DYEING, *Hiſtory of.* The origin of the art of dyeing is involved in that obſcurity which pervades the hiſtory of all thoſe arts connected with the common wants and neceſſities of life. They have originated in times beyond the reach of hiſtory or tradition, and are the offspring of the natural faculties of man directed by the great primeval wants of food, ſhelter, and raiment. The art of dyeing is, of courſe, poſterior to many of theſe, and is founded leſs on the neceſſities than paſſions of mankind. A love of diſtinction is common to man in every ſtage of civilization, but that paſſion for admiration which is diſplayed in a love of finery and ornament is peculiar to him in his moſt barbarous and uncultivated ſtate. Hence ſavage nations delight in brilliant and gaudy colours, and many paint their ſkins, and adorn themſelves with feathers, ſtones, and ſhells of various hues. Hiſtory has not furniſhed us even with her fables on the origin of dyeing; but from analogy, as well as obſervation of the practice of barbarous nations at the preſent day, we may trace the rude beginnings from whence the art has ſprung. The rich and gaudy plumage of birds, the finely ſpotted ſkins of animals, coloured ſtones, and ſuch other ſubſtances as nature herſelf ſupplies, would afford the firſt materials for ſavage finery and dreſs. The caps and mantles of the chiefs of the South Sea iſlands, ſuch as were brought home by captain Cook, are compoſed almoſt wholly of feathers richly coloured.

It is eaſy to conceive that accident muſt furniſh innumerable inſtances of obſervation even to the eye of a ſavage, that many of theſe colours were capable of imitation, and that ſome ſubſtances readily imparted their colour to others. The bruiſing of a fruit, a flower, or leaf, is one of the moſt natural and obvious occurrences to which we ſhould look for the firſt notion of applying vegetable juices to dyeing, and doubtleſs the knowledge of the tingent properties of various herbs was thus early acquired. The art, however,

muſt

muſt have waited the progreſs of induſtry and luxury, before it became extended and improved. Long antecedent, however, to the period when authentic hiſtory begins, it muſt have made conſiderable progreſs. Moſes ſpeaks of ſtuffs dyed blue, and purple, and ſcarlet, and of ſheep-ſkins dyed red. Theſe colours require great ſkill in the preparation, and the knowledge of them implies a very advanced ſtate of the art at that period.

The colour which appears to have been earlieſt brought to perfection, and which was held in ſuch high eſtimation among the ancients, is purple. It was to chance alone, according to the tradition of antiquity, that they owed this diſcovery. A ſhepherd's dog, inſtigated by hunger, having broken a ſhell on the ſea ſhore, his mouth became ſtained with ſuch a colour as excited the admiration of all who ſaw it. They endeavoured to apply it to ſtuffs, and ſucceeded. There is ſome diſcordance in the details of the ancient writers of the circumſtances of this event. Some place this diſcovery in the reign of Phœnix, ſecond king of Tyre, that is to ſay, a little more than 500 years before Chriſt: others, at the time that Minos the firſt reigned in Crete, about 1439 years before the Chriſtian era. But the greateſt number agree in giving the honour of the invention of dyeing purple ſtuffs to the Tyrian Hercules. He gave his firſt trials to the king of Phœnicia, who was ſo jealous of the beauty of this new colour, that he forbade the uſe of it to all his ſubjects, reſerving it for the garments of royalty alone.

Some authors relate the ſtory differently. Hercules's dog having ſtained his mouth with a ſhell, which he had broken on the ſea ſhore, Tyras, a nymph of whom Hercules was enamoured, was ſo charmed with the beauty of the colour, that ſhe declared to her lover ſhe would ſee him no more till he brought her a ſuit dyed the ſame. Hercules thought of a way to ſatisfy his miſtreſs; he collected a great number of the ſhells, and ſucceeded in ſtaining a robe of the colour the nymph had demanded. Such are the different traditions handed down by the ancients of the origin of the purple dye. They are evidently blended with fiction, yet they may ſerve to fix the epoch of this diſcovery, which appears to have been made about fifteen centuries before the Chriſtian era. Whether the purple of Tyre was ſimilar to that mentioned in holy writ, as uſed by Moſes for the veſtments of the high prieſt, and the ornaments of the tabernacle, may admit of ſome diſpute, ſince it is not certain, according to M. Huet, that the word *argaman*, of the Hebrew text, which all the interpreters tranſlate by *purpura*, means in reality that colour.

The teſtimony of Homer confirms the antiquity of this diſcovery. This great poet and accurate obſerver, aſcribes to the heroes of that age, in which we have ſuppoſed it became known, ornaments and cloths of purple.

The ancients had ſuch an eſteem for this colour, that it was eſpecially conſecrated to the ſervice of the deity. Moſes, as we have juſt obſerved, uſed ſtuffs of purple for the works of the tabernacle, and the habits of the high prieſt. The Babylonians gave purple habits to their idols; it was the ſame with moſt of the other people of antiquity. The Pagans were even perſuaded that the purple dye had a particular virtue, and was capable of appeaſing the wrath of the gods.

Purple was alſo the diſtinguiſhing mark of the greateſt dignities from the earlieſt times. We have ſeen that the king of Phœnicia, to whom tradition ſays the firſt eſſays of this colour were preſented, had it reſerved for the ſovereign. Among the preſents which the Iſraelites made to Gideon, the ſcripture makes mention of purple habits found among the ſpoils of the kings of Midian. Homer gives us plainly to underſtand, that it only belonged to princes to wear this colour; and we may remark, that this cuſtom was obſerved by all the nations of antiquity.

It is not eaſy to give a clear and preciſe idea of the proceſs followed by the ancients in the production of this highly valued colour. We find ſome details in the works of Ariſtotle and of Pliny, in whoſe days the practice was very common, but they are not ſufficiently circumſtantial. The purple dye, according to Pliny, was drawn from many ſpecies of ſhell fiſh. The beſt were found near the iſle where New Tyre was built. They fiſhed for them in other parts of the Mediterranean. The coaſts of Africa were famous for the purple of Getulia. The coaſts of Europe ſupplied the purple of Laconia, which was held in great eſteem.

In the 36th chapter of his ſeventh book, Pliny ranges in two claſſes the different kinds of ſhell fiſh which produced the purple. The firſt comprehended the ſmaller ſpecies under the denomination of *buccinum*, from their reſemblance to a hunting horn; the ſecond included thoſe denominated *purpura*. Theſe Fabius Columna conceives to have been alſo diſtinguiſhed by the generic name of *murex*, though others ſuppoſe this to have ſignified all the different ſpecies generally. All theſe ſeveral ſpecies, the chief of which are enumerated by Pliny, appear to have given colours of different ſhades, from which, by mixture of the liquors in various proportions, other varieties of colour were produced. A few drops only of this precious dye were obtained from each fiſh, by extracting a white vein placed in the throat; but to avoid this trouble with the ſmaller ſpecies, according to Ariſtotle and Pliny, the whole fiſh was bruiſed in a mortar, a practice which, according to Vitruvius, was often followed with the larger. The liquor, when extracted, was mixed with a conſiderable portion of ſalt, and ſuffered to remain three days; after which it was diluted with five or ſix times its quantity of water, and digeſted, moderately hot, during ten days, in a lead or tin veſſel, ſkimming it frequently, to ſeparate all impurities. The wool was afterwards put in, being well waſhed, cleanſed, and properly prepared. After ſoaking five hours, it was taken out, carded, and again immerſed in the boiling dye, till all the colour was taken up or exhauſted. To produce particular ſhades of colour, nitre, urine, and a marine plant called fucus, of which the beſt kind is found on the rocks of the iſle of Crete, were occaſionally added.

