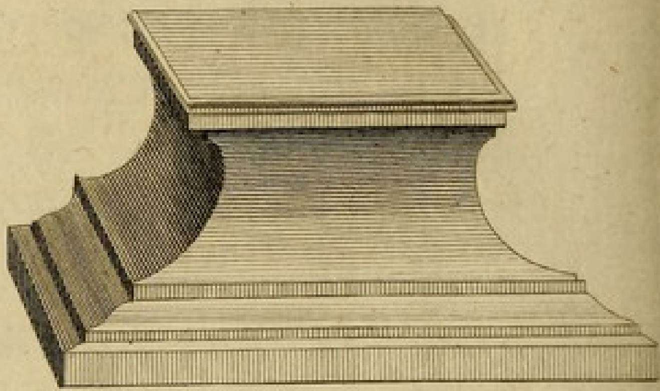


Fig. 3

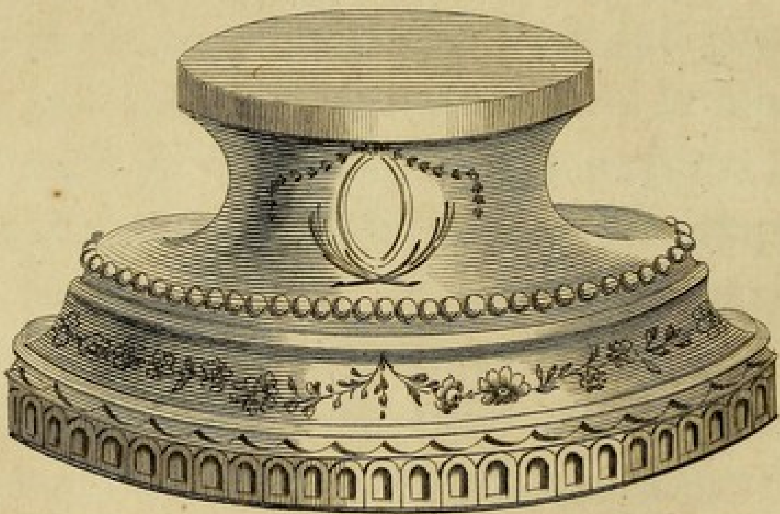


Fig: 4

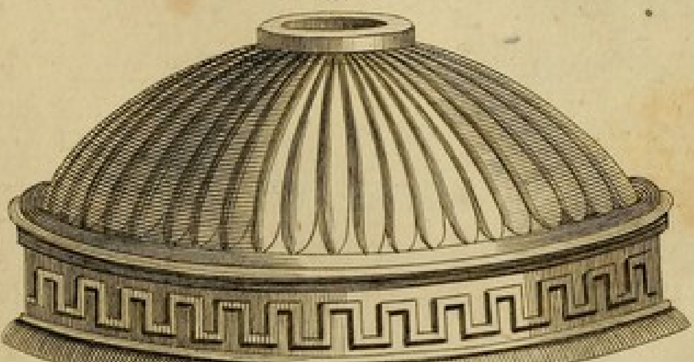
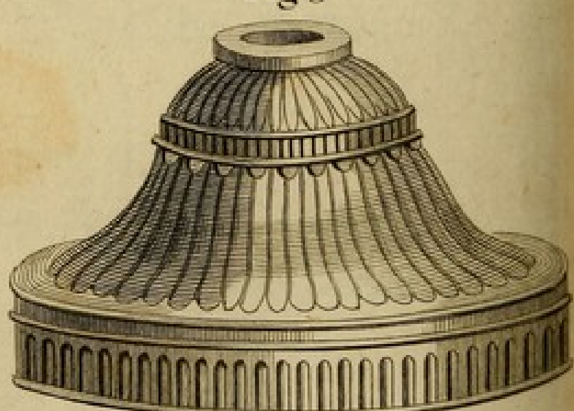


Fig. 5



T. Pole delin.

W. Darton & Co.

preſerved, or for any other hollow preparation of a ſimilar nature; they ſhould be faſtened to the backboard, by two or three ſmall tacks. The double glazed caſes are convenient for corroded preparations, as both ſides are wanted to be ſeen.

EXPLANATION OF PLATE IX.

Repreſenting ſeveral Pedeſtals caſt in Plaſter of Paris, intended to ſupport Corroded and many other Kinds of dried Preparations, and recommended as more conſiſtent with their Elegance, than the common rude Maſſes of Plaſter, upon which they have been hitherto generally placed.

