A

TREATISE ON GEMS,

IN REFERENCE TO THEIR

PRACTICAL AND SCIENTIFIC VALUE;

A USEFUL GUIDE FOR THE JEWELLER, LAPIDARY, ARTIST, AMATEUR, MINERALOGIST, AND CHEMIST; ACCOMPANIED BY A DESCRIPTION OF THE MOST INTERESTING AMERICAN GEMS, AND ORNAMENTAL AND ARCHITECTURAL MATERIALS.

BY DR. LEWIS FEUCHTWANGER,

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NOTICE TO THE PUBLIC.

The Author of the foregoing Treatise, has in preparation, and will shortly be ready for the press, the following works, viz:—

DOMESTIC GUIDE, for the preparation of Cosmetics, and substances of every description for Washing, Bleaching, Cleaning, and Polishing: in which the author has collected all the information of others, with his own long experience, and has demonstrated all the principles of the above practical branches by their natural causes and effects. The whole work will contain upwards of 200 octavo pages and 2000 receipts.

ALSO,

MINERALOGICAL TEXT-BOOK for schools, Seminaries and Private Students.

This Book is intended to explain the Elements of Mineralogy by their external and internal characters, without depending, however, altogether, upon the crystallographical distinctions, but with particular reference to their localities and application to the useful arts.

This work does not intend to be strictly philosophical, as it is a plain Text Book for the younger student, who wishes to be informed of the elementary principles, how to collect, and how to classify the minerals coming under his observation.

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DR. LEWIS FEUCHTWANGER,
No. 2 Courtlandt-street.

COLUMBIA COLLEGE,
New York, 26th March, 1838.

SIR:

I have, at your request, perused the manuscript of your Treatise on the Gems. It gives me great pleasure to be able to bear my testimony to the care and labour with which this treatise has been compiled. The work is one which may be usefully employed by teachers of Mineralogy, and particularly in its useful applications. To the practical man it cannot fail to be of great value, from its opening sources of information which, in this country, are as yet confined to but few persons, and from the reputation of the authorities whence you have drawn your facts. It is, however, in reference to the native minerals and rocks of the United States, that I conceive your treatise to be most likely to be eminently useful. I observe that you have collated the descriptions and localities of American specimens, which are now to be sought in scientific periodicals, or in the transactions of learned societies. For such searches practical men have not the opportunities, and scientific men, although well aware of the value of our native treasures, are rarely so circumstanced as to be able to render them objects of commercial speculation. This part of your task has been laboriously and faithfully accomplished.

I am aware that you have experienced a difficulty in being compelled to write in a language which to you is foreign. On this head, however, you need not feel discouraged. The language of science is universal; and as I have found no difficulty in understanding every portion of your manuscript, I do not doubt that it will be equally clear and intelligible to your readers, when it shall appear in a printed form.

JAMES RENWICK.

Dr. LEWIS FEUCHTWANGER.

PREFACE.

Among the many publications of the present day on the various subjects of Natural History, a practical work on mineralogy, as applied to the Arts, has been much needed in the English language. Of this general subject the history of the Gems, in reference to their mineralogical, chemical, and physical characters, and with a view to serve as a guide to the lapidary, the jeweller, and the amateur, is one of the most important branches.

The author of the following Treatise has, at the solicitation of his numerous friends, consented to fill with his feeble means that vacancy in our literature. Should he therefore have been so successful as to realize their wishes, and to contribute in guarding against deception and ignorance, and in pointing out those theoretical and practical cautions to be observed in the treatment and purchase of Gems, he would feel satisfied that his humble and imperfect efforts are amply rewarded. He has considered the Gems in their most extended sense, and not treated of the mineral productions generally called by that name alone, but has included the Corals, Pearls, and such Rocks as promise to prove ornamental and useful to architecture. He has drawn the attention of the reader to those specific characters which distinguish the true Gems from all other minerals and false stones, the last of which are now in such general use, and are palmed upon the ignorant as precious gems, which in truth are remarkably good imitations, and often require a practised eye to distinguish the false from the true. The former are now worn by all classes, either from ignorance or from the more moderate price at which they can be afforded, and often present nearly the same appearance as real Gems. In order to encourage the artist in the manufacture of those pastes, the author has described the mode of manufacturing them, according to the best information, and from his own experience.

The author has been very particular in describing all the localities of the various Gems and mineral productions suitable for

ornamental purposes, and particularly those of this country, upon which the unbounded blessings of Providence have been spread in the most liberal manner, in order to awaken the mind of the young observer to those rich treasures of Nature which are yet principally hidden beneath the surface of the earth, or which may be left for his future investigation. It is, however, not at all surprising that those rich natural productions with which the American soil abounds, are not yet sufficiently known, or even appreciated, because neither the naturalist nor the student has, in this country, the opportunity of examining cabinets of specimens of these rich treasures.

It was the author's intention to accompany this work with plates in illustration of the lapidary's wheels and tools, as well as of the forms in which all the Gems and minerals originally crystallize. He likewise proposed to prepare coloured prints, representing all the colours of the Gems, such as have been given by Mr. Mawe, in his Treatise on Diamonds and Precious Stones, printed in London in 1813. He would at the same time have extended this work to nearly double its present volume. He has, however, deferred this task lto a future occasion, when, after this essay will have received the sanction of an enlightened pub lic, he may feel encouraged to issue another edition. In the arrangement of the following Treatise, the author has followed the plan of a small work, published in 1832, by Dr. Blum, in Germany; but he has drawn other references from the following works:—

Haüy des Pierres Precieuses,
Brard Mineralogie Appliquée aux Arts,
Dumas Chemie Appliquée aux Arts, 1821,
Hitchcock's Report on the Geology of the State of Massachusetts,
Comstock's Mineralogy,
Leuch's Waarenkunde,
Sillimann's Journal.

TREATISE ON GEMS.

PART I.

INTRODUCTION.

§ I. GENERAL DIVISIONS.

All things in Nature, (material or immaterial,) of which we take cognizance by our senses, may be arranged under one of two heads: they are either such as are comprised within space or may be discriminated by our external senses, as animals, plants, etc.; or such as do not possess a form, and are only comprehended by the inner senses, as doubt, belief, etc.: the latter belong to psychology, and the former to physiology, or what we may call physics by a more comprehensive term. Physics is divided into natural philosophy and natural history; the latter is divided into the study, examination, and treatment of organic bodies, such as those belonging to zoology and botany, and of inorganic bodies, as for example, those belonging to mineralogy.

§ II. DIVISIONS IN MINERALOGY.

The crust of the globe we inhabit consists of inorganic substances; minerals in their mechanical, simple, solid, or liquid state; and mineralogy, in its strictest sense, treats and considers of the individual properties of minerals, or those which have reference to their form, quality, and material; and this part of the science is generally called oryctognosy: whereas that part of mineralogy which treats of the constant relation that minerals bear to each other, in regard to their series, or order of superposition, and also the geographical distances of their layers, is called geology. That part of mineralogy which treats of the application of minerals to the different arts and other purposes of life is called economical mineralogy, or mineralogy applied to arts.

§ III. PRECIOUS STONES, OR GEMS.

Precious stones or gems are such minerals as, either from their beauty or other valuable properties, have been made subservient to the arts or to trade, and are used as ornaments or employed in jewellery. In order to appreciate more fully such minerals as may possess superior properties, it is our present object to consider them in reference to their scientific and practical value.

§ IV. DIVISION OF GEMS.

Gems are generally classed as follows:

1s.t Are real gems, or jewels; and,

2d. Semi-gems, or merely precious stones. The first comprise such minerals as combine, within a small space, either vivid or soft and agreeable colours, with a high degree of lustre, usually termed fire, as well as hardness; whereas the second possess these properties in a less degree, often occur semi-transparent or translucent, and in larger shapeless masses. It is, however, impossible to draw a strict line between these classes, as the conventional value put upon particular gems belonging to the one or the other class, also affects their character; for very often some, which generally are considered as belonging to the second class, may be valued, for peculiar properties, much higher than others of the first class.

Those species of minerals which are generally considered real gems are the—

Diamond,	Garnet,
Sapphire,	Tourmaline,
Chrysoberyl,	Rubellite,
Spinelle,	Essonite,
Emerald,	Cordierite,
Beryl,	Iolite,
Topaz,	Quartz,
Zircon,	Chrysolite.

The rest are considered as semi-precious gems. There is another division, under which the minerals are arranged according to their different degrees of hardness. This property will be considered in its proper place.

§ V. GENERAL DISTINGUISHING CHARACTER OF MINERALS.

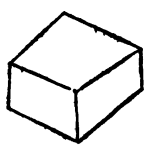
In order to distinguish the crude and polished precious stones, it is necessary to describe more particularly the properties and other peculiarities of the minerals, which we shall now proceed to do.

§ VI. FORM.

All minerals which are distinguished by the form which they assume within the planes they are included in, are called crystals; and such regular individual forms, are said to be crystallized. On the other hand, such minerals as have not acquired this perfect form, and which appear to us more irregular, are uncrystallized, and are denominated amorphous.

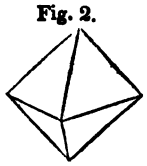
Crystallography is a highly important branch of study for the understanding of the practical relation of the crystallized forms of minerals; for as these forms or modifications are mostly peculiar to different species, one mineral may often, with certainty, be distinguished from another by a knowledge of the difference between the forms of their crystals. The great variety of forms under which the crystals of different substances appear, may all be reduced to a few fundamental or primitive forms, which are—

Fig. 1.