The Tyrians, by the confeſſion of all antiquity, ſucceeded beſt in dyeing ſtuffs purple. Their proceſs differed a little from what we have related above. They uſed nothing to make their colour but purple ſhells taken out at ſea. They made a bath of the liquor they drew from theſe fiſhes. They ſteeped their wool in this a certain time, and afterwards took it out and ſteeped it in another boiler, in which was nothing but buccina or trumpet fiſh. This is all the ancients tell us of the practice of the Tyrians. Wool, which had received this double Tyrian dye, (diabapha) was ſo very coſtly, that in the reign of Auguſtus, each pound ſold for 1000 Roman denarii, about 36*l.* ſterling. Nor need we wonder at this exceſſive price, when we conſider the tedious nature of the proceſs, and the ſmall quantity of dye afforded by the ſhell fiſh, from each of which not more than a ſingle drop was obtained. For 50lb. of wool they uſed no leſs than 200lbs. of the liquor of the buccinum, and 100lbs. of that of the purpura, or 6lbs. of liquor to 1lb. of wool. We ought not to be much ſurprized, therefore, that this colour vied in value even with gold itſelf. The ancient writers diſtinguiſh many different ſhades of purple. One of them, which was very dark, appears to have been a kind of violet, inclining towards a reddiſh hue. "Nigrantis roſæ colore ſublucens,"

ſublucens," Pliny, lib. 9. ſec. 50. Another, leſs eſteemed, was a kind of crimſon. "Rubens color, nigrante deterior," lib. 9. ſec. 62. The moſt valued of all, and in which the Tyrians particularly excelled, was a deep red purple, of the colour of coagulated blood. "Laus ei ſumma in colore ſanguinis concreti," Pliny, ibid. It is in alluſion to this that Homer and Virgil give to blood the epithet *purple*. There was a fourth kind known in later times, very different from thoſe we have ſpoken of. The colour was whitiſh; an account of which may be ſeen in Perrault's tranſlation of Vitruvius.

The purple has been almoſt every where a mark of diſtinction attached to high birth and dignity. It was an ornament of the firſt offices of Rome; but luxury, which was carried to great exceſs in that capital of the world, rendered the uſe of it common among the opulent, till the emperors reſerved to themſelves the right of wearing it. Soon afterwards it became the ſymbol of their inauguration. They appointed officers to ſuperintend the manufactories, principally eſtabliſhed in Phœnicia, where it was prepared ſolely for their uſe. The puniſhment of death was decreed againſt all who ſhould have the audacity to wear it, though covered with another colour. The penalty, ſo tyrannically denounced againſt this whimſical ſpecies of treaſon, doubtleſs occaſioned the loſs of the art of dyeing purple; firſt in the Weſt, but much later in the Eaſt, where it flouriſhed conſiderably till the eleventh century.

It appears that ſome kinds of purple preſerved their colour for a very long time. Plutarch, in his life of Alexander, relates that the Greeks found in the treaſury of the king of Perſia a great quantity of purple which had not loſt its beauty, though it was 190 years old.

It is commonly aſſerted, on the authority of moſt of the ancient writers, that the purple had a very ſtrong and diſagreeable odour. It would appear, however, from Pliny, lib. 9. ſec. 36. that this was the caſe only with ſome particular kinds. After extolling the beauty of the true purple, and allowing that it was juſtly an object of ambition, he aſks, how it happens that the other kinds of purple, obtained from the ſhell-fiſh called *conchylia*, ſhould be ſo high priced, conſidering the ſtinking diſagreeable odour which the ſtuffs have that are dyed with them.

After all, the boaſted purple of antiquity was a miſerable dye compared with many which we now poſſeſs, and affords a ſtrong proof of the imperfect ſtate of the art at the period when it was held in ſuch eſteem. It was, no doubt, the moſt rich and brilliant colour then known.

It is a curious fact, that Mr. Bruce, whoſe acquaintance with ancient authors ought to have convinced him of the contrary, maintains that the Tyrian purple was produced with cochineal, and that the ſtory of its being the blood of a ſhell-fiſh was invented and propagated by the Tyrians with a view of deceiving other nations, and keeping the art of dyeing this colour excluſively to themſelves. He even adduces this as a proof of the early intercourſe carried on with the new world, in times long antecedent to thoſe in which we ſuppoſe the diſcovery of the continent of America was firſt made.

The ancients obtained from the *coccus*, now known by the name of kermes, a colour which was almoſt as highly eſteemed as purple, and which was ſometimes mixed with it. Pliny informs us it was employed in the preparation of the imperial robes. It was generally called ſcarlet, and was ſometimes confounded with the purple. The uſe of the coccus in dyeing is very ancient, ſince it appears from the commentators, to be alluded to in Exodus, chap. xxxix. ver. 1. and 28.

Our materials for a hiſtory of the art of dyeing, during the ages of claſſical antiquity, are very ſcanty. Amongſt the Greeks the uſeful arts were degraded even in the eyes of philoſophers, and this contempt deſcended to the Romans; for Pliny, ſpeaking of dyeing, avowedly neglects the deſcription of operations which are unconnected with the liberal arts. "Nec tingendi rationem omiſiſſimus, ſi unquam ea liberalium artium fuiſſet."

The art of dyeing among the Greeks appears to have made no great progreſs; the dreſs of the people was of cloth which had received no dye, and which might be waſhed. The rich preferred coloured clothes; they eſteemed ſuch as were dyed ſcarlet with the kermes, but they valued ſtill more highly thoſe of purple.

The few details relative to dyeing into which Pliny has entered in his great work, are almoſt wholly confined to the purple, of which we have given an account. The few ſcattered facts to be met with, that ſerve at all to illuſtrate the hiſtory of the art, we ſhall briefly notice. Some varieties of colour, derived from the purple, and produced by different mixtures of the various kinds of ſhell-fiſh, and alſo by admixture with the dye of the coccus, or kermes, appear to have been faſhionable in Pliny's time. Theſe originated, according to our author, in the errors and failure of the dyers, who having, in the firſt inſtance, ſpoiled their cloth, endeavoured to hide the defects by giving it another ſhade: hence aroſe thoſe compound twice-dyed colours which were ſoon held in high repute.