Fig. 1. Is a ſmall pattern adapted to corroded kidneys, &c.

Fig. 2. This is deſigned to ſupport the models of heads, buſts, &c. caſt in Plaſter of of Paris, and for this purpofe fhould be made large.

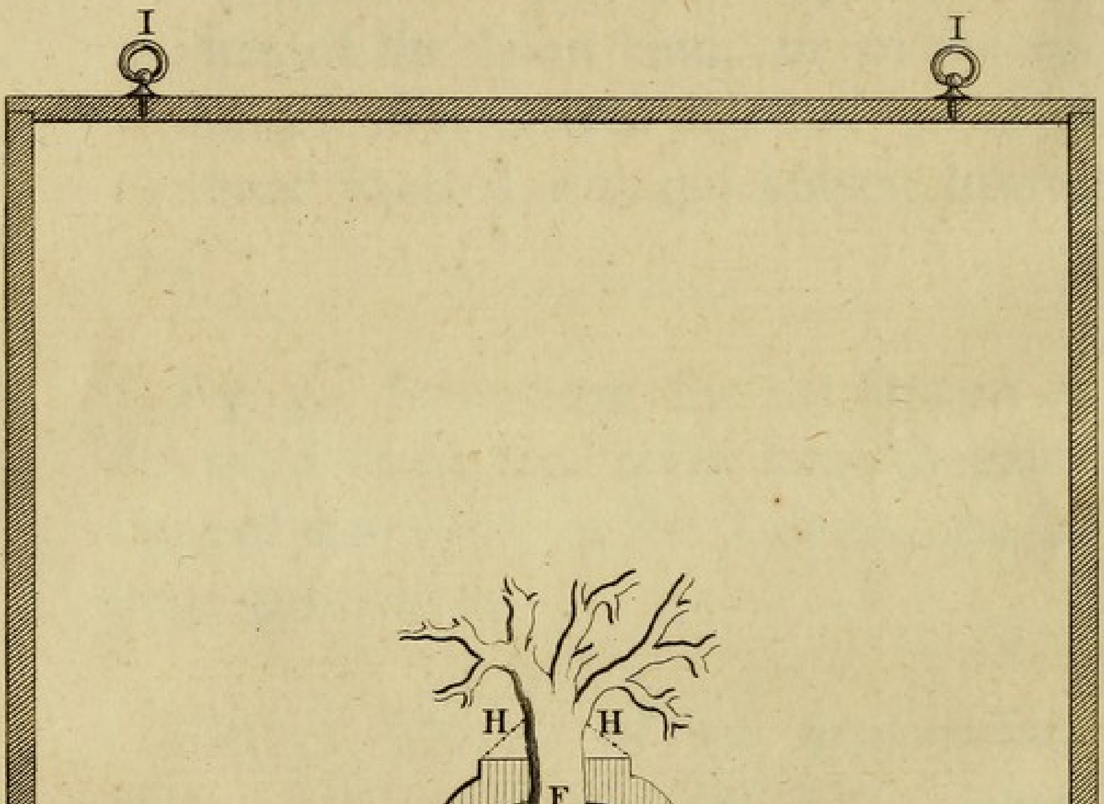
Fig. 3. Is adapted to fupport fmaller models of the fame kind, or of the extremities; alfo various injected parts, as the hand injected with quickfilver, hearts, &c.

Fig. 4. Is intended for the fupport of corroded livers, and other large preparations of that kind, as the kidneys, &c. of large quadrupeds.

Fig. 5. This is of an intermediate make, between Fig. 1 and Fig. 4; and may be ufed for corroded fpleens, lungs, kidneys, &c.

EXPLA-

Plate X



EXPLANATION OF PLATE X.

Repreſenting a perpendicular Section of a Glazed Caſe and Plaſter Pedeſtal, to ſhew the Manner of fixing in Corroded Preparations, and faſtening the Pedeſtal to the Caſe to ſecure it from Accidents.

A A. The edges of the divided pedeſtal, ſhewing its thickneſs.

B. A hollow which always remains when the mould is not filled with the plaſter.

C C. A circular piece of thin board, with its edges ſloped off, and fitted into the bottom of the pedeſtal after it is made, in which ſituation it is confined by filling up, with Plaſter of Paris, the groove, formed by the ſloping edge of the board and the bottom of the pedeſtal.