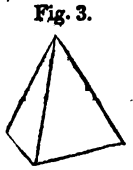
1st. The *Parallelopiped*, which includes the cube, four-sided prism, rhomb, or any other figure having six faces, the two opposite ones being parallel with each other. When its angles are equal in every direction, and the size of its planes alike, it is called a cube. When the same figure is extended, so as to make the length greater than the breadth, it becomes a four-sided prism; and when the angles are oblique, that is, alternately acute and obtuse, it is a rhomb.

Fig. 2.



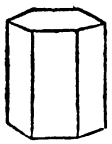
2d. The *Octahedron*, which has eight triangular faces, four of which meet at points opposite to each other, and has the appearance of two four-sided pyramids, joined base to base.

Fig. 3.



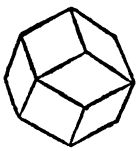
3d. The *regular Tetrahedron*, bounded by four oblique planes, having four points or angles, and six edges.

Fig. 4.



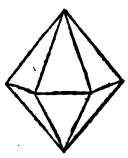
4th. The *regular Hexahedral Prism.* A solid contained within eight planes; namely, six rectangular, a hexagon, and a six-sided prism, bounded by a terminal plane at each end.

Fig. 5.



5th. The *Dodecahedron*, with *rhombic faces.* A solid, containing twelve rhombic planes, all similar to each other.

Fig. 6.



6th. The *Dodecahedron*, with *triangular faces.* Twelve triangular planes, exhibiting two six-sided pyramids, joined base to base.

These forms are the basis of many species of minerals, which may yet entirely differ in composition from each other; and although their external appearance may differ from those forms, proper to some minerals, yet each primitive form will always be found to exist under precisely the same angles.

There are, besides, a vast number of forms under which minerals appear in nature; but the object of the present essay is only to refer to mineralogy in its important bearing upon the value of precious stones: and we will describe, therefore, the crystallization of the different minerals under their proper heads, when treating of the individual minerals used as gems. The non-crystallized minerals exhibit in their external appearance either—

1st. A resemblance to certain natural or artificial products; such as a tree, a globe, wire, &c.; or—

2d. They appear in particular forms, unlike other substances, such as a compact, sprinkled, or granular one; and are divided then into—

1st. Those which have a free formation; or—

2d. An interrupted formation. Under the first we recognise globular, clustered, reniform, dentiform, arborescent, capillary, foliated, stalactiform and prongy. To the second we consider as belonging the pseudo-morphous crystal, the amygdaloid, spectre petrifactions or incrustations.

§ VII. CLEAVAGE.

All regular formed minerals or crystals are capable of being cloven or split in certain directions more easily than in others: and this circumstance is of the utmost importance as regards precious stones, as some of them may be thus divided into the thinest leaves, and with great facility, whereas it would require considerable power to split them in any other direction, and they would, furthermore, exhibit irregular faces. We may also judge from the cleavage, of the external crystalline formation of a mineral, as the cloven faces run, generally, parallel to one or the other crystalline plane. The cleavage of minerals is of essential advantage to the mineralogist and lapidary.

§ VIII. FRACTURE.

Fracture exhibits itself in minerals in directions where no cleavage can be seen or exists, and is either—

1st. Even, if the faces are on a plane without elevations or depressions;

2d. Uneven;

3d. Conchoidal, exhibiting conchoidal excavations;

4th. Splintery, showing small splintery parts on the broken surface which yet adhere to the mass, but are more transparent;

5th. Earthy, when the faces show earthy parts on the fracture;

6th. Knotty, or prominent knots, which are left after the fracture.

§ IX. SURFACE.

The surfaces of the crystallized, as well as non-crystallized minerals, exhibit some differences; they are either—

1st. Smooth;

2d. Striped, exhibiting linear, fine or strong hollows;

3d. Drusy, presenting small prominent crystals, nearly equal to each other;

4th. Uneven;

5th. Rough; or,

6th. Granular.

§ X. HARDNESS.

The hardness of minerals forms an important character, it being uniform in the same variety. It is that property by which minerals

or precious stones resist impressions of an instrument, or efforts to scratch them. There are two modes of testing the hardness of minerals.

1st. By employing them to scratch such minerals as are known to be standards for comparison; or,

2d. By using such standards on the mineral to be examined. In the first instance we test the hardness on such minerals as the Diamond, Sapphire, Topaz, Quartz, Felspar, Apatite, and Fluorspar: or we may use the file, or point of a steel, which is the mode practised by jewellers, who make use of fine English files, and acquire sometimes great skill in their employment. The soft minerals and pastes will readily be touched by the file; whereas, Diamond, Ruby, and Sapphire are not at all attacked. In mineralogy, however, a simple table, constructed by Mohs, and called the scale of hardness, is made use of; and jewellers might derive great benefit from its application. This scale consists of a great number of minerals arranged together, each of which, in succession, possesses a degree more of hardness than the one preceding.

The Standard Minerals are as follows:—

1. Talc.
2. Gypsum, or Rock Salt.
3. Carbonate of Lime.
4. Fluorspar.
5. Asparagus Stone, (Phosphate of Lime.)
6. Felspar.
7. Quartz, or Rock Crystal.
8. Topaz.
9. Corundum.
10. Diamond.

We see, by the numerical order, that Fluorspar is 4 and Diamond 10; and for determining more particularly the hardness of a mineral, the distance between every two members of the scale may be divided into decimals. In order to test the hardness of any mineral, its corner is applied to the members of the scale, beginning with the hardest, so as not unnecessarily to scratch the softer, until we ascertain what mineral is readily scratched. We compare then, by means of a file, the hardness of the mineral to be tested, with the last member of the scale that has not been scratched; and we judge from the resistance which the mineral offers to the file, and from the noise produced in scratching, whether this mineral is as hard as, or actually softer than, the last unscratched member of the scale. Oriental Topaz, for instance, will not scratch the two highest members of the scale, but will the third, the Topaz = 8; and, tested by

the file, we find its hardness not to be under 9; since Corundum, the standard on the scale, gives the same result as the Oriental Topaz by this test; whereas, the proper Topaz scratches No. 7. Precious stones have latterly been divided and arranged according to their hardness, into the following three classes:—

1. HARD GEMS; OR THOSE HARDER THAN QUARTZ.

Diamond,	Topaz,
Sapphire,	Emerald,
Ruby,	Hyacinth,
Chrysoberyl,	Essonite,
Spinelle,	Garnet.

2. SEMI-HARD GEMS.

Rock Crystal,	Opal,
Amethyst,	Chrysolite,
Chalcedony,	Lazulite,
Carneleon, and other similar ones,	Obsidian,
	Turquoise.

3. SOFT PRECIOUS STONES.

Those softer than Fluorspar; Malachite, Amber, and Jet.

§ XI. COHESION.

If the smallest particles of a mineral adhere together so as to represent it in a solid, fluid, or any other condition, we consider this effected by the power of cohesion; and we find that in minerals which are brittle, the particles are coherent; in those which are friable, they are more slightly so. A solid mineral is said to be *brittle*, if in trying to separate small particles with a knife or file, they lose their original condition, detach themselves with noise, and fly about in form of powder.

2d. *Pliable*, if the separate particles remain in their condition.

3d. *Mild*, if those particles, after being detached, remain on the cutting instrument.

4th. *Extensible*, if the mineral may be beaten into plates or drawn into wire.

5th. *Flexible*, if the detached particles that have been bent, will not resume their former position.

6th. *Elastic*, if, after being bent, they will resume their former position.

A liquid mineral may be either tough or thickly liquid. The degree of the cohesion of a mineral depends upon the hardness which it possesses, and this property has been already considered.

§ XII. SPECIFIC GRAVITY.

The specific gravity of a body is its weight, when compared with the weight of a quantity of water equal to its own bulk. When a mineral is suspended in water, and weighed, it is lighter than when weighed in air, by the weight of a quantity of water equal to the bulk of the mineral so suspended. It is obvious, that a mineral, bulk for bulk, as heavy as water, could not sink in it; but if it should sink, its weight must be diminished by exactly that of the quantity of water it displaces. In order to find the specific gravity of a substance, it must be weighed in air by a hydrostatic balance, or by a common balance, and then weighed in water, when its specific gravity may be found by calculation, viz: by dividing its weight in air by its loss in water. Specific gravity in minerals is a very remarkable property; since different substances possess, in most all instances, a different gravity; whereas all varieties of one and the same substance possess nearly the same specific gravity. For determining the specific gravity of minerals with the hydrostatic balance, we proceed, for instance, as follows:—an unknown mineral having been weighed first in the air, is then fastened by means of a hair, and weighed in water. Its weight in the air we state at 17.65, in water 12.35. The loss in water is, therefore, 5.30; and this number indicates the loss of so much bulk of water displaced by the mineral, considering the specific gravity of water 1.00; dividing 17.65 by 5, makes it equal to 3.53, which is the exact specific gravity of the mineral, and which is that of Essonite. Instead of a hydrostatic balance, we may as well use Nicholson's hydrometer, a simple and very convenient instrument, consisting of a hollow glass cylinder (A,) and two dishes (B and C) filled with lead, in order to keep the instrument upright. The hydrometer is put into a glass vessel (E,) filled with water, and used as follows:

1st. The weight is determined, which is required to sink the instrument to mark D in water.

2d. The mineral is put in the dish A, over the weight noted, that is required, in addition to the mineral, to sink the hydrometer to D.

3d. The same experiment is repeated, by putting the mineral, after being moistened and washed with water, in the dish C; and now is A—B the weight of the mineral in the air, and C—B the weight of a quantity of water equal in volume to that of the mineral.

For instance, let A = 32.8
B = 7.3
C = 15.8

there is (A—B) 32.8—7.3=25.5 the weight of the mineral in the air.