Beſides the Tyrian purple, ſcarlet, and the varieties and compounds of thoſe colours, Pliny mentions yellow as a very ancient dye, and highly eſteemed in former times. The veil which the bride wore on her wedding day was of yellow, and none but women were permitted to uſe it. They had alſo a colour reſembling the cyanos, or blue-bottle, and another like the golden yellow flower elichryſon. None of theſe colours, ſays Pliny, were known, or at leaſt in requeſt in the days of Alexander the Great; for the Greek writers, who wrote ſoon after his deceaſe, make no mention of them. They are evidently, however, of Greek origin, as appears from their names, which, though Greek, were current in Italy in Pliny's time.

The uſe of vegetable dyes appears to have been in a great meaſure unknown to the Romans; though the inhabitants of Gaul, according to Pliny, imitated all colours, even the Tyrian purple and the ſcarlet, with the juice of certain herbs. In the eleventh chapter of the thirty-fifth book of Pliny's hiſtory, is preſerved a valuable notice of the proceſs followed by the Egyptians in dyeing linen. They ſtained, ſays he, white cloth, not with colours, but with certain drugs, which have the property of abſorbing them, but which exhibit no appearance of any dye till they have been boiled ſome time in a cauldron, from which they are withdrawn painted or ſtained of various colours. What is moſt extraordinary, ſays Pliny, is, that the cauldron containing only colour of one kind ſhould impart to the cloth ſhades of various hues according to the nature of the drugs which were laid on, and the colours are ſo fixed that they can never be waſhed out, but are more durable and fixed than if they had never been immerſed in the boiling dye.

We have here a tolerably accurate deſcription of the proceſs of calico printing; and the only mention in any ancient author of an art which has exiſted for ages paſt in the Eaſt, and is practiſed there at this day, probably with little variation from the mode deſcribed by Pliny.

The art of dyeing linen appears not to have been known in Greece before Alexander's invaſion of India, where they dyed

dyed the ſails of his veſſels of different colours. The Greeks ſeem to have borrowed this art from the Indians.

We may form ſome idea of the ſtate of the art of dyeing amongſt the Romans, from the enumeration of the different colours which were in uſe, and the ſubſtances employed in producing them. In addition to thoſe enumerated by Pliny, we find, that in the equeſtrian games of the circus, the different diviſions were diſtinguiſhed by the colours *green*, color praſinus; *orange*, rufatus; *grey*, venetus; and white. We ſhall enumerate, after Mr. Biſchoff, who has minutely examined the ſubject, the ingredients employed at that time in the art of dyeing, in addition to the two important ones already mentioned, the purple fiſh and coccus.

1. Alum. It is probable, from what we ſhall ſtate hereafter, that the ancients were unacquainted with our alum in its ſtate of purity.

2. Alkanet. Suidas ſays, that this ſubſtance was alſo uſed by women as a paint.

3. The blood of birds, which was uſed amongſt the Jews.

4. The fucus; that of Crete was preferred, and it was generally employed as a ground or preparative for valuable colours.

5. Broom.

6. The violet, from which the Gauls prepared a kind of purple.

7. Lotos medicago arborea; ſnail trefoil; the bark was uſed in dyeing ſkins, and the root in dyeing wool.

8. The bark of the walnut-tree and the peel of the ſhell.

9. Madder. We are not certain whether the madder of the ancients was the ſame as ours, or another root of the ſame tribe.

10. Woad (glaſtum). This plant was undoubtedly in uſe among the ancients, but we do not know whether their preparation of it was the ſame as ours.

We are not to infer, however, that theſe were the only ſubſtances employed by the ancients in the art of dyeing; many more being, in all probability, in uſe, of which we have no account. Indigo (indicum nigrum) is mentioned by Pliny, and though ſome doubts have been entertained by his commentators reſpecting the true nature of this ſubſtance, ſome ſuppoſing it to have been Indian ink, yet it is very evident he meant the indigo of the moderns, from the purple ſmoke which he ſays it emitted when ſet on fire, and which we believe is peculiar to indigo. It was never, however, we believe, employed in dyeing, but ſimply as a pigment.

India was the nurſery of the arts and ſciences, which were afterwards ſpread and perfected among other nations. Accidents, which had a tendency to improve the art, could not fail to be multiplied rapidly in a country rich in natural productions, which requires little labour for the ſupport of its inhabitants, and the population of which was favoured by the bounty of nature and the ſimplicity of manners, till it was oppoſed by the tyranny of ſucceeding conquerors. But religious prejudices, and the unalterable diviſion into caſts, ſoon put ſhackles upon induſtry; the arts became ſtationary, and it would ſeem that the knowledge of dyeing cotton in that country was as far advanced in the time of Alexander as it is at preſent.

The beautiful colours which we obſerve in their printed calicoes, would lead us to ſuppoſe that the art of dyeing had then attained a high degree of perfection, yet we find, from the details of thoſe who have witneſſed their operations, that the Indian proceſſes are ſo complicated, tedious, and imperfect, that they would be impracticable in any other country, on account of the difference in the price of labour. The art of printing calicoes has been practiſed in India at leaſt twenty-two centuries; for the hiſtorians of Alexander's invaſion of that ill-fated country ſpeak of their flowered cloths or chintz. If they excelled therefore in the richneſs and brilliancy of two or three colours; it is to be attributed to the ſuperior quality of ſome of their dyes, peculiar to their own country, the effect of which was perhaps heightened by the length and multiplicity of their operations. The knowledge of this art appears to have ſpread over a conſiderable part of Aſia. It was practiſed, and is to this day, by the Perſians; and we have ſeen that in Pliny's time, it was eſtabliſhed in Egypt.

From the fifth volume of the "Memoires concernant l'Hiſtoire, les Sciences, les Arts, les Mœurs, &c. des Chinois," it appears, that wool was never worn in China but as a ſubſtitute for fur, and that cotton and ſilk, being the only ſubſtances ever dyed by the inhabitants, received all their colours from vegetable tingent matters; that their colours were principally red, blue, violet, and what is called a woad colour; and that under the three firſt dynaſties the buſineſs of dyeing was chiefly practiſed by the female part of each family, for its own particular uſe; and it probably continued to be practiſed without any thing like principle or ſcience until near the end of the ſeventh century, when the Chineſe diſcarding their own, borrowed the art and means of dyeing which were then in uſe among the Indians and Perſians; and it is ſaid, that alum and copperas, which the Chineſe did not uſe before, were among the means ſo borrowed; a fact which renders it probable, that there was little, if any thing, in the Chineſe art of dyeing, of which the loſs need now be regretted.