D D. The bottom of the caſe upon which the pedeſtal ſtands.

E. A ſcrew which paſſes upward through the bottom of the caſe into the board fixed in the pedeſtal, by which it is ſecurely kept in its ſituation.

F. The trunk of a blood-veſſel planted in the top of the pedeſtal, by means of an aperture made for its reception; and further ſecured in this ſituation by an addition of plaſter (G G) on the inſide, ſurrounding its large extremity: alſo on the top, ſo placed as to aſcend obliquely to the trunk of the veſſel, H H.

I I. Two picture-frame rings ſcrewed into the top of the caſe to ſuſpend it upon two nails.

ARTICLE IV.

Of preserving Urinary Calculi and other Concretions.

THE nature of Calculi admits of no great variety in the method of preservation; such as are large should be kept in a box of cotton, or under glass covers, to defend them from injury, which they are very liable to by falls, and even handling, especially if their texture is soft, as is frequently the case. In order to shew the laminated structure, and the progressive increase from the nucleus, they may be divided by a fine saw through the middle, and the two surfaces polished; or as a substitute for the true polish, may be varnished by mucilage of gum arabic, and, when dry, with spirituous copal varnish. Biliary concretions being generally small, should be ſtuck upon ſlips of card, with a little glue, or mucilage of gum arabic, and preſerved in glaſs veſſels; if there are a large number of them, they ſhould be placed in proper order on a piece of fine paſteboard of ſufficient ſize, and then bent round the inſide of a glaſs jar, with the concretions next to the glaſs. The paſteboard ſhould be coloured, if neceſſary, to make a contraſt, in order to exhibit them to better advantage.

ARTICLE V.

Of rendering ſolid Bones flexible and tranſparent.

FOR this purpoſe take a recent bone from any animal, and before it has become at all dried, macerate it in water for ſeveral weeks, to perfectly extract the blood;

blood; then cleanſe it from all the ſurrounding fleſhy, or membranous parts, and put it in a veſſel of acid liquor, made by adding three drachms of muriatic acid to one quart of water; the veſſel ſhould be adapted to the ſize and figure of the bone, that it may be entirely covered with the liquor; and that there may not be ſo large a ſurface for evaporation. In this liquor it is to remain for three, ſix, or nine months, according to its ſolidity and thickneſs: the acid is to be renewed from time to time, as it becomes abſorbed by the earthy part of the bone, and frequently ſtirred to mix the acid with the water. When the bone is become perfectly ſoft and flexible, remove it from the acid, and lay it in freſh clean water for a day or two; then ſuſpend it in a current of air, and when completely dried, and put into a glaſs veſſel of fine oil of turpentine, it will immediately, upon the oil penetrating the pores of the bone, aſſume a beautiful tranſparency, eſpecially if it is thin, as a ſcapula or an ileum.

Bones

Bones thus rendered ſoft and flexible by the acid, may be tied in knots; or if broad and flat, may be rolled up like paſte-board, and put into narrow-mouthed veſſels; they will afterwards by their own elaſticity, expand themſelves and reſume their natural figures: if they are preſerved in ſpirits of wine without being dried, they will not appear tranſparent, but quite natural: this is ſometimes done to puzzle perſons not acquainted with the art, to account for the introduction of a bone through an aperture ſo much ſmaller than its diameter.

ARTICLE

ARTICLE VI.

A Preparation to ſhew the Diſtribution of the Nerves.

FOR making a preparation to ſhew the diſtribution of the nerves, a ſmall ſubject is more convenient than a large one, as it is eaſier to preſerve it in ſpirits.

The diſſection is begun by an inciſion through the cutis, from the lower part of the forehead, over the ſummit of the head to the occiput, then turning the ſcalp on each ſide, in order to remove a circular portion of the cranium with a ſaw; then remove the brain, in doing which, the nerves are to be cut off cloſe to this viſcus, beginning with the firſt pair, and gradually proceeding to the tenth pair.

As

As the firſt pair, the olfactory, are too tender to be traced by diſſection, the ſecond pair, the optic, are to be ſhewn by making a ſection to remove the ſuperior part of the orbit. This ſhould be large enough to admit of ſhewing the diſtribution of the branches of the third, fourth, fifth, and ſixth pair of nerves, which are contained within the orbit. When theſe branches have been traced, the remaining branches of the fifth pair may be diſſected. Theſe are the ſuperior and inferior maxillary branches. By dividing the maxilla inferior at its ſymphyſis, the branches of the inferior maxillary nerve may be traced, one of which paſſes to the tongue, and another enters the foramen near the angle of the lower jaw.