(C—B) 15.8—7.3=8.5 the weight of an equal quantity of water, and proceed $8.5 : 25.5 = 1 : x$

$$x = \frac{25.5}{8.5} = 3.00,$$

which is the proper specific gravity. For determining the specific gravity of substances or minerals lighter than water, or which float in water, it is necessary to adhere to the same method by the hydrometer. A heavier body, such as lead, after determining the difference of weight, within or without the water, of both together, and then of the heavier body alone, the specific gravity of the lighter substance is the result. And for determining the specific gravity of liquids, by means of the hydrostatic balance, a glass ball is applied to one of the arms, (its loss of weight in pure water being known,) and, dipping the same in the liquid to be examined, any addition or abstraction will show the specific gravity of the liquid. The hydrometers of Beaumé for the different liquids to be examined, are employed with satisfactory results.

That the specific gravity of minerals has been known as far back as the thirteenth century, and was applied by the Oriental nations for determining the character of precious stones, is sufficiently proved by a work written in that century by Mohammed Ben Manner. In fact, the specific gravity is often, in connexion with the colour, quite essential in determining the nature of a gem.

§ XIII. COLOURS.

The colour of minerals and precious stones is one of their most obvious and striking properties; but yet it is very difficult to distin-

guish accurately a mineral by this, on account of the colours very frequently being accidental, or depending upon the presence of certain metallic oxides. The nature of the colouring principle was well known in former ages, but nought but erroneous views were entertained of the same. Thus, for instance, it was believed that gold and tin were the colouring principle of garnet; and Boyle, several centuries ago, speaks of a metallic spirit that communicates the colour to precious stones. Mineralogists have fixed eight primary or fundamental colours, besides all the different shadings from one colour to the other, on account of the colours being reflected from the different substances. They are generally divided into—

1st, Metallic; and,

2d, Non-metallic colours.

Metallic colours are the following:

Copper, red.	Silver, white.
Bronze, yellow.	Tin, white.
Brass, yellow.	Lead, gray.
Gold, yellow.	Steel, gray.
Iron, black.	

The eight primary of the non-metallic colours are as follows:—White, Gray, Black, Blue, Green, Yellow, Red and Brown. And the shades of each of these primary colours are—

1. WHITE.

Snow-white,	Grayish-white,
Reddish-white,	Greenish-white,
Yellowish-white.	Milk-white.

2. GRAY.

Bluish-gray,	Greenish-gray,
Pearl-gray,	Yellowish-gray,
Smoky-gray,	Ash-gray.

3. BLACK.

Grayish-black,	Brownish-black,
Velvet-black,	Bluish-black.
Greenish-black,	

4. BLUE.

Blackish-blue,	Prussian-blue,
Lasur-blue,	Sky-blue,
Indigo-blue,	Violet-blue,

Smalts-blue, Lavender-blue,

5. GREEN.

Verdigris-green, Grass-green,
Seladon, or Green Earth-green, Epidote-green,
Asparagus-green, Olive-green,
Mountain-green, Blackish-green,
Garlic-green, Oil-green,
Emerald-green, Siskin-green.

6. YELLOW.

Lemon-yellow, Honey-yellow,
Sulphur-yellow, Ochre-yellow,
Straw-yellow, Wine-yellow,
Wax-yellow, Isabel-yellow.
Orange-yellow,

7. RED.

Carmine-red, Rose-red,
Scarlet-red, Brownish-red,
Crimson-red, Flesh-red,
Cochineal-red, Aurora-red,
Columbo-red, Hyacinth-red,
Cherry-red, Brick-red,
Peach-red, Blood-red.

8. BROWN.

Chesnut-brown, Yellowish-brown,
Reddish-brown, Mica-brown,
Clove-brown, Lignite-brown,
Hair-brown, Silver-brown.
Blackish-brown,

The precious stones possess the colours in the highest perfection, and their principal and intrinsic value depends mostly upon this property; as most gems occur of various colours, the following table will exhibit them, along with their specific gravity —

LIMPID GEMS.

	SPECIFIC GRAVITY.
Zircon,	4.41 to 4.50
Sapphire,	3.9 4.00

Diamond,	3.5	3.6
Topaz, (Pebble)	3.49	3.56
Rock Crystal, (False Diamonds, Lake George, Trenton Falls,)	2.69	
Beryl, Aquamarine,	2.67	2.68

RED GEMS.

Zircon, Hyacinth,	4.41 to	4.50
Garnet, (Oriental Garnet)	4.0	4.2
Sapphire, Ruby,	4.0	
Garnet, Bohemian Garnet. Pyrope,	3.7	3.8
Spinelle, Ruby Spinelle, Ruby Balaise,	3.58	3.64
Diamond	3.5	3.6
Essonite,	3.5	3.6
Topaz, Brazilian Topaz, (often burnt)	3.52	3.56
Tourmaline, Siberite, Rubellite,	3.03	3.10
Rose Quartz. Bohemian Ruby,	2.61	2.63
Carneleon,	2.5	2.6

YELLOW GEMS.

Zircon,	4.41	4.50
Sapphire. Oriental Topaz,	4.0	
Chrysoberyl,	3.59	3.75
Topaz. Brazilian, Saxonian, and Syrian Topaz	3.50	3.56
Diamond,	3.5	3.6
Beryl,	2.68	2.71
Rock Crystal, Citron,	2.60	2.69
Fire-opal,	1.90	2.12

GREEN GEMS.

Zircon,	4.41	4.50
Sapphire, Oriental Chrystolite, and Emerald	3.9	4.00
Malachite,	3.67	
Chrysoberyl,	3.59	3.75
Spinelle,	3.58	3.64
Diamond,	3.5	3.6
Topaz. Aquamarine,	3.49	3.56
Chrysolite,	3.33	3.44
Idocrase,	3.08	3.40
Tourmaline, (Brazilian and Maine,)	3.00	3.30
Emerald,	2.67	2.73

Beryl,	2.67	2.71
Prase,	2.66	2.68
Heliotrope	2.61	2.63
Chrysoprase,	2.58	2.60
Felspar, Amazon Stone,	2.50	2.60
BLUE GEMS.		
Sapphire,	3.90	4.00
Disthene, (Kyanite,)	3.63	3.67
Spinelle,	3.58	3.64
Diamond,	3.5	3.6
Topaz. Brazilian Topaz,	3.49	3.56
Tourmaline, Indigolite,	3.00	3.30
Turquoise,	2.86	3.00
Beryl, Aquamarine	2.67	2.71
Dichroite (Iolite,)	2.58	2.60
Haüyne,	2.47	
Lazulite,	2.30	
VIOLET GEMS.		
Garnet,	4.0	4.2
Sapphire, Oriental Amethyst,	3.9	4.0
Spinelle,	3.58	3.64
Axinite,	3.27	
Tourmaline,	3.00	3.30
Amethyst,	2.65	2.78
BROWN GEMS.		
Zircon,	4.41	4.50
Garnet,	4.00	4.20
Essonite,	3.53	3.60
Diamond,	3.50	3.60
Tourmaline,	3.00	3.30
Smoky Quartz,	2.69	2.70
BLACK GEMS.		
Diamond,	3.50	3.60
Tourmaline,	3.00	3.30
Rock Crystal, Morion,	2.69	2.71
Obsidian,	2.34	2.39
Pitch Coal,	1.29	1.35
Cannell Coal,	1.23	1.27

GEMS DISTINGUISHED FOR THEIR VARIOUS SHADINGS OF COLOUR AND LIGHT.

Garnet,	4.00	4.20
Sapphire, Star Sapphire,	3.90	4.00
Chrysoberyl,	3.70	3.80
Hypersthene,	3.38	
Labrador Spar,	2.71	2.75
Dichroite,	2.58	2.60
Cat's-eye,	2.56	2.73
Adularia,	2.50	2.60
Felspar,	2.50	2.60
Precious Opal,	2.00	2.10
Hydrophane,	1.90	2.00

A number of the precious stones do not possess a fixed colour, but merely a tinge or shade of a colour which we distinguish from one another by the terms, dark, high, light and pale coloured or tinged. Another distinction consists in precious stones possessing either one or more colours or a varigated colour, or being spotted, painted or stained with different colours; these latter characters, however, more properly belong to the semi or common precious stones, than to gems.

§ XIV. LUSTRE.

The quantity of light which is reflected from the surface of minerals and precious stones, is indicated by the lustre; and this is an important character for distinguishing minerals, inasmuch as it is almost uniform in the same species. It exhibits itself either—

A, in the strength; or,

B, in the kind.

The first depends in precious stones, on the beauty of their substance, and the manner in which they are cut and polished; and we distinguish—

1, highly lustrous;
2, lustrous;
3, little lustrous;
4, shining;
5, faint;
and the highest degree of lustre is called fiery.

The kinds of lustre are—

1, metallic;
2, adamantine;

3, resinous; 5, pearly;
4, vitreous; 6, oily.

Often we perceive the transitions from one lustre into the other: and we describe a mineral as possessing the lustre between the adamantine and vitreous lustre, and approaching to the pearly lustre.

§ XV. TRANSPARENCY.

The capacity of minerals and precious stones to permit the passage of the rays of light through them, so that an object held on the one side may be clearly seen on the other, is called its transparency: and according to the extent in which this property is possessed, we divide it into—

1st. Transparent, as where the object is perfectly visible;

2d. Semi-transparent, where not distinctly visible;

3d. Translucent, where the object is but feebly seen through, and yet is clear towards the light;

4th. Translucent on the edges; and,

5th. Opaque, where no light at all is transmitted through the mineral.

§ XVI. REFRACTION.

When the rays of light pass from one substance (rarer medium) into another (denser medium), they are always refracted or bent towards a perpendicular line passing through that substance (medium): and so also when the rays pass from a denser into a rarer medium, they are refracted in a contrary direction, or from such a perpendicular; and objects are multiplied when seen through the inclined contiguous surfaces of any transparent medium. The light coming from the object being refracted by the oblique surface, passes to the eye in a different direction from that of the real object, and there are as many images seen as there are oblique planes.