It appears, however, that long before this time a knowledge of the uſes of alum and of iron in dyeing had ſpread from Hindooſtan and Perſia weſtward to Egypt, and thence to Greece and Rome. Bergmann, indeed, and after him, Beckmann, have repreſented the alum of the ancients as different from the cryſtallized ſalt of the moderns; and have ſuppoſed that the varieties of alum mentioned by Dioſcorides, were ſtalactites, containing but little alum, and conſiſting chiefly of calcareous earth. Nature, however, does produce ſome, though but little, cryſtallized alum, particularly in Egypt and ſome parts of Aſia; and it probably was in this ſtate that its good effect in dyeing had been firſt obſerved, before mankind were led to the means and operations ſince employed for ſeparating and collecting it from the various aluminous ores. Bergmann informs us, that the factitious ſalt which is now called alum, was firſt diſcovered in the eaſtern countries, and that among the moſt early works eſtabliſhed for the preparation of alum, we may juſtly number that of *Roccho*, a city in Syria, now called Edeſſa, hence the appellation of *roch alum*. He adds, that Bartholomew Perdix, or Pernix, a merchant of Genoa, who had been at Roccho, diſcovered the matrix of alum in the iſland of Iſchia, about the year 1459, and eſtabliſhed a manufactory there; at the ſame time, John de Caſtro, who had viſited the manufactories at Conſtantinople, diſcovered a matrix at Tolfa, by means of the ilex aquifolium, which he had alſo obſerved to grow in the adjacent mountains of Turkey; and his opinion was confirmed by the taſte of the ſtones. The attempts made by the Genoeſe at Viterbium and at Volaterre ſucceeded extremely well; and the preparation of it in Italy ſoon increaſed wonderfully faſt. The firſt manufactory of alum in England was eſtabliſhed in the reign of Elizabeth, at Giſborough, by one Thomas Chaloner.

In the fifth century all the arts were loſt throughout the Weſt, except a few, which in a ſtate of decay were preſerved

in Italy; and no traces were left of knowledge, induſtry, or humanity.

Muratori quotes a manuſcript of the eighth century, in which we find a deſcription of ſome dyes, principally for ſkins, and ſome proceſſes connected with the arts; but the Latin, which is almoſt unintelligible, and the chaſms we find here and there, prevent us from being able to form a juſt idea of theſe proceſſes.

The arts were better preſerved in the Eaſt, where articles of luxury were procured by ſome of the great, even ſo late as the twelfth century. During the cruſades, the Venetians derived their power from the barbarous mania of the age: their commerce increaſed; the arts were eſtabliſhed among them, and improved by the induſtry of the Greeks, and ſpread from thence through the other parts of Italy. In the year 1338, Florence contained two hundred manufacturers, who are ſaid to have made from ſeventy to eighty thouſand pieces of cloth, which, as an object of commerce, were worth twelve hundred thouſand crowns of gold.

It is ſaid that archil was accidentally diſcovered by a Florentine merchant, about the year 1300. Having obſerved that urine imparted a very fine colour to a certain ſpecies of moſs, he made experiments, and learned to prepare archil. He kept his diſcovery ſecret a long time; his poſterity, a branch of which ſtill exiſts, according to Dominiqu? Manni, have retained the appellation of Ruccellai, from oreiglia, the Spaniſh term for that kind of moſs.

The arts continued for a long time to be cultivated in Italy with increaſing ſucceſs. In the year 1429, the firſt collection of the proceſſes employed in dyeing appeared at Venice under the name of "Mariegola del' arte dei tentori;" a ſecond edition, much improved, came out in 1510. A certain perſon, named Gioran Ventura Roſetti, formed the deſign of rendering this deſcription more uſeful and extenſive. He travelled through the different parts of Italy, and the adjacent countries, where the arts had begun again to flouriſh, in order to make himſelf acquainted with the various proceſſes employed, and he publiſhed, under the title "Plictho de l'arte de tentori," &c. a collection which, according to Mr. Biſchoff, is the firſt that united the different proceſſes, and which ought to be regarded as the leading ſtep toward the perfection which the art of dyeing has attained. This work was printed at Venice, in 1548; a French tranſlation of it appeared at Paris in 1716. It is remarkable that in the work entitled "Plictho," not a word is ſaid either of cochineal or indigo; from which we may conclude that theſe two dyes were either unknown or not employed at that time in Italy.

The firſt indigo uſed in Europe appears to have been brought from the Eaſt Indies by the Dutch. India was doubtleſs the country where that valuable ſubſtance was firſt produced. The uncivilized inhabitants of other countries have, indeed, diſcovered modes of obtaining colouring matter, very nearly reſembling that of indigo, from other plants, as the iſatis tinctoria, or woad, and the genipa americana, but they obtained theſe matters in a liquid form only, and employed them in their recent ſtate.

The natives of India, however, went farther, they precipitated and collected, in a dry ſolid form, the colouring matter of indigo, and diſcovered the means of afterwards diſſolving and applying it to ſtuffs. In Africa, the Mandingo negroes, according to Mr. Park, dye their cloth of a laſting blue colour, by the following ſimple proceſs. The leaves of the indigo, when freſh gathered, are pounded in a wooden mortar, and mixed in a large earthen jar, with a ſtrong ley of wood aſhes; chamber-lye is ſometimes added. The cloth is ſteeped in this mixture, and allowed to remain until it has acquired the proper ſhade. In Kaarta and Ludamar, where indigo is not plentiful, they collect the leaves and dry them in the ſun, and when they wiſh to uſe them, they reduce a ſufficient quantity to powder, and mix it with the lye as before. "Either way," ſays Mr. Park, "the colour is very beautiful, and equal to the beſt Indian or European blue." The uſe of indigo was known to the Mexicans before the arrival of the Spaniards, and Clavigero, in his hiſtory of that country, gives an account of the method of obtaining it. Hernandes had long before deſcribed the plant as being indigenous in Mexico, and employed by its ancient inhabitants; and Ferdinand Columbus, in his "Life of Chriſtopher Columbus," mentions it as one of the native plants of Hiſpaniola. What the abbé Raynal therefore aſſerts, of its being tranſplanted from the Eaſt Indies to America, can be true only of one ſpecies, the indigofera tinctoria, Linn. The manufacture of indigo, however, was not eſtabliſhed in America till ſome time after the diſcovery of that country; and on the plant which produces it being recognized by the Portugueſe in Brazil as identical with that from which indigo was extracted in the Eaſt Indies. The uſe of indigo, which was a great acquiſition to the art of dyeing, was not eſtabliſhed without conſiderable difficulty. It was ſtrictly prohibited in England in the reign of Elizabeth, as was alſo logwood, which was ordered to be burned if found in any manufactory. This prohibition was not taken off till the reign of Charles II.

In like manner the uſe of indigo was proſcribed in Saxony, in the edict againſt it, which brings to one's mind the edict againſt the employment of antimonial emetics; it is ſpoken of as a highly corroſive colour. This is a ſtriking example of the errors into which an unenlightened adminiſtration may fall, which liſtens to the ſuggeſtions of intereſted individuals. Thoſe who dyed blue, and were accuſtomed to uſe paſtel and woad, repreſented that indigo would deſtroy the ſale of thoſe two articles, which were the produce of the country. Such a reaſon, which would appear ſpecious to many, even in the preſent day, eaſily produced a prohibition which would be ſoon eluded by paying a tribute to the induſtry of other nations. The prejudice againſt indigo was likewiſe communicated to France, and Colbert's inſtructions forbade the uſe of more than a certain quantity in the paſtel vats.