The portio dura of the ſeventh pair is next to be traced, by carefully raiſing the parotid gland, when it will be found paſſing out at the ſtylo-maſtoid foramen.

The eighth pair is to be traced, with

the intercoſtal nerves, from the baſis of the ſkull into the thorax and abdomen, carefully diſſecting all their branches.

The branches of the ninth and tenth pairs are eaſily traced to the different muſcles which receive their ramifications.

To diſſect the nerves that ariſe from the ſpinal marrow, begin with the firſt pair, and after tracing their ſeveral branches, proceed to the ſecond pair, and diſſect them in like manner; then to the third, and ſo on, following all the branches to their laſt ramifications.

In diſſecting the cervical nerves, the branches which form the phrenic ought to be preſerved, and the nerve traced to the diaphragm.

When the diſſection is completed, the ſubject may be preſerved in proof ſpirits.

Any perſon not well acquainted with

the diſtribution of the nerves, may be greatly aſſiſted by conſulting Monro on that ſubject, or Winſlow's Syſtem of Anatomy.

ARTICLE VII.

Of varniſhing Anatomical Preparations.

THE intention of varniſhing anatomical preparations is, in moſt inſtances, to defend them from the moiſture of the air, without which they would ſoon become mouldy, and thereby in a ſhort time loſe their beauty and utility; alſo to defend them from the ravages of inſects, which otherwiſe would abound in all anatomical muſeums: laſtly, to increaſe the tranſparency of ſome preparations, whereby their vaſcularity, or other particular organization may be better demonſtrated.

Preparations

Preparations have been hitherto generally varniſhed with the white ſpirit varniſh of the ſhops: for hard inflexible preparations it may anſwer, ſuch as boney and thick muſcular parts, but is not ſo ſuitable for the thin and flexible, ſuch as bladders, inteſtines, membranes, &c. on account of its friability; for ſome time after ſuch preparations have been covered with this varniſh, and happen to be the leaſt bent or preſſed with the finger, it immediately crumbles into a reſinous kind of powder; thus the beauty of the preparation is ſpoiled by giving it a degree of opacity. There is a varniſh incomparably ſuperior to this for moſt anatomical purpoſes, ſold in ſhops under the name of oil varniſh; it gives a beautiful tranſparency to membranes, inteſtines, &c. is ſtrong and flexible when dry, and affords a much better defence from the humidity of the atmoſphere, and from the deſtruction of inſects: a preparation well varniſhed with it may at any time be waſhed with ſoap and water without injury. Preparations deſigned to be covered with this, or any other varniſh, ſhould be previouſly and carefully freed from all greaſineſs, as that in a very ſmall degree will prevent its drying. Whatever varniſh is uſed, it is neceſſary that it ſhould be done over two or three times; if with ſpirit varniſh, it is of conſequence that the part is firſt thoroughly dried, as the leaſt moiſture will chemically decompoſe the varniſh, by entering into union with the ſpirit, and ſeparating the reſinous body it contains; hence alſo a very diſagreeable opaque covering to the preparation.

Varniſh ſhould always be laid on with a fine camel's-hair bruſh about the ſize of a finger, or ſmaller, as occaſion may require. And as we cannot apply the bruſh to the inſide of many hollow preparations, ſuch as bladders, inteſtines, hydatids, &c. the varniſh ſhould be poured into them; and after turning them about in all directions, till the whole ſurface is covered, it is to be poured out and drained as clean as poſſible,

poſſible, otherwiſe it will collect in the moſt depending parts.

Corroded preparations are varniſhed without the uſe of a bruſh; theſe ſhould be held over a baſon, and the varniſh poured over them in all directions, until the ſurface becomes entirely covered; then ſuffer them to hang up over the baſon to drain, attending them frequently to remove the drops of varniſh collecting on the moſt depending extremities of the veſſels. Theſe preparations do not ſtand in ſo much need of varniſhing as moſt others; and I have frequently omitted it without any diſadvantage; though ſome Anatomiſts are of opinion, when it is properly done, it greatly increaſes their beauty.

ARTICLE

ARTICLE VIII.

Of preſerving Dried Preparations from Deſtruction by Inſects.