According to the manner in which the rays are refracted, the power is divided into—

1st, simple; and,

2d, double refraction.

An object may be seen double or treble; it is yet the simple refraction, since the direction of the rays of light are only changed by the direction in which they happen to strike the transparent

surface. When an image of a single object is doubled, if seen through the parallel surface, it is called double refraction. Almost all precious stones possess the power of double refraction in a greater or less degree: we may distinctly see the single refraction in quartz of a prismatic form, and that of double refraction in the rhombic limestone, called the Iceland spar. But all precious stones do not possess this property in the same degree; and on that account we specify the same by calling it—

a, treble;
b, moderate;
c, high; and
d, very high degrees of double refraction.

This property, depending upon the interior structure of the mineral, is of intrinsic value in testing the most valuable gems. But it has always been difficult in practice to determine with accuracy this character; for the observer is often disappointed in his experiments. Fissures in the substances partly contribute to the disappointment, and sometimes the general structure of the mineral will not permit of an accurate test, as it may not yield the proper face or facette, or the plate may be too thick for obtaining the proper refraction; it therefore cannot be employed without much practical skill.

§ XVII. PLAY OF COLOUR.

The property of many precious stones to display different colours in smaller or greater points of brilliancy, when the rays of the sun are directed towards them, or by changing the position of the gem, is called a play of colours: such we perceive in the Diamond, precious Opal, and Labrador Spar.

§ XVIII. IRIDESCENCE.

If the fissures contained in the interior of a transparent precious stone, represent coloured rings, resembling colours of the rainbow, the appearance is called iridescence.

§ XIX. CHANGE OF COLOUR.

The property of certain precious stones to display two different colours, if held in different directions, is called the change of colour: such we observe in the Cat's-eye, Moon-stone, and Iolite; also, in the Chrysoberyl. This property has generally been termed opalescence, which, in my opinion, is the same as iridescence.

§ XX. LOSS OF COLOUR.

Many precious stones, when exposed more or less to atmospheric air, and also from the oxydation of the colouring principles contained in them, lose their colour; which may, however, very often be restored, either by laying them in a dark or moist place; as in the case of Rose Quartz and Chrysoprase; or they may be restored by leaving them some time in oil, as is done with the Opal.

§ XXI. LUSTRE SHINE.

A soft waving shine of lustre is often perceived in the interior of several gems; also that of a star, such as we detect in the Star Sapphire.

§ XXII. PHOSPHORESCENCE.

Many precious stones possess the property of giving a greater or less distinct light, either by mechanical means, artificial heat, or the effect of the rays of the sun: this is called phosphorescence. The Diamond, for instance, if merely rubbed with wool, or a brush, exhibits this property. Other precious stones, if rubbed together, such as two pieces of Quartz: others, again, by being scratched with iron, steel, or copper, such as Dolomite and Blende. Some of them, such as Diamond, White Topaz, and Fluorspar, become phosphorescent by warming with the hand; and others again by exposing them to the rays of the sun, such as Diamond, Amber, Fluorspar, and several other gems. The light representing the phosphorescence is white or coloured, and but momentary in its duration.

§ XXIII. ELECTRICITY.

Many precious stones become electric by friction, pressure or heat. Electricity manifests itself by attracting or repelling light movable substances. There are two kinds of electricity—

1st. The positive;

2d. The negative; vitreous or resinous electricity;

and, according to their surface when either smooth or rough, all gems may be made electric: many of them, such as Quartz, Mica, Sapphire, and Barytes, when rubbed only with the dry hand or a piece of silk, woollen or fur: others again, such as Tourmaline or Topaz, by being heated; the latter are said to be pyroelectric, or

electric by heat. Most crystals acquire positive electricity at one end and negative at the other. If they terminate in a different number of faces at each extremity, the end having the greatest number of faces is always positive.

All polished stones acquire positive electricity by friction; while if the same stones (except the Diamond) have their polish destroyed, they acquire negative electricity. The most simple apparatus by which electricity may be ascertained, is a brass or copper needle, with two small balls at each end, and which being isolated, is to be suspended on a steel point. In experimenting, the gem to be tested being rubbed, and then brought near one of the balls, the strength or power of attracting the same indicates the degree of electricity contained in the body. The length of time that the electricity acquired by rubbing may be retained, varies in different minerals and gems; and as the latter are all electric, this differing in the length of time, may sometimes be used to distinguish one gem from another. Abbé Haüy found, in his experiments, that many precious stones lose their electric power after a few moments, whereas others will retain it for twenty-four hours. The Brazilian Topaz affected the needle even after thirty-two hours.

§ XXIV. MAGNETISM.

The properties by which minerals act upon the magnetic needle is called magnetism. There are but few gems that possess this property; the Chrysolite, Essonite, and Garnet owe their magnetic properties to the metallic oxides they contain. A common magnetic needle is used for testing its presence.

§ XXV. TOUCH.

Precious stones produce a peculiar impression on the senses; and most gems impart a cold feeling when touched, indicating, at equal temperatures, a much colder feeling than pastes.

§ XXVI. TASTE AND SMELL.

Many minerals have a taste, on touching with the tongue, and they are—

1, As Vitriol;
2, Sweetish, as Alum;
3, Saline;
4, Alkaline;
5, Cooling;
6, Bitter;
7, Urinous.

Many minerals emit a smell on rubbing, or merely holding them in the hand; such as Bitumen, Pyrites, Carbonate of Lime, Barytes, Gypsum, Quartz and Coal.

§ XXVII. CHEMICAL CHARACTERS.

Although mineralogy could not exist as a science, without the aid of chemistry, and whole systems or classifications have been established, as well as the constituent parts of minerals determined by knowledge of chemical characters, still it is difficult to resort to chemical means for distinguishing the gems or precious stones, as they would be destroyed by such an examination, and we can, for that purpose, only employ splinters or fragments. The most simple mode of proceeding is to test—

1st, Their greater or less fusibility, with or without a flux;

2d, Their behaviour before the blowpipe, an instrument highly convenient, and indeed indispensible to the mineralogist; and,

3d, The action of the acids upon them.

All of these means, however, have not an effect upon all gems, as many of them, for instance, are either infusible, or fusible with the greatest difficulty by the addition of a flux.

§ XXVIII. COMPOSITION OF GEMS.

The attention of writers, as far back as 1502, had been directed to the establishment of some hypothesis as to the composition and origin of the gems, and many fabulous views were entertained in respect to their formation.

There was also connected with some hypothesis, a species of medical superstition as to their effect. Boyle (1672) thought that all gems were originally formed from clear limpid water, and that they received their colour and other properties from their metallic spirit. Others considered a peculiar earth, called the noble or precious earth, as the principal ingredient of the precious stones. Bruckman (1778) recognized Quartz as the principal of the gems. Bergman thought that gems were all composed of the same ingredients, such as alumina, silex, and lime, and that the different proportions produced the different species; and the older mineralogists determined the character of the gems by their hardness, lustre, structure, and resistance to acids. But modern chemistry has ascertained the component parts, and other characters of gems, with more certainty;

and it is satisfactorily proved that the principles they contain are the earths, such as silica, alumina, and lime; that some contain a peculiar earth, (such is the case with the Zircon, Emerald, and Chrysoberyl,) and that the Diamond, at the head of gems, consists of pure carbon, &c.

§ XXIX. GEOLOGICAL CHARACTERS.

The origin, locality, and geological characters of gems are various; it was formerly supposed that the trap formation was their matrix; but it is ascertained that we find them distributed in rocks of different ages and kinds, either as accidental mixtures—such as Garnet in gneiss and micaceous schiste—or in drusy cavities, such as the Emerald, which occurs in druses of argillaceous slate and micaceous schiste; and many precious stones are found in gangues. Many gems are found at a distance from their original bed, on secondary or diluvial strata, or in the beds of rivers, mixed with their sand. Thus, Zircon is found in Ceylon in regular beds; and likewise we find in Ceylon, after much rain, the Topaz, Zircon, and other gems. This happens more frequently in the beds of the rivers, and then the gems appear often in the shape of pebbles, showing that those hard stones, carried away from their original beds, have been rolled and rounded by the streams and rivers, although they retain sometimes their crystalline structure, on account of their hardness.

§ XXX. GEOGRAPHICAL DISTRIBUTION.

The locality of the gems bears some highly interesting characters, inasmuch as we may sometimes judge, from their appearance of the climate of their locality; and it seems as if the countries of the torrid zone had been particularly favoured by nature in producing the most precious gems, or that those hot-beds were more propitious to the formation of the blossoms of the inorganic world. Comparing, for instance, Spinelles and Zircons, from Siberia, with those of Ceylon and Peru, we find the first to be dark and of impure colour, as if emblematic of a cold, unfriendly, northern climate; whereas, the latter glitter with full brilliancy, and possess all those properties and beauties for which gems are so highly esteemed. Often, too, we find the gems collected in particular countries, or isolated spots of our globe, such as the most precious gems from the East Indies and Brazil, where, singular enough, they occur with the precious

metals: as, for instance, the Diamond in company with gold and platina in Brazil. Some of the gems have likewise been hitherto discovered in a single spot on one continent only, and are then exhausted: such as the Rubellite, in Maine, United States; the Iolite in Connecticut, United States, and the Lazulite in Persia.

§ XXXI. PRACTICAL DIVISION AND NOMENCLATURE OF GEMS.