Cochineal was another important acquiſition to the art of dyeing, for which we are indebted to the firſt conquerors of Mexico. The Spaniards, having obſerved that the inhabitants of Mexico employed cochineal in painting their houſes and dyeing their cotton, gave their government an account of the beauty of the colour; and Cortes, in the year 1523, was ordered to promote the increaſe of the valuable inſect from which it is obtained. The natural colour, however, which the cochineal gives, is but a dull colour. Soon after cochineal was known in Europe, a great chemiſt of the name of Kuſter, Kuffler, or Kepfler, found out the preſent proceſs for dyeing ſcarlet by means of a ſolution of tin, and carried the ſecret to London in the year 1543. See COCHINEAL and SCARLET.

The ancients applied the name ſcarlet to the colour obtained from kermes, which was much inferior in beauty to the colour we diſtinguiſh by that appellation. We probably know how to employ the kermes to greater advantage than they did, ſince we poſſeſs a pure alum which diſpoſes the ſtuff to receive a more beautiful and durable colour; yet our dyers have almoſt entirely diſcontinued the uſe of it, becauſe they can obtain from cochineal a colour beyond all compariſon more beautiful. The ſuppoſition, that the

colour

colour which we obtain from kermes is preferable to that obtained by the ancients, is ſupported by the teſtimony of Pliny, who inſinuates that it was not a durable colour; now the colour we give by means of kermes to wool prepared with alum, is exceedingly durable. The diſcovery of ſcarlet may be conſidered as the moſt important æra in the art of dyeing, as it introduced to our knowledge the ſolution of tin, ſince ſo variouſly and happily applied. A Flemiſh painter, called Gluck, got poſſeſſion of this ſecret, and communicated it to Gobelin. The knowledge of the proceſs afterwards ſpread throughout all Europe. Gluck travelled into the Eaſt, where there were ſtill ſome remains of Grecian induſtry, and afterwards ſettled in Flanders, where he ſpent a long and proſperous life. According to Mr. Francheville, this man, who had been ſo uſeful to his country, died about the year 1550.

For a long time Italy, and eſpecially Venice, poſſeſſed the art of dyeing almoſt excluſively; a circumſtance which contributed to the proſperity of their manufactures and commerce: by degrees it was introduced into France. Giles Gobelin, to whom the proceſs for making the true ſcarlet had been communicated, eſtabliſhed a manufactory in the place which ſtill bears his name; and this undertaking was deemed ſo raſh, that it was termed *Gobelin's folly*.

The attention of the Royal Society appears to have been early directed to the improvement of the art of dyeing. At a meeting of that learned body on the 30th of April, 1662, Mr. Hook was deſired to tranſlate into Engliſh, a work on dyeing, which appears to have been that already mentioned under the title of Plictho. On the ſame day alſo, ſir William Petty, one of its earlieſt and moſt active members, in conſequence of a previous requeſt from the ſociety, brought in "An Apparatus to the Hiſtory of the common practices of Dyers," which was afterwards printed in "Dr. Spratt's Hiſtory of the Royal Society," and ſeems to have been the firſt work publiſhed in the Engliſh language on the proceſſes and operations of dyeing. Nearly two years afterwards Mr. Boyle preſented to the ſociety his "Experiments and Conſiderations touching Colours." And on the 10th of Auguſt, 1664, it was ordered by the ſociety, "that the way of *fixing colours* ſhould be recommended to Mr. Howard, Mr. Boyle, and Dr. Merritt." Theſe, and eſpecially the two firſt, were amongſt the moſt diſtinguiſhed members of the ſociety; but it does not appear that any thing deſerving of notice was done in conſequence of this recommendation. However, at a meeting of the ſociety on the 11th of November, 1669, that very ingenious and uſeful member, Mr. Hook, produced a piece of calico ſtained after the way contrived by himſelf, which he was deſired to proſecute in other colours beſides thoſe that appeared in this piece; and accordingly on the 9th of the following month, Mr. Hook produced another ſpecimen of ſtaining with yellow, red, green, blue, and purple colours, which he ſaid would endure waſhing with warm water and ſoap. But from this time it does not appear that any thing conſiderable was done for nearly the ſpace of a century by men of ſcience in this country towards the improvement of the arts of dyeing and calico printing.

In France, however, the miniſter Colbert, anxious to extend the commerce and manufactures of his country, which had languiſhed during the ſtormy adminiſtrations of Richlieu and Mazarin, turned his attention particularly to the art of dyeing. He invited the moſt ſkilful artiſts, rewarded their talents, and eſtabliſhed many manufactories; and it is curious to remark, that thoſe of Vaurobais and Sedan were called, in the letters patent which were granted them, manufacturers of fine cloth after the Dutch and Engliſh faſhion. In 1672, he publiſhed a Table of Inſtructions for Dyeing, under the title of "General Inſtructions for dyeing Wool and woollen Manufactures of all Colours, and for the Culture of the Drugs or Ingredients employed in them." This, however, was not intended merely to diffuſe information, but as a legiſlative act, to controul the dyers in their operations. This work merits attention; we ſhall firſt notice the reaſon which he gives for conſidering the ſubject as one of great importance.

"If," ſays Colbert, "the manufactures of ſilk, wool, and thread are to be reckoned amongſt thoſe which moſt contribute to the ſupport of commerce, dyeing, which gives them that ſtriking variety of colour by which they reſemble what is moſt beautiful in nature, may be conſidered as the ſoul of them, without which the body could ſcarcely exiſt. Wool and ſilk, the natural colour of which rather indicates the rudeneſs of former ages, than the genius and improvement of the preſent, would be in no great requeſt if the art of dyeing did not furniſh attractions which recommend them even to the moſt barbarous nations. All viſible objects are diſtinguiſhed and recommended by colours, but for the purpoſes of commerce it is not only neceſſary that they ſhould be beautiful, but that they ſhould be good, and that their duration ſhould equal that of the materials they adorn."—But Colbert, though he inſtituted many uſeful regulations for the inſtruction of the farmer and the artiſt, impoſed a ſyſtem of prohibition and reſtraint ſo exceſſive, as almoſt to bar all future improvement. He divided the dyers into two claſſes, to one of which were confined the colours deemed durable and fixed, whilſt the other claſs was allowed only to meddle with thoſe which were conſidered fugitive. In the dyeing of black cloth he inſiſted that the operation ſhould be begun by the dyers in grain, or thoſe who gave the durable colour, and finiſhed by thoſe who produced the falſe one. Each was confined to a certain number of ingredients, and neither were ſuffered to have Brazil wood, and various other articles. The bad effects of this prohibition were moderated by the facility of eluding it, and by the rewards beſtowed on thoſe whoſe experiments promoted the progreſs of the art, and whoſe diſcoveries were afterwards to be publiſhed, and to modify the exiſting regulations.