ANATOMISTS have ſuſtained no inconſiderable loſs in their muſeums by the rapacity of the inſects, with which they will always abound; and unleſs ſome effectual means are taken to prevent them, will ruin the dried muſcular and membranous preparations: this inconvenience may however be eaſily and effectually remedied.

Varniſhing preparations of theſe kinds in the common way, is intended to protect them not only from the inſects, but from the moiſture of the atmoſphere, which would otherwiſe occaſion them to grow mouldy, and ſoon deſtroy their beauty and

and their texture: in reſpect to the latter, it will have a good effect, but againſt the former it will prove little or no defence; yet the varniſh may be ſo prepared as to anſwer this purpoſe alſo, by the addition of corroſive ſublimate of mercury finely powdered, in the proportion of about a quarter of an ounce to a pint, which may be uſed in any of the varniſhes recommended in this work; but a ſtill better and more effectual method is, to lay the recent preparation in ſublimate water for about twenty-four hours before it is dried; after which it may be removed and varniſhed agreeable to the rules laid down in the preceding Article. The ſublimate water is made by diſſolving finely powdered corroſive ſublimate of mercury in water, in the proportion of one ounce to a gallon.

As the ſublimate is intended to deſtroy the inſects, it is probable white arſenic may anſwer the ſame purpoſe.

ARTICLE

ARTICLE IX.

Of making Vegetable Skeletons.

VEGETABLE Skeletons are moſt commonly made of fruit leaves and pods; the mode of conducting this proceſs, is to reduce their more tender parts to a pulpy ſtate, by boiling, or putrefaction: boiling is the moſt expeditious and the moſt agreeable method; but in many inſtances, does not anſwer ſo well as putrefaction.

The moſt favourable fruits for this purpoſe are plumbs, peaches, pears, &c. ſuch as have ſtrong fibres ramifying through them from the ſtem or ſtone; but the burgamy pear is the beſt for this purpoſe: they ſhould be choſen as free as poſſible from all blemiſhes; and ſome trees

 produce

produce fruit much more favourable for this purpofe than others, on account of the difference in the ftrength of their fibres. The firft part of the procefs is to boil them till they are become foft, then remove the external part with a knife, taking care not to injure the ftems; then break down their texture, by gently preffing them in all directions with the fingers; afterwards wafhing away the pulp from the fibres by the finger and thumb under water, beginning at a part the moft remote from the ftems, and where the fibres terminate in extremely fine points; fo proceed round and round, gradually advancing toward the ftems; the cores may or may not be preferved, as is moft agreeable; after they have been thus wafhed from all the pulp, they may be fufpended in clean water for a few days, when the fibres will appear more pulpy; they fhould be again wafhed as before with great care: being then thoroughly cleanfed, they fhould be fufpended in veffels of fpirits of wine, diluted to one part of rectified fpirits, and two of water, and properly enclofed.

Leaves are more readily and beautifully anatomized by putrefaction; they ſhould be ſuch as have ſtrong fibres, as the ivy, currant, hazle, &c. and ſhould be put in a pan of water for two or three months, and expoſed to the rays of the ſun to forward putrefaction; the water ſhould not be changed, but the pan filled up from time to time with water, and the better if from ſome ſtagnant putrid pond.

When putrefaction has rendered the pulpy parts ſoft, they may be gently beaten with the finger in the palm of the hand, till the external ſkins are looſened from the fibres, which ramify in a reticulated form between them; then remove the ſkins, and waſh the fibres clean from the pulp, by continuing to gently beat them in the hand with clean water; when thoroughly cleanſed, they ſhould be dried between the leaves of a book, and afterwards fixed on ſome coloured paper, beſt adapted to ſhew their beauty by a contraſt of colour.

The

The pod, or bladder, ſurrounding the Phyſalis Viſcoſa, or Winter Cherry, makes one of the moſt beautiful vegetable ſkeletons; they are made by putting them in a damp cellar, or ſome ſuch place, till the more tender parts are decayed, and the fibres only remain. The pod is a pleaſing form, and the fibres beautifully reticulated.

ARTICLE X.

Of improving old and injured Dry Preparations by Painting, &c.

THERE are many preparations kept in public anatomical muſeums, and in the hands of private ſurgeons, until they are greatly defaced by time and uſe, yet too rare and valuable to be diſcarded; the improvement of ſuch muſt undoubtedly be a deſirable object to us all. The injuries dry anatomical preparations ſuſtain are either from time, accidents, or the rapacity of inſects, occaſioning a loſs of their proper colours, or of their ſubſtance: and although the improvement they receive from painting, varniſhing, and otherwiſe repairing them, does not at all times make them equally good and valuable as when new, yet it is doubtleſs far better than to loſe entirely ſuch as are ſcarce and valuable.