Artists have not profited in their arrangement and nomenclature of the gems, of the advanced state of mineralogy, as a science; and although they have been newly classified by the mineralogists according to their scientific characters, the practical artist arranges them according to those properties that principally attract the eye: such as colour, transparency, and lustre. Gems have, in consequence, received their names from their colour: as Ruby, from its red colour; Sardonyx, Yellow Onyx; since they often call gems by such gloss or colour as a distinctive property of different species by the same name, according to their colour. For instance, they call the Corundum, the Spinelle, or the Topaz, if of a red color, Ruby; if blue, Sapphire; if green, Emerald; if yellow, Topaz, and if violet, Amethyst: and thus gems of the same colour, but of different composition, were arranged under the same head. The artist confounds under the name of a Brazilian Ruby, either a light rose-red Spinelle, or a Topaz approaching to the red colour. The name of a country or locality, is often sufficient to give name to gems of the same colour, but of different shadings, and of more or less vivid lustre. Thus, by Oriental Chrysolite is meant a yellowish-green Sapphire, and by Saxonian Chrysolite, a pale wine-yellow Topaz. Many gems have always been known under the name of Oriental gems, partly because they were first obtained in the East, and partly because they stood, from their excellent properties, in higher estimation than those from any other country. Those from the East were likewise called "Oriental," in opposition to those less valuable, which were called "Occidental" gems. Subsequently, all gems of superior qualities were called Oriental gems, even when their locality was not in the East. Thus, for instance, they call that precious Opal, so well distinguished for its beautiful play of colours, the Oriental Opal, although it is never found there; likewise, the purest and most valuable Emerald, which in great perfection only occurs in Peru, is known as the Oriental Emerald.

§ XXXII. HISTORY OF THE GEMS.

Those precious stones, which are now called gems, were known in ancient times but very little, if at all. The first notice given of them is in the Bible, where it is stated that the high priest wore one stone on his gold scarf, and twelve gems set in gold plate, called the Urim and Thummim, each of which represented a tribe. It appears that the Hebrews borrowed the names of their gems from the Egyptians, and few of those gems named in the holy scriptures correspond in any respect with those at present known in our mineralogical books, with the exception of the Sapphire. The Greeks appear to have been but little acquainted with the gems, as they did not use them as ornaments in the Trojan wars; and Homer, when speaking of the treasures of those times, does not make any mention of the gems. Theophrastus and Pliny have described some gems of their time but very imperfectly and confusedly; and their descriptions are so replete with vain fancies, that it is difficult even to identify any from their descriptions. They began then to attribute most wonderful powers to the gems; to give fabulous descriptions; the most singular and perverted views in regard to their origin; and it was said that they had great influence upon health and beauty, riches, honour, and good fortune. They were called, when worn, Amulets. They were brought in connexion with the planets, the twelve constellations, and the seasons of the year; and a certain gem was worn each month, which was said to have during that term, its peculiar influence and healing virtues. Such superstitious notions have been transmitted to our times. The gems corresponding to the different months, and also to the twelve Jewish tribes, are the following:—

January	Hyacinth	Dan.
February	Amethyst	Gad.
March	Jasper	Benjamin.
April	Sapphire	Issachar.
May	Agate	Naphtali.
June	Emerald	Levi.
July	Onyx	Zebulon.
August	Carneleon	Reuben.
September	Chrysolite	Asher.
October	Beryl	Joseph.
November	Topaz	Simeon.
December	Ruby	Judah.

Artists have made certain alterations between some gems corresponding to the months, and the tribes represented in the Urim and Thummim, and they consider May to be represented by Emerald;

June, - - by Chalcedony, Onyx, or Agate;
July, - - Carneleon;
August, - - Sardonyx;
October, - - Aquamarine;
December, - Chrysoprase, Torquoise, or Malachite.

In the early ages similar views were entertained in the East, and many of them are yet prevalent. Thus, among others, the Persians believe that Spinelle affords joy, and protects them against bad dreams. The Indians believe in the efficacy of large Diamonds to bring them back to their families. (The Rajah of Mattan, a district of the Western Borneo, possessed a Diamond of 367 carats.) The Ruby is esteemed as a talisman in the East, which is not shown ever willingly to friends; it is considered ominous if it contain any black spots. The Chinese, on the contrary, present the same stone as a testimony of friendship. The Peruvians adore the Emerald as their deity. Many of these fabulous notions were probably brought from the East to Europe; for we find, in the middle ages, similar views entertained by Marbodus, Bishop of Rennes, who wrote a book on the miraculous powers of the gems. The twelve Apostles were likewise represented symbolically by the gems, and they were called "the Apostle Gems;" such as—

Jasper, - - for St. Peter;
Sapphire, - - St. Andrew;
Chalcedony, - - St. James;
Emerald, - - St. John;
Sardonyx, - - - St. Philip;
Carneleon, - - St. Bartholomew;
Chrysolite, - - St. Matthew;
Beryl, - - - St. Thomas;
Chrysoprase, - - St. Thaddeus;
Topaz, - - - St. James the Less;
Hyacinth, - - - St. Simeon;
Amethyst, - - St. Matthias.

The ancients, induced by the beauty of the gems—such as the

pure and deep colour of the Emerald, the vivid and high lustre of the Diamond, and the agreeable reflections of the Opal—had commenced using them as ornaments and jewellery, and they took pains to adapt them to their purposes. Although they did not, in those times, understand the cutting and polishing in the same manner as in the present, yet they endeavoured to work them in all possible shapes, by rubbing off the corners, or polishing the natural faces. They generally fixed the gems on strings; they also tried to carve figures representing deities, religious costumes, historical events, exploits of celebrated generals, or the heads of great men.

§ XXXIII. SCULPTURE IN GEMS.

The art of carving was well known to the ancients, and those were called gems, in the proper sense of the word, which had figures or letters engraved on a very small compass, the workmanship of which we, at this day, cannot help admiring.

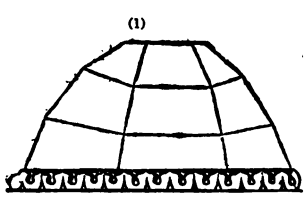
Gem-sculpture, or the glyptic art, (or lithoglyptics,) is the art of representing designs upon precious stones, either in raised work (cameos) or by figures cut into or below the surface (intaglios.) The first were most natural to the rising art, and were used as seals; whereas the latter were used as ornaments, for which the most precious materials were employed, according to the state of the art. They did not understand engraving in Diamonds, and few in other gems: they employed only the softer stones, the common precious stones, such as Carneleon, Onyx, Jasper, &c.; they also used paste, or artificial coloured glass composition, for their engravings. Their mode of working was very simple: the polishers prepared their stones on a plate, by means of the powder of harder stones, either round, oval, flat, or in shield form, according to the designed subject, and then left to the sculptors the subject of the engraving, which was done by means of iron, or Diamond splinters mounted in iron. It was not until the year 1500 that Ambrosius Caradossa first discovered the method of cutting the Diamond. He prepared the figure of a patriarch for Pope Julian II. He also discovered the first traces of sculpture among the Jews, Persians, and Egyptians. In the traditions of the holy Scriptures, Moses, for instance, had the names of the twelve tribes of Israel engraved on the gems used by the high-

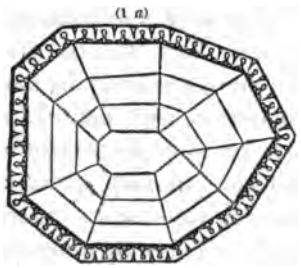
priest. Solomon possessed a seal: Alexander presented his seal to Perdicas. Augustus had a sphinx engraved on his seal; but the Indians and Persians engraved mostly mythological animals or priests in their gems; the Egyptians, beetles, which they adored, and which are called the scarabæi. "Abraxes" were the oldest gems, which had the representation of fantastical animals, with the above word in the Greek language, engraved on them.

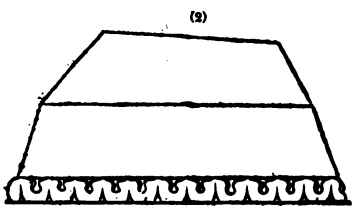
The Phenicians, Hetrurians, and Greeks learned the art of carving from the Egyptians; and from them it was carried to the Romans, where it was lost, with the decline of the empire, in the fifteenth century, under the Popes Martin V. and Paul II. The art was revived again by some fugitive Greeks in Italy. Great merit is also due to the Medicians for the revival of the art; and Giovani was considered the first in Italy. The *talisman*, or carved gems bearing Arabian letters, belong to those times. Precious stones with layers, veins, or such as Onyx, Sardonyx, &c., were employed by the ancients, with great skill, in the carving of cameos, where we find the head of one colour, and hair and dress of a different colour carved out of the other layer of the stone. Very often the subjects were mythological, and this mode of carving or sculpture has been imitated by modern artists. It is sometimes with difficulty that we are enabled to distinguish the ancient from the modern works, and the only authentic authority for the antiquity of the cameo or intaglio is its excavation from ancient monuments, except in a few instances, where we may be able to judge by comparison of the difference in antiquity; by observing whether or not they are unnaturally, or stiffly done; have large heads, hands, and feet, stiff streaks resembling the hair, or the eyes drawn in the length, &c. We find that some gods, representing the peculiar gems, (such we see all sculptures of Bacchus, and what relates to him,) were executed in Amethyst, being the colour of wine; and all nymphs, Neptune, or fish, in Aquamarine, &c., the colour of water. We find also, in Germany, traces of sculpture, in the fourteenth and sixteenth centuries; the oldest known artist, Daniel Engelhard, at Nuremburgh, died in 1552; also Lucas Kilian; and the best artist, Nater, died in 1705. England and France had likewise very distinguished artists in carving. A full history of gem-sculpture may be found in the Encyclopedia Americana, pp. 403—405.