French induſtry loſt its pre-eminence by the criminal revocation of the edict of Nantz, which carried deſolation into her manufactories, and diſperſed her workmen, and the knowledge of her arts, throughout all Europe.

Since that time the department of adminiſtration, charged with the ſuperintendence of the arts and manufactures, has conſtantly ſought to repair thoſe errors, and to encourage induſtry and exertion by the diffuſion of knowledge, which, under wiſe laws, is the moſt efficacious means that can be employed.

Dufay, Hellot, Macquer, and Berthollet, have been ſucceſſively charged with the care of improving the art of dyeing; and to their labours all Europe is indebted for moſt valuable acquiſitions.

Dufay amended, or rather ſuperſeded, the "Inſtructions, &c." of Colbert, by the publication of a new one, under the adminiſtration of M. d'Orry, in 1739. He appears to have been the firſt who entertained juſt, though incomplete, ideas of the true nature of colouring ſubſtances, and the cauſe of their adheſion to ſtuffs when dyed. In his "Obſervations phyſiques ſur le melange de quelques couleurs dans le tincture," Mem. de l'Academ. 1737, he obſerves, that colouring particles are naturally diſpoſed to adhere more or leſs firmly, to the filaments which receive them; and he remarks very juſtly, that without this diſpoſition

ſtuffs would never aſſume any colour but that of the bath, and would always divide the colouring particles equally with it; whereas the liquor of the bath ſometimes becomes as limpid as water, giving out all the colouring matter to the ſtuff, "which ſeems to indicate," ſays he, "*that the ingredients have leſs attraction for the water than for the particles of the wool.*" He alſo noticed, *the difference in the degree of attraction which different ſubſtances, as wool and cotton, exert on the ſame colouring matters*, and which he found ſo great, that a ſkain of each having been in an equal degree ſubjected to the operation for dyeing ſcarlet, the woollen yarn was found to be fully and permanently dyed, while the cotton retained all its former whiteneſs. Yet theſe facts, important as they were, to the foundation of a theory of the art of dyeing, were unproductive in his hands; for though ſatisfied with the explanation they offered of many phenomena, yet they left, ſays he, ſo much to be wiſhed for, that he would relinquiſh it readily, if a more probable one could be found. He appears to have had no idea of the other and more important cauſe of the permanency of colours, that which ariſes from the uſe of mordants, or the interpoſition of a ſuitable baſis, poſſeſſing a particular attraction both for the colouring matter and dyed ſubſtance, and acting as a bond of union between them. He examined, with great ſagacity, certain proceſſes, and eſtabliſhed the ſureſt methods that could at that time be employed for determining the goodneſs of a colour, and this he did in an eaſy and familiar manner. His labours, on the whole, entitle him to the gratitude of poſterity, and he may juſtly lay claim to the merit of having firſt diſcovered and enunciated the facts, and of having drawn ſome partial concluſions from which the true theory of dyeing was ſome years afterwards clearly and luminouſly deduced.

He was ſucceeded by Hellot, to whom we are indebted for one of the beſt practical treatiſes on the art of dyeing wool and woollen cloths now extant. This work is valuable for the accuracy with which the numerous proceſſes are deſcribed: without profiting however by the hints thrown out by his predeceſſors, he ſuffered himſelf to be miſled by a vague and groundleſs hypotheſis, on the cauſe of the adheſion of the colouring particles to the ſubſtance dyed, the action of mordants, and the difference between the true or durable, and falſe or fading dyes. Of his theoretical ideas, and the principles he laid down, ſome judgment may be formed from the following paſſage taken from his work. "I believe it may be laid down as a general principle in the art of which I am now treating, that all the inviſible mechaniſm of dyeing conſiſts in dilating the pores of the body to be dyed, in depoſiting in them particles of foreign matter, and retaining them there by a kind of covering not liable to be affected by water, rain, or the rays of the ſun; in chooſing colouring particles of ſuch a degree of fineneſs as to be rendered ſufficiently fixed in the pores of the ſtuff opened by the heat of boiling water, and again conſtricted by cold, and alſo coated by the kind of varniſh which the ſalts, employed in its preparation, had left in thoſe pores; whence it follows that the pores of the fibres of the wool which has been wrought, or is to be wrought into cloth, ſhould be cleanſed, enlarged, coated over, and then conſtricted, ſo that the colouring particles may be retained in them nearly in the ſame manner as the diamond is retained in the collet of a ring." He fancied that he could diſcern in every dyeing proceſs ſome means by which ſulphate of pot-aſh, then called vitriolated tartar, might be formed; and this neutral ſalt not being readily ſoluble by cold water, nor air, nor light, he conceived the whole art of dyeing to conſiſt in firſt dilating the pores of the ſubſtance to be dyed, ſo as to procure a copious admiſſion of colouring matter, divided by a ſuitable preparation into atoms, and then wedging or faſtening theſe atoms within the pores of the dyed ſubſtance, by the ſmall particles or cryſtals of this difficultly ſoluble ſalt. Upon this *mechanical* hypotheſis, he ſuppoſed that alum became uſeful in dyeing, not by the pure clay or alumine which it contains, but by furniſhing ſulphuric or vitriolic acid, to aſſiſt in forming the ſulphate of pot-aſh, which was to perform the important function of wedging or faſtening the colouring atoms. But though nothing could be more groundleſs than ſuch a theory, the learned in all countries appear to have been ſatisfied with it for a conſiderable length of time, it being always leſs troubleſome to believe than to make experiments.—Macquer followed next. He has given us an exact deſcription of the proceſſes employed in dyeing ſilk, and his practical treatiſe, publiſhed in 1763, is held in deſerved eſtimation. He has made us acquainted with the combinations of the colouring principle of Pruſſian blue; he has endeavoured to make an application of it to the art of dyeing, and has given us a proceſs for communicating the moſt brilliant colour to ſilk, by means of cochineal. Macquer intended to have publiſhed a general treatiſe on the art of dyeing, the proſpectus of which he iſſued in the year 1781, but the indiſpoſition which ſo long preceded his death, prevented his engaging in it, and he died in 1784, before he had been able to carry into effect any part of his plan. It is ſurpriſing that Macquer, who was an excellent chemiſt, and amongſt the firſt who entertained correct ideas of the nature of chemical affinity ſhould have been ſeduced by the hypotheſis of Hellot. "I ſhould now," ſays he in his treatiſe on dyeing ſilk, "explain the action of mordants, and unfold the cauſes of durable and fading dyes; but this ſubject has been treated with ſuch ſagacity by Mr. Hellot, that I ſhall refer the reader to him." Bergmann ſeems to have been the firſt who referred the phenomena of dyeing *entirely* to chemical principles. Having dyed ſome wool and ſilk in a dilute ſolution of indigo in ſulphuric acid, he explains the effects he obſerved in the operation, by attributing them to the precipitation occaſioned by the blue particles having a ſtronger attraction for the particles of the wool and ſilk than for thoſe of the acidulated water: he remarks, that this attraction of the wool is ſo ſtrong as to deprive the liquor entirely of the colouring particles, but that the weaker attraction of the ſilk can only diminiſh the proportion of thoſe particles in the bath; and he ſhews that both the durability of the colour, and the degree of intenſity it is capable of acquiring, depend on theſe different attractions. This is the true light in which the phenomena of dyeing, which are purely chemical, ſhould be conſidered. Dufay had advanced thus far, but overlooked the importance of his own ſimple truths, in the ſearch after more recondite and complicated cauſes. But the peculiar action of mordants was ſtill unexplained, except on the wild hypotheſis of Hellot, till our countryman Mr. Keir, the ingenious tranſlator of Macquer's Chemical Dictionary, ſuggeſted, "that in dyeing, the earth of alum was precipitated, and in this form attached to the material prepared or dyed." Macquer ſoon after adopted the opinions of Bergmann and Keir, and in the ſecond edition of his dictionary, under the article *Dyeing*, publiſhed in 1778, treated the ſubject in a more extended manner, and proved that he had formed juſt conceptions of the nature and uſes of alum, and of different metallic ſolutions, as mordants in dyeing. Berthollet ſucceeded next to the place of truſt which had been ſucceſſively held by Dufay, Hellot, and Macquer, a poſt which he has held, and ſtill holds, with diſtinguiſhed honour to himſelf, and