Blood-veſſel ſubjects, whether entire or ſeparate parts, or any preparations of that nature, requiring cleanſing and repairing, ſhould firſt be ſoked in lukewarm water for a few hours: it will be neceſſary to have it warm, by that means to ſoften the injection, which will prevent the veſſels being ſo readily broken in the waſhing; then waſh them with ſoap water, or ſome alkaline liquor, as ſoap-lees, working it into all the interſtices with a common Painter's bruſh; when they are thoroughly cleanſed

cleanſed by repeated waſhings in this way, they ſhould be laid in clean water for a few hours, to clear away all remains of the ſoap, and then may be hung up till perfectly dry; after which, the veſſels may be painted of proper colours, with ſuitable ſized camel's-hair pencils, and if carefully done, will look very well. Theſe colours need only be mixed in the manner of common Painters colours. If once painting is not ſufficient, they ſhould be done over a ſecond time; the muſcles are ſometimes diſcoloured, which may be remedied in the ſame way with proper colours. The paint ſhould be thoroughly dried, and nothing more is neceſſary to complete the proceſs than to varniſh them a ſufficient number of times to give them a perfectly gloſſy covering; and this ſometimes gives them a better appearance than they originally had. If there is a loſs of any parts, either of the veſſels or muſcles, &c. they may be artificially ſupplied, if ſmall, by Glaziers putty, or if larger, by wax, or ſomething of that kind convenient

convenient for forming the natural figure of the part: but this ſhould always be done previous to their being painted. Membranous preparations, when partially deſtroyed by Inſects, or otherwiſe, ſhould be carefully cleanſed by a dry bruſh, or by waſhing with ſoap-water, if they will admit of it, and the holes mended by pieces of bladder of ſuitable thickneſs; or ſome pieces of the ſame kind of membranes, cut to a proper ſhape and ſize, and faſtened round the edges with a ſolution of gum arabic or iſinglaſs, and when dry, the preparation ſhould be varniſhed. If the part ſo deſtroyed had been injected, it may be made to reſemble the original appearance, by delineating the veſſels with a fine hair pencil on the part artificially ſupplied.

ARTICLE XI.

How to make Mineral White.

THE intention of this colour is to be uſed in injeƈtions, inſtead of Flake-White, and will be found to anſwer the purpoſe much better than any White heretofore ſold in the ſhops.

The proceſs is to be conduƈted in the following manner:—Saturate one pound of double aquafortis with clean lead cut into ſmall pieces, then add to it gradually a ſolution of ſalt of tartar in water, as long as any effervеſcence appears; and when it has ſtood a quarter of an hour for the precipitate to ſubſide, pour off the fluid from it, then fill up the veſſel again with hot water, and ſtir up the precipitate from the bottom,

bottom, which water is to be again poured off when the precipitate has ſubſided as before: this operation with the hot water ſhould be repeated three or four times, to be certain of waſhing away all the ſaline matter: when the water may be more effectually ſeparated by filtration, and laſtly by evaporation; for which purpoſe it ſhould be ſpread out upon a glazed diſh, and expoſed to the air, or a moderate degree of artificial heat. It ſhould be obſerved, that none but vitrified veſſels are to be uſed in this proceſs.

This colour is prepared and ſold by FREDERICK SMITH, Chymiſt, in the *Hay-Market*, *London*; whoſe care and attention to the proceſs may be confided in.

ARTICLE

ARTICLE XII.

Of the Compoſition of Varniſhes uſed for Anatomical Purpoſes.

THE beſt ſpirit varniſh for varniſhing corroded and other preparations is made of gum copal, in the following manner, and is called

Spirituous Copal Varnish.

Take of fine gum copal, reduced to a powder, and clean writing ſand, of each one ounce; put them into a pint bottle, then pour in three ounces of the higheſt rectified ſpirits of wine, and continue conſtantly to ſhake them briſkly together, until the gum loſes its tenacity, and the ſand will ſubſide freely to the bottom, which, and the ſpirits aſſuming a yellow colour, is a ſufficient criterion that the gum is diſſolved and received by the ſpirits; then let it ſtand until it becomes fine and tranſparent, when it may be decanted off for uſe. The proportion of the gum may be varied as occaſion may require.——This varniſh is carefully prepared and ſold by F. SMITH, Chymiſt, in the *Hay-Market*, *London.*

OIL VARNISH, OR OIL COPAL VARNISH.