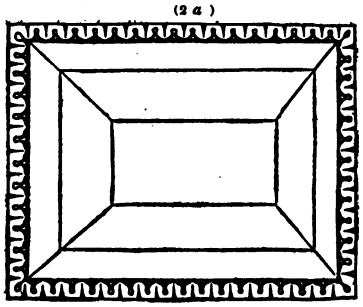
§ XXXIV. ON GRINDING.

The art of grinding gems is of more modern origin; it consists in cutting the gems, and other precious stones into figures, bounded by many planes, and by polishing the faces thus formed, increasing their lustre, transparency, and other valuable properties. This constitutes the work of the lapidary. In the year 1290 a society of lapidaries was formed at Paris, and in 1385 there were diamond-cutters at Nuremburgh; but it was not until 1456 that Ludwig Van Bergen invented the art of polishing the Diamond with its own powder; and they then began to cut the gems according to mathematical principles, and brought the art in modern times to the greatest perfection. There is a great difference in gems, (which are mostly procured from the Indians in a rough or polished state,) easily to be detected by their imperfections. They look more upon the size of the stone than upon the cut, which is generally irregular and devoid of symmetry. We observe this in the two celebrated Diamonds of the Shah of Persia, the Darjainur—*brilliant sea*—(1 and 1 *a*) and the Kuinur—*brilliant mountain*—(2 and 2 *a*:)





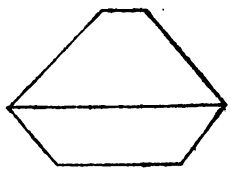


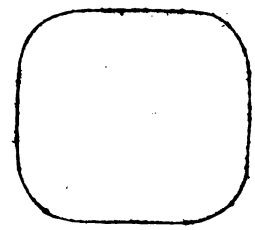


the one is worn on the left arm, and the other on the right knee.

By looking at the subjoined representation of the Diamond belonging to the Crown of France, which weighs one hundred and thirty-six and a quarter carats, is fourteen lines long, thirteen

and a quarter lines broad, and nine and a quarter lines thick, and which is known by the name of *Regent*, we can more distinctly discriminate the irregular and unmathematical cut.





The gem-grinders are divided into three classes: 1st, the Diamond; 2d, the gem; and, 3d, the jewellery grinders.

The Diamond grinder divides his work into—*a*, slitting or cleaving; *b*, cutting; *c*, grinding; and *d*, polishing.

Before operating upon Diamonds, some preliminary experiments as to their soundness are made: for very fine imperceptible fissures may, at the end of a laborious grinding, terminate either in cracking or spoiling the stone. An examination for this purpose is made in one of the two following modes: either the Diamonds or any other gems to be examined, are steeped in Canada balsam, or in oils of sassafras or anniseed, in which fluids they are well turned around, whereby the minutest fissure, on account of its changed refraction of light from that of the rest of the stone, may be detected; or the Diamond is exposed to a great heat, and is then thrown into water, when it will crumble to pieces should any cracks exist within it. The Diamond, although the hardest of all known substances, may yet, with facility, be cloven with steel tools, the blow being properly applied. The octahedrons are best fitted for cleaving: they are generally, however, somewhat rounded, and in order to cleave them, those planes which are to be cloven, are left bare, and the rest is coated with a composition of resin and brick-dust; the bare plane is now rubbed with another sharp-edged Diamond until a furrow is obtained, which will render the planes suitable for applying the cleaving instrument, and this operation is repeated with every plane. Diamonds that are not fit for being cloven, are called by the Dutch, "*divelsteene*," (devil-stones). Large Diamonds, which are too precious to be exposed to a dangerous cleavage, are sawed by means of a fine steel wire, moistened with oil and Diamond-powder.

Mr. Mawe gives the following description of the art of cutting and polishing Diamonds:—

"The object of cutting and polishing the Diamond is two-fold:—

"First, to divide the natural surface of the stone in a symmetrical manner, by means of a number of highly-polished polygonal planes, and thus to bring out to the best advantage the wonderful refulgence of this beautiful gem; and, secondly, by cutting out such flaws as may happen to be near the surface, to remove those blemishes that materially detract from its beauty, and consequently from its value.

"The removal of flaws is a matter of great importance: for, owing to the form in which the Diamond is cut, and its high degree of refrangibility, the smallest fault is magnified, and becomes obtrusively visible in every facet. For this reason, also, it is by no means an easy matter, at all times, to ascertain whether a flaw is or is not superficial; and a person with a correct and well-practised eye may often purchase, to great advantage, stones which appear to be flawed quite through, but are, in fact, only superficially blemished.

"The first thing the artist has to do, when a rough Diamond is put into his hands, is to examine carefully in what direction the stone may be cut, so as to afford the greatest breadth, or *spread*, as it is technically termed, after the flaws, if any, shall have been taken out. So great a stress is laid, by modern fashion, on the superficial extent of a brilliant, that the old rules of proportioning its dimentions are now nearly obsolete: the best cutters have entirely discarded the use of measures, and, in forming the facets, trust wholly to an accurate and well-practised eye. The direction being determined on, the artist must be well aware which are the *hard points* and which the *soft ones;* the former being those solid angles of the original octahedron, which it is necessary to cut directly across, and the latter those solid angles which are to be obliquely divided. A degree of force which may be safely applied, and is even requisite in making a section through the former, will be very apt to flaw and tear up the laminæ when applied to the latter. On these accounts it probably is, that the fatiguing and even painful process of performing this part of the business by hand, is not yet susperceded by the use of machinery.

"These preliminary matters being settled, the Diamond is embedded in a strong cement, fixed at the end of a stout spindle-shaped stick, about a foot long, with that portion only projecting, the removal of which is to form the first facet. The instrument employed for this purpose is another Diamond, fixed in a stick similar to the former, with one of the solid angles projecting. In order to collect the powder and shivers that are detached during the process, the cutting is performed over a strong box, four or five inches square, furnished with a false bottom, perforated with excessively minute holes, in order to sift, as it were, the dust from the shivers; and also with two upright iron pegs, fixed on the sides, for the workman to support and steady his fingers against, while with a short repeated stroke, somewhat between scratching and cutting, he is splitting off, or more laboriously wearing away the Diamond in that part where the facet is to be placed. This being done, the cement is softened by warming it, and the position of the Diamond is changed, in order to bring a fresh part under the action of the cutting-diamond. When, in this slow and laborious way, all the facets have been placed upon the surface of the Diamond, the cutting is completed. The stone, if examined by a moderate magnifier, now presents ragged, rough edges; and a broken, foliated surface, with a glistening lustre on those facets that are nearly in the direction of the natural laminæ, and on the other facets a more even surface, but of a dull opaque grayish-white colour.

"The shape of many Diamonds is so irregular, that it is necessary to remove pieces of considerable magnitude in order to bring them to a form proper for cutting. Where the lines of these proposed sections coincide with the natural lamellar structure of the stone, the workman has recourse to the delicate, and perhaps some what hazardous, operation of splitting the Diamond, by which a double advantage is obtained. In the first place, there is a great saving of time; and in the second place, the slices or shivers are themselves sufficiently large to admit of being cut and polished. The method of splitting is made a great mystery; thus much, however, may be mentioned, that when the direction in which the section is to be made has been determined on, it is marked by a very fine line, cut by the point of another Diamond: the stone is afterwards fixed by strong cement in the proper position, in a block

of wood, and then, by the application of a due degree of force, the section is effected.

"The Diamond being thus, by the joint action of splitting and cutting, brought to the required form, the next object is to polish the facets, and at the same time to redress any little inequalities that may have taken place in the cutting. The polishing-mill is an extremely simple machine, consisting of a circular horizontal plate of cast-iron, fourteen or fifteen inches in diameter, called a *skive*, suspended on a spindle, and capable of being put into rapid motion by means of a larger wheel, five or six feet in diameter, and turned by an assistant. From the centre to the circumference of the iron plate, are lines or shallow grooves, formed by rubbing it in that direction with a fine grained gritstone: these grooves serve to retain the mixture of oil and Diamond powder with which the plate is charged. In order to keep the Diamond perfectly steady while the polishing of each facet is going on, the following contrivance is had recourse to:—A copper cup, called a *dopp*, about three-quarters of an inch in depth and in width, and furnished with a stem about four inches long of stout copper wire, is filled with plumbers' solder, which also projects in a conical form beyond the rim of the cup: in the apex of this cone, the solder being softened by heat, the Diamond is imbedded with one of the facets projecting. The stem of the cup is now put into very powerful pincers, which screw up with a nut and a wrench or lever, and thus hold it perfectly tight. The handles of the pincers (made of wood, and called *tongs*) are broad, and terminate in two feet, about an inch high, so that when laid horizontally, they are supported exactly as a pair of candle snuffers are, the studs fixed to the handles of the snuffers representing the legs of the pincers, and the single stud near the point of the snuffers representing the inverted copper cup holding the Diamond is placed on the plate, the pincers resting on their legs on the wooden bench or table that supports the plate, and pressing at the same time against an upright iron peg; the broad part of the pincers between the legs and the Diamond, is then loaded with weights, both to steady the machine, and to increase the pressure of the Diamond against the skive. Matters being thus adjusted, a little oil and Diamond powder is dropped on the plate, it is set in motion at the rate of about two hundred revolutions in a minute, and the process of grinding down, and at the same time of polishing, is begun.

The Diamond is taken up and examined from time to time, and is adjusted so as to give the facet its true form. The heat occasioned by the friction is at all times pretty considerable, and when the pincers are heavily laden, it occasionally increases to such a degree as to soften the solder and displace the Diamond. This is a serious accident, frequently occasioning a flaw in the Diamond, and always tearing up the surface of the skive, so as to damage it very considerably. There is room on the skive for three or four Diamonds at the same time; and, to give each its proper share of attention, is as much as one person can well manage. The completion of a single facet often occupies some hours."