advantage

advantage to his country. In a ſeries of memoirs, inſerted in the Tranſactions of the academy, the Annales de Chimie, and Journal de Phyſique, he has examined various points of chemical theory connected with the art of dyeing, and almoſt all his labours have ſince been directed to this object. In 1791, he publiſhed his elements of the art of dyeing in 2 vols. 8vo. a work which has contributed more to the progreſs of true theory and the general improvement of the art, than any other treatiſe whatever. This work has been tranſlated into Engliſh by Dr. Hamilton, and a ſecond edition of the original, with conſiderable additions, appeared in 1803. Every thing which a liberal and enlightened government could do for the encouragement and progreſs of the art, has been done in France, and this ſolicitude has been crowned with the ſucceſs it merited. Mr. Anderſon attributes the ſuperiority which certain articles of French manufacture maintain over thoſe of other nations, who poſſeſs the moſt beautiful wool, to the perfection of their dyes; and Mr. Home is of opinion, that the French are indebted to the academy of ſciences for their ſuperiority in many of the arts, and eſpecially that of dyeing. Perhaps another cauſe of the alleged ſuperiority of the French over other nations in the art of dyeing, may be diſcovered in the peculiar nature of their manufactures. Silk, of all other ſubſtances, ſeems beſt adapted to the diſplay of fine and brilliant dyes, and it conſtitutes, in all its various forms, a large portion of the manufactures of France. We may look, therefore, to the dye-houſes of Lyons, as well as to the academy of ſciences, for the cauſe of that ſuperiority which is now gradually declining. We have already ſpoken of our countryman Mr. Keir, as the firſt who ſuggeſted the true theory of mordants, which was afterwards extended and improved by Macquer. The worthy preſident of the literary and philoſophical ſociety of Mancheſter, Mr. Henry, ſome time after, read a paper to the ſociety, ſince publiſhed in the 3d volume of their Memoirs, "On the nature of wool, ſilk, and cotton, as objects of the art of dyeing; on the various preparations and mordants requiſite for theſe different ſubſtances, and on the nature and properties of colouring matter." This paper, which is replete with new and ingenious views of the nature and objects of dyeing, may be conſidered as amongſt the firſt attempts in this country to reduce to ſyſtem and theory the ſubject of which it treats: Mr. Henry, in theſe Memoirs, firſt pointed out the peculiar nature of the aluminous mordant of the calico printers; he ſhewed that by double decompoſition an acetite of alumine was formed, and explained the cauſe of its ſuperiority over the ſulphate of alumine, which conſiſts in the ſubſtitution of a volatile vegetable acid in lieu of the ſulphuric.

In the year 1794, Dr. Bancroft publiſhed his "Experimental Reſearches concerning the philoſophy of permanent colours, and the beſt means of producing them by dyeing, calico printing, &c." which may be conſidered as the firſt, and indeed only original work on the ſubject which this country has produced. This work, as the title indicates, is rather an experimental than practical treatiſe: it contains, however, much valuable information, which the practical dyer may apply in many caſes with conſiderable advantage, and is alſo uſeful as containing a hiſtory of all the different ſubſtances of which it treats, and an account of the labours of Macquer, Dufay, Hellot, Berthollet, and others, in this field of ſcience. It is to be regretted, that the work is ſtill imperfect, the firſt volume only having yet appeared. The ſecond, which was intended to comprehend all the remaining adjective colours and colouring matters, not treated of in the firſt, particularly thoſe very intereſting ones which are derived from the tribe of madders, can hardly, after an interval of fifteen years, be looked for with confidence.

Dr. Bancroft firſt pointed out the true action of tartar in the proceſs for dyeing ſcarlet, and clearly proved that the nitro-muriate of tin, or any ſolution of tin alone, produced a crimſon only; and that the addition of tartar produced a ſcarlet, by the converſion of a portion of the crimſon colouring matter of the cochineal, to a pure yellow. On this obſervation he founded an improvement in the ſcarlet dye, which conſiſted in communicating to the cloth, by means of quercitron bark, and any ſuitable mordant, ſuch a ſhade of yellow as would produce, with the crimſon of the cochineal, a true ſcarlet. By this proceſs he expected to ſave all that cochineal which he conceived to be expended in the production of the yellow: the trials on the large ſcale, however, we are informed by Dr. Bancroft, did not juſtify the expectations he had formed, of the importance of the proceſs.

A more important and laſting ſervice, however, he has rendered to the art of dyeing, by the introduction of the quercitron bark, a drug which is now become of ſuch general and acknowledged utility, as to ſuperſede almoſt every other kind of yellow colouring matter whatever. For the hiſtory of this ſubſtance, and other particulars reſpecting its introduction, we muſt refer to the article itſelf, under the head QUERCITRON BARK.

Though we have to record no brilliant diſcoveries or improvements in the practice of dyeing, within theſe few years, yet the art has continued progreſſively to improve, the different proceſſes have been ſimplified and amended; and what ſome years ago was conſidered a matter of chance and uncertainty, is now reduced to fixed principles.

The dyeing of Turkey red is now fully underſtood and practiſed in this country, with a ſucceſs at leaſt equal to that of any other. The proceſs has, with ſome modifications, been applied lately to the dyeing of piece goods, and the red thus produced ſurpaſſes in beauty and durability, all other colours which it is poſſible to fix on cotton. But it is not our intention here to enter into a hiſtory of all the minor improvements that have been made in the art of dyeing; they will be treated of at large, during the progreſs of the work, under their reſpective heads.