This is made by reducing fine gum copal to a powder, and liquifying it in a ſecure copper veſſel over a well regulated heat, then adding to it about two thirds of clean linſeed-oil, and as much oil of turpentine as will reduce it to the conſiſtence of a ſyrup. This varniſh, if attempted to be made in a ſmall quantity, will not be likely to ſucceed, and will be the better if kept twelve months before it is uſed. It ſhould be remembered, that this is at all times a very difficult proceſs, in which we are very uncertain of properly uniting the ingredients; and is dangerous in the extreme; ſo that an inexperienced adventurer may ſuffer much in the attempt to unite ſuch inflammable ingredients in an highly heated ſtate.

Turpentine Varnish.

This is made by melting Venice turpentine over a gentle fire, and adding to it as much oil of turpentine as will reduce it to the conſiſtence of a ſyrup, and ſtirring them well together. This and the oil copal varniſh are ſold in moſt oil ſhops of a tolerable quality.

An Appendage to Article XIII.

To be read after Valves, in line 5, page 65.

AN accidental omiſſion in the Article, in reſpect to injecting the Coronary Vein of the Heart, has rendered this Appendage neceſſary, to deſcribe the method of filling this veſſel; which may be performed by making a ſmall inciſion in the right auricle, through which the pipe is to be conveyed and introduced into the orifice of this vein; or the pipe may be conveyed through the inciſion made in the ventricle, as already mentioned, for the exit of the water in waſhing out the blood from the heart and veins. "The coronary vein of the heart opens into the "right auricle, between the orifice of the "cara inferior, and the paſſage into the "ventricle, and is furniſhed with a ſemilunar valve, to prevent the blood from "flowing back:" This valve ſhould be deſtroyed before the pipe can be properly introduced. After the injection of this veſſel, the inciſion is to be cloſed by the twiſted ſuture, or carefully ſewed up.

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E R R A T A.

Page xi, line 16, *for* Tryo, *read* Tyro.

lxiv, — 18, *for* unneceſſary, *read* neceſſary.

lxxv, — 5, *for* inflammatory, *read* ulcerated.

15, — 21, *for* fruition, *read* friction.

47, — 1, *after* manner, *read* and the veins coming from the different parts of the head and face.

Ditto, *for* cervical, *read* vertebral.

49, — 8, *for* naſum, *read* naſi.

65, — 5, *after* valves, *read* the Appendage, page 303.

76, — 14, *for* anatomoſis, *read* anaſtomoſis.

80, — To be read in the ſingular number.

82, — 23, *for* muta, *read* mater.

84, — 9, *for* villi, *read* villæ.

91, — 1, *for* D, *read* E.

96, — 20, *after* they, *read* generally.

104, — 14, *for* ſpatual, *read* ſpatula.

109, — 25, *for* perpedicular, *read* perpendicular.

115, — 11, *for* ſuppled, *read* ſupplied.

134, — 2, *for* hæpatic, and hæpaticus, *read* hepatic and hepaticus.

—— — 3, *for* cæliaca, *read* cœliaca.

143, — 7, *for* oylinder, *read* cylinder.

146, — 8, *for* bronchea, *read* bronchiæ.

147, — 10, ditto.

150, — 3, *for* perioſteums, *read* perioſtea.

155, — 2, *for* perioſteum, *read* pericranium.

166, — 14, *for* ovariæ, *read* ovaria.

—— — 15, *for* anenreims, *read* aneuriſms.

171, — 6, *for* proſtrate, *read* proſtate.

—— — 8, *for* vas deferens, *read* vaſa deferentia.

172, — 2, *for* by the, *read* by a.

—— — 16, *after* ſide, *read* of.

189, — 5 and 8, *for* ilei and ileum, *read* ilii and ilium.

196, — 13, *for* its, *read* their.

206, — 16 and 19, *for* plan, *read* plane.

211, — 15, *for* mould, *read* model.

222, — 14, add one more B to the references.

225, — 16, *for* them, *read* than.

253, — 2, *for* ſtrike, *read* ſtick.

292, — 16, *for* burgamy, *read* burgundy.

304, — 12, *for* cara, *read* cava.

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