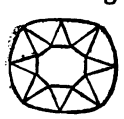
The polish is often produced by rubbing the Diamond with a cloth or bare hand. The form which the gems have to receive from the lapidary varies according to the condition of the stones; and the skill of the artist consists in the right selection of a form which shall correspond with the natural structure of the gems. A good cut has the greatest influence on the lustre and beauty of gems; the colourless and limpid gems, for instance, require a different form from those which have a play of colours. With a Diamond, the form must correspond as much as possible with its natural or original shape, in order to save the great trouble of grinding, and the waste thereby produced. Transparent gems ought not to be cut too thick; the rays of light might otherwise be refracted too much, or prevented from penetrating through them at all: in the first instance, the lower facets do not act in correspondence with the upper, and the rays are much distributed before reaching the eye. Gems of such description are called clotty. On the other hand, if the gems are too thin, their beauty, elements, and general value are likewise diminished. There is a definite proportion of thickness to the breadth of colourless or limpid gems, whereas the cut of the coloured gems depends upon the intensity of the colour.

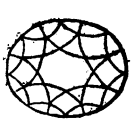
§ XXXV. FORMS OF THE DIAMOND.

Diamonds were formerly cut according to their natural form, and mostly in the planes of the octahedron. They were called then point Diamonds (pierris de Nature, or pointes ingénues).

The following forms are now, more or less, adopted by the Dutch and English Diamond cutters:—

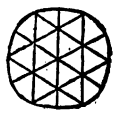
A, The *Brilliant*. This cut displays to greatest advantage the lustre of the Diamond: it may be considered as obtained by two truncated pyramids, united together by one common base, the upper pyramid being much more deeply truncated than the lower. It is formed—*a*, Of the *crown*, or that part of the stone which remains visible after the stone is mounted; *b*, The *collet*, or lower part; *c*, The *girdle*, or the common base for the crown and collet; *d*, The *table*, that plane which is formed by the truncature of the upper pyramid; *e*, The *bisel*, that space which lies between the girdle and table; and *f*, The *collet-side*, that space between the girdle and collet. The English lapidaries cut the girdle sharp, whereas the Dutch leave it broad: the crown amounts to one-third and the collet to two-thirds of the whole height of the Diamond; the table amounts to four-ninths of the diameter of the brilliant, whereas the collet only needs one-fifth of the size of the table. The table and collet are regular octagons, and the facets occupied by the bisel are eight lozenges, with twenty-four triangles, and are called the *star-facets*; the facets occupied by the collet-side are four irregular pentagons, alternating with as many irregular lozenges, radiating from the collet as a centre, and are bordered by sixteen triangular facets adjoining the girdle, and are generally called the *pavilion* or *cross* facets. According to the number of facets, the brilliants receive their names, either of *double* or *treble* brilliant: the double brilliant is surrounded by two rows of facets on the bisel, which are triangular, and meet each other; the treble brilliant has fifty-eight planes, fifty-six facets, table and collet, thirty-two facets of which are in the bisel in three rows; the star and pavilion facets are triangular, the intermediate ones are four-sided, and on the collet-side are twenty-four facets.



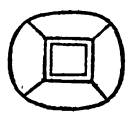


The English double brilliant consists of twenty-four facets, table and collet, sixteen of which terminate in the form of a star in the bisel.

Brillionets, or half-brilliants, are those Diamonds, the spread of which is too great in proportion to their depth, and the crown is only cut like a brilliant, but the collet-side is wanting.



B, The *Rose-Diamond*, has but a crown, and no collet; it is formed of equilateral triangles, and consists of two rows of three-sided facets; those on the girdle are pavilion, and the others star-facets. But there are variations in the number of facets: the Dutch roses have eighteen pavilion and six star-facets; others have six pavilion and six star facets, or twelve pavilion and six star-facets; and some, also have twenty-four three-sided pavilion and twelve star-facets. The Rose Diamond is only that Diamond, the proportion of whose breadth to its depth is too much extended, and which would not, without much loss, make a good brilliant. There are fragment Rose Diamonds, which are very small, and Ear-drop Roses.



C, The *Table-Diamond*, is that stone which is very flat, and of little depth, and which reflects but little lustre: they have a table with four planes and eight facets; and, in order to make the best of their lustre, they receive a brilliant cut.

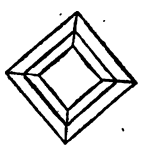
D, The *Bastard-Diamond*, is that Diamond whose cut is mixed up from the above forms.

There are a few more forms given to those Diamonds which are found unfit for any of the above cuts, such as the Thick-Stones, the Portrait Diamonds, the Senail Diamonds, which are, however, all unfit for the above cuts.

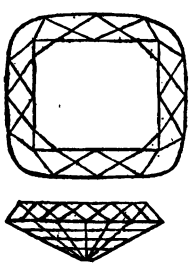
§ XXXVI. FORM OF GEMS.

The gem lapidary occupies himself not only with grinding the common and rare gems, but also pastes, &c.: he uses likewise wheels, but of different material from those for Diamonds. His wheels are either of copper, if for very hard stones; or of lead or pewter for softer stones; he has likewise polishing wheels. If any wheel is too soft for very hard stones, he cuts furrows in it, which are then filled out with rotten-stone or tin ashes; or if very hard stones, such as Sapphire, are to be ground, the Diamond powder is used for the same: likewise tin wheels are used for hard stones; water, also oil of vitriol, are used for moistening the wheels. The gems, in order to grind them or to give their facets, are likewise cemented into a handle, at the end of which is a composition of resin and brickdust. Particular attention is required in grinding the coloured gems, as the greatest effect may be produced by their

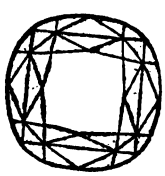
thickness; pale-coloured gems require to be left thicker than darker ones; on the other hand, they ought not to be left too thick, as they will appear too dark, and thereby lose their lustre. The same proportion in the manner of cutting the crown and collet of the coloured gems has to be observed as with the brilliant, namely, the crown ought to be one-third, and the collet two-thirds in size of the depth of the whole stone; if the gem be of a pale colour, the collet ought to be three-fourths of the size; and if of a darker colour, much less: the table of those coloured gems which require to be heightened, ought to be waved somewhat, whereas it ought to be even in darker gems. The forms of the coloured gems received in cutting, resemble, in many instances, those of the Diamond; but the following are the additional ones they receive, according to the nature of the shape and colour of the stone:—



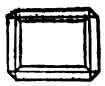
A, The *Step* or *Pavilion cut*. The planes, which are long and small, decrease towards the table and collet, and terminate in steps; the crown has usually two, and the collet four or five facets on each side; the form of the stones may be of four, six, eight, or twelve sides, or may be long or round. This cut is particularly applicable to coloured gems, as it reflects the light in a high degree, by which the play of colour is much raised; and it is at all events to be preferred in the collet of coloured gems, even to those brilliants in pavilion: the crown may be of any form whatever.



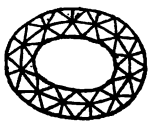
B, The *Mixed facet cut*, is a compound of brilliant and pavilion cuts, the first being on the crown; it is a very favourite cut for coloured gems, and contributes much in raising the lustre.



C, The *Elongated Brilliant facet cut*, which, if the brilliant facets are on the crown elongated, and the collet has a pavilion cut, is very appropriate to long and thin stones.



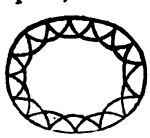
D, The *Table cut*, having either an uneven or conchoidal table, with one or two rows of facets, in a circular form, around it; a very useful form for sealstones.



E, The *Double facet cut*, the crown having two rows of facets, and the collet the pavilion form; this cut is well adapted to such stones as require the concealment of any faults, flaws, or fissures.

F, The *Cabochon cut*, is either flat, convex, or double-convex,

that is, arched; it may be on both sides, or only on one. This cut is particularly applicable for semi-transparent gems, or those which display their peculiar colours: such as the Opal, Moonstone, &c.; or collect the light in a small space, on one or several points, according to the convexity they have



received. The Cabochon cut may have one, two, or more rows of facets; and opaque stones receive with advantage the facets over the whole surface. Garnets, for instance, which are generally of a dark colour, are cut *en cabochon*, the lower plane excavated in a circular form, and the upper plane all around with facets. Other gems, the interior faults of which cannot be concealed, may be improved by this cut, giving them more transparency, vividness of colour, and a greater degree of fire.

A judicious choice of the form in which any particular gem shall be cut, depends on the skill and discrimination of the artist.

§ XXXVII. COMMON LAPIDARY.

Such common precious stones as are suitable to be cut for snuff-boxes, rings, grinding mortars, seals, and ear-rings, are wrought by the common lapidary, by means of copper or iron wheels revolving vertically. The tools are generally of iron, and sometimes brass; some are flat like chisels, gouges, ferrules, and some others have conicular heads. The polish is given with rotten stone, on a tin plate; or with crocus martis, on a wooden plate covered with felt. The cuts applied by the workman are either even, cup-shell form, excavated, elevated, or quite simple: facets are not used by him.

Mr. Mawe describes a lapidary's apparatus, fit for polishing minerals, shells, &c., and which may be placed in a parlour, where every operation of polishing, on a scale sufficiently large, may be

effected, and pebbles may be slit of three or four inches diameter: it consists of the following mills:—

1st. A lead mill, or wheel, to be used with emery and water, for grinding down substances preparatory to polishing.

2d. A pewter mill, to be used with rottenstone a little wet, for polishing.

3d. Tin plate, properly prepared, the edge of which is to be used with Diamond powder, to slit or cut hard stones asunder.

4th. Wood mills, covered with leather, &c. for polishing marble, alabaster, shells, or other soft substances.