DYEING, *the Laws relating to*, are as follow: Dyers ſhall dye both the cloth and the liſt, or forfeit it. 1 R. III. cap. 4. No dyer may dye any cloth with archil, or with brazil, to make a falſe colour in cloth or wool, &c. on pain of twenty ſhillings. Stat. 3 & 4 Edw. VI. cap. 2. Dyers are to fix a ſeal of lead to cloths, with the letter *M*, to ſhew that they are well maddered, &c. or forfeit three ſhillings and fourpence; and not to uſe log wood in dyeing on pain of forfeiting twenty pounds. Stat. 23 Eliz. cap. 9. And penalties are inflicted on dyers, who dye any cloths deceitfully, and not being dyed throughout with woad, indigo, and madder; alſo marks ſhall be put to the cloth dyed, &c. Dyers in London are ſubject to the inſpection of the Dyers' company, who may appoint ſearchers; and out of their limits, juſtices of peace in ſeſſions to appoint them: oppoſing the ſearchers incurs ten pounds penalty, by ſtat. 13 Geo. I. c. 24.

DYEING, in a more extenſive ſenſe, is applied to all kinds of colourings given to bodies of any ſort.

In which ſenſe, dyeing amounts to the ſame with *coloration*; and includes ſtaining, painting, gilding, marbling, printing, &c. The Chineſe are ſaid to practiſe the dyeing of tea with catechu, which gives the worſt ſorts of green tea leaf the colour, and its infuſion the tincture of bohea. Short. Diſſert. on Tea, pref. p. 15. See TEA and CATECHU.

The

The ſorts of dyeing now commonly uſed in vulgar trades, are. 1. Whitening of wax, and ſeveral ſorts of linen, and cotton cloths, by the ſun, air, and reciprocal effuſions of water. See BLEACHING. 2. Staining of wood and leather by lime, ſalt, and liquors, as in ſtaves, canes, marble, leathers, marquetry. &c. 3. Marbling of paper by tempering the colours with ox gall, and applying them upon a ſtiff-gummed liquor. See PAPER. 4. Colouring, or rather diſcolouring ſilks, tiffanies, &c. by brimſtone. 5. Colouring ſeveral iron and copper works into black with oil. 6. Giving leather a gold colour, or rather dyeing ſilver-leaves like gold, by varniſhes; and in other caſes by urine and ſulphur. 7. Staining of marble and alabaſter, with heat, and coloured oils. 8 Tinging ſilver into braſs with brimſtone or urine. 9. Colouring the barrels and locks of guns blue and purple with the temper of ſmall-coal heat. 10. Colouring glaſs cryſtals, and earthen-ware with the ruſts and ſolutions of metals. See POTTERY, &c. 11. Colouring live hair, as in Poland, both horſe and man's hair; and alſo of furs. 12. Enamelling and annealing. See ENAMELLING. 13. Application of colours, as in the printing of books and pictures; and the making of playing cards, japanning, &c. See PRINTING, CARDS, and JAPANNING. 14. Gilding and tinning with mercury, block tin, and ſal ammoniac. See GILDING and TINNING. 15. Colouring metals, as copper with calamine into braſs, and with zinc or ſalt-petre into falſe gold, or into falſe ſilver with arſenic. See CALAMINE, BRASS, ZINC, ARSENIC, &c. 16. Making painters' colours, by preparing of earth, chalk, and ſlates, as in umber, oker, Cologn earth, &c. out of the calces of lead, as ceruſs and minium; by ſublimates of mercury and brimſtone, as in vermilion; by tinging of white earths variouſly, as in verditer, and ſome of the lakes; by concrete juices or fæculæ, as in indigo, pinks, ſap-green, and lakes: and by ruſts, as in verdigris, &c. See CERUSS, MINIUM, VERMILLION, INDIGO, &c. 17. The applying of theſe colours by the adheſion of ox-gall, as in the marbled paper aforeſaid; or by gum-water, as in limning: or clammy drying oils, as the oils of linſeed, nuts, ſpike, turpentine, &c. See PAINTING, LIMNING, &c. 18. Watering of tabbies. See WATERING, CALENDER, TABBY, &c. Petty. Appar. Hiſt. of Dyeing, ap Sprat.

Glaſs dyed is the common matter of artificial jewels: the tinctures are given with zaffer, manganete, feretto, crocus martis, &c. The proceſſes are deſcribed at length in Antonio Neri, de Re Vitrario, lib. i. cap. 12, 13, 14, ſeq. See GLASS, GEM, &c.

The Peruvian women, when grown old, dye their grey hairs black by a very untoward operation, *viz.* holding the head ſome hours with the hair ſopped in a boiling tincture of the root of a tree called *cuchau*, by the Spaniards *maquey*.

DYEING *of Hats*, is done by boiling a hundred pounds of logwood, twelve pounds of gum, and ſix pounds of galls, in a proper quantity of water for ſome hours; after which about ſix pounds of verdigris, and ten pounds of green vitriol are added, and the liquor kept ſimmering, or of a heat a little below boiling. Ten or twelve dozen of hats are immediately put in, each on its block, and kept down by croſs bars for about an hour and an half; they are then taken out and aired, and the ſame number of others put in their room; the two ſets of hats are then dipped and aired alternately, eight times each; the liquor being refreſhed each time with more of the ingredients, but in leſs quantity than at firſt. This proceſs affords a very good black on woollen and ſilk ſtuffs as well as on hats. Com. Phil. Tech. p. 428. See HAT.

DYEING, *or ſtaining of wood, for inlaying, veneering, &c.* *Red* is done by boiling the wood in water and alum; then taking it out, adding brazil to the liquor; and giving the wood another boil in it. *Black*, by bruſhing it over with logwood boiled in vinegar, hot; then waſhing it over with a decoction of galls and copperas, till it be of the hue required. Any other colour may be given by ſqueezing out the moiſture of horſe-dung through a ſieve, mixing it with diſſolved roch alum, and gum-arabic; and to the whole adding green, blue, or any other colour deſigned. After ſtanding two or three days, pear-tree, or other wood, cut to the thickneſs of half a crown, is put into the liquor boiling hot, and ſuffered to remain till it be ſufficiently coloured. Park. Treat. of Japan. chap. xxvii. p. 82.

DYEING *of bone, horn, or ivory*. *Black* is performed by ſteeping braſs in aqua fortis till it be turned green: with this the bone, &c. is to be waſhed once or twice; and then put in a decoction of logwood and water, warm. *Green* is begun by boiling the bone, &c. in alum-water; then with verdigris, ſal ammoniac, and white wine vinegar; keeping it hot therein till ſufficiently green. *Red*, is begun by boiling it in alum-water, and finiſhed by decoction in a liquor compounded of quicklime ſteeped in rain-water, ſtrained, and to every pint an ounce of brazil wood added: the bone, &c. to be boiled therein till ſufficiently red. Other methods are given by Salmon. And from him by Houghton. Park. lib. cit. p. 83. Salm. Polygraph. lib. iii. cap. 35. p. 275. Hought. Collect. N° 138. tom. i. p. 361. See BONES, HORN, IVORY, &c. The refuſe of the Bow-dye, given to hogs to feed on, is ſaid to tinge their very bones red.