§ XXXVIII. ENGRAVING.

The value of many precious stones is increased by engraving them. The common gems have, for several centuries, been used in heraldry. In Italy, Germany, and England, we find the coat of arms of distinguished or noble families engraved on stone. The machine used for such purposes is like that of the glass cutters, with this difference, that finer and harder instruments, and sometimes Diamond splinters, are required for this work. Before the stone can be cut or engraved, its surface, after having received the proper shape and form required, is rubbed with emery, glass, or leaden wheels: the artist now makes his drawing with a brass pin, and executes it afterwards with his tools. On hard stones he uses Diamond powder; on soft, emery and oil.

The engraving of armorial bearings, single figures, devices, &c. on any gem, is performed by means of a small iron wheel, the ends of the axis of which are received within two pieces of iron in a perpendicular position, that may or may not be closed as the operation requires; the tools are fixed to one end of the axis, and screwed firm; the stone to be engraved is then held to the tool, the wheel set in motion by the foot, and the figure or device gradually formed.

Difficult works are executed after models of plaster of Paris, of clay, or other substances; the polish is afterward given on wheels, provided with brushes or with rotten-stone. The semi-transparent and opaque stones are more used for engraving than the transparent gems, because the drawing will not show distinctly through them, on account of the great refraction of light; the same is the case with iridescent or shining stones. The engravings are generally bas-relief or raised; those having layers are mostly preferred

for cameos: for instance, the Onyx, Sardonyx, and Chalcedony; also, Wood-opal, which is constantly exported from Germany for the Italian artists in Rome.

§ XXXIX. SAWING AND DRILLING GEMS.

Gems and precious stones often require to be sawed in different directions, which operation is performed on a machine like that of a lapidary, with the exception of a polishing plate, for which is substituted a cutting plate having sharp ends, or by fastening the stone on a stand, and moving continually a fine iron or copper wire stretched in a bow, which is moistened with emery and oil. Care has, however, to be taken not to let the stone grow too hot, as the heat may crack or make it spotty. The Chinese use strings spun over in preference to the wire, they having the advantage of keeping the emery sticking to them, and of accelerating thereby the operation. For drilling gems or other precious stones, a Diamond set in steel is made use of to move to and fro by a bow, or the common engraving machine, the drilling instrument of which consists of an iron point, to which is fastened a Diamond splinter, which is pressed upon the stone while it is revolving upon the plate.

§ XL. GRINDING AND POLISHING MATERIALS.

The materials for grinding and polishing vary according to the hardness of the gem: the Diamond-powder is obtained by grinding real Diamonds, which are unfit for use, with each other in a hollow cylinder of cast iron, in which another one exactly similar is used for the most costly and the hardest gems. Corundum, Sapphire, Topaz-powder, and emery-powder, are commonly used for grinding and polishing the Diamond. It is well to remark that emery is often adulterated by a mixture of quartz and oxide of iron, or by garnet or iron-powder. Emery fit for the use intended, requires to be properly pulverized and levigated. According to Hawkins, the following method is pursued in England:—The emery is pulverized in an iron mortar and passed through different sieves, one finer than the other: the first is levigated with oil, which keeps it in better suspension above water; according to the time in which the powder settles, the different numbers are thus obtained.

For polishing the different precious stones, hard and soft gems, the Diamond powder and emery are mostly used. Rotten-stone,

tin-ashes, pumice-stone, oxide of iron, English jewellers'-red, are all used in their finest pulverized state. A great deal depends upon the polish which a gem has received; all its other superior qualities being thereby called forth.

§ XLI. RAISING THE COLOUR OF GEMS.

Since colour is one of those characters which is the most tempting in the sale of gems and jewellery, all means are employed for heightening the same, and covering any real defect. Foil of small thin metallic substances, coloured or uncoloured, either of fine silver or copper, is placed under the gem in the back of the mounting, which heightens the colour and lustre, particularly of the transparent gems. Almost all gems were formerly set in black coloured backs, composed of burnt ivory-black and gum mastic, but are now mostly set *à jour*, which is, leaving the lower part of the stone uncovered in setting, and only mounting around the girdle, an old method, and very applicable to perfect stones, where no defects require concealment.

Foiling materially heightens the lustre of gems. The Rose Diamond always requires it on account of its flat form. There are many gems which would not produce any effect without the foil. It is therefore used whenever a pale or impure colour is to be raised, or when the gems are to be protected against dust or moisture in order to produce a uniform shade of colour; the foil forms then a suitable application.

The colouring of the foil is generally performed by the jewellers. Isinglass, first dissolved in water and afterwards boiled in spirits of wine, and then strained, is the mass or body to which the colours are afterwards added, which are also soluble in water.

For producing a red colour, the best material is carmine,

"	Blue,	Litmus,
"	Yellow,	Saffron.

To produce the different shades and varieties of colour, the above are mixed in different proportions with each other. Very clear stones, such as Chrysoprase, Carneleon, etc., are sometimes painted on the back. The Paris jewellers are very skilful in painting stones of inferior value so as deceive even professional men; it is for this reason that gems when set, ought not to be purchased; the valuable gems which have a foil on their back are mostly set in such a man-

ner that they may be examined without the same. Foiled gems may likewise be distinguished by holding the table of the set gem on the nail of the thumb and observing the passage of the light through the crown.

In the East, rubies are never set with foil, but a cavity is made from below and filled with finely polished gold, which raises its lustre remarkably.

Fissures, flaws, or veins, in the interior of gems, are mostly concealed by the foil, and when near the girdle, are covered by the mounting.

The defects of stones are sometimes concealed by colouring the case with mastic and ivory-black, and according to circumstances leaving blank the spot of the faulty stone, or covering only the spot, so as to produce a uniform colour. Another and not unusual method of concealing fissures, flaws, or other faults, is to cut those stones having many faults, the momentary detection being thereby prevented from the play of the refracting light and the lustre. The colour of many gems is raised by fire, which acts in a peculiar manner on them; thus the *Brazilian Topaz* assumes a very fine, pale red colour by burning; the process of affecting this colouring is very simple, viz: after wrapping the Topaz in a sponge, ignite the same and keep it burning until consumed.

The *Zircon* sometimes assumes a better colour after having been subjected to a high degree of heat. *Amethysts* having dark spots, may be calcined for a short time in a crucible containing sand and iron filings, under which process they mostly lose those faults; but if exposed to an excess of heat, they will loose their colour altogether and become as white as quartz. The *Oriental Carneleon* assumes, after burning, a fine colour, and in Hindostan those carneleons which are found detatched in the mines, are cut up and burnt on the spot. Very fine cracks are sometimes produced in mounting stones, which may be repaired and concealed successfully by means of garlic juice. When stones are broken by the same operation, they may be cemented by gum mastic.

§ XLII. SETTING OF GEMS.

The gems are generally fastened or set at the girdle in a box or rim of metal: limpid and faultless gems are always set *à jour*,

(i. e.) without backs, since they appear then to the best advantage, and if the gem is intended to display its full size and colour, the *à jour* setting is only fastened by small shanks or claws. The good setting of a gem very much increases its value and beauty. The material for mounting the limpid gems is silver, which displays them to more advantage than gold. In order to increase the colour or lustre of large gems, they are often surrounded by smaller gems, such as small Roses, Rubies, Emeralds, Garnets, Turquoise, &c.

The jewellers wax used for mounting the gems, is made of three parts rosin, one part bees-wax, and four parts fine brick-dust.

§ XLIII. CLEANING THE GEMS.

The following composition I have found to be the best for thoroughly cleaning gems, particularly when set:—Take one part flour of sulphur, and two parts of rotten-stone or bone-ashes, which when mixed is used by rubbing it on a piece of buck-skin and with that and a stiff hair brush alternately rubbing the gems, finishing with a softer skin or cloth to remove the dust.

§ XLIV. IMITATIONS OF GEMS.

Pliny mentions the imitation of jewels by glass fluxes, and it is sufficiently proved that the ancients were far advanced in this art. The Egyptian mummies were provided with glass-buttons of green and blue colour, and during the reign of the Roman empire, coloured glass was very general; and we find antique cameos carved in various coloured glass, representing the Onyx, likewise coloured glass cemented with real Onyx, but they never attained such perfection in their art as to set at defiance the skill of the artist and jeweller to distinguish between the genuine and spurious ones. The imitation of gems may be divided into three classes:—

A, The *Pastes*. The basis of these imitations is a fine, pure, and white glass composition, called *strass*, after its inventor, Strass of Strasburgh, in the seventeenth century, who first conceived the importance of imitating the real gems as respects their hardness, specific gravity, and refraction of light. He accomplished the task so far that in many instances, either all three, or one or the other of his objects were attained. The strass is composed of silex, (quartz, flint, or pure sand,) potash, borax, red-lead, and

sometimes arsenic. To three hundred parts of silex add ninety-six parts potash, twenty-seven parts borax (prepared from the Boracic acid,) and five hundred and fourteen parts of white-lead, and one part arsenic; or according to another method, mix seven ounces and twenty-four grains of quarts with ten ounces and seven and a half drachms red-lead, three ounces and six drachms pure pearlashes, three twenty-seven-thirtieth drachms borax, and twelve grains arsenic; the mixture is put into a covered hessian crucible and kept at a great heat in a pottery furnace for twenty-four hours. The longer the mass is kept in a fluid state, the harder and clearer it will be when turned out and cooled. This discoloured strass is used by the lapidaries for imitating the Diamond, rock-crystal, and white Topaz.

For imitating the coloured gems, various colouring ingredients are employed. To obtain that intensity of colour approaching nearest to the original gem, it is experience alone which can guide the manufacturer. In order to imitate the uniform and intense colours, the strass colouring ingredients are to be of the finest powder, and very intimatcly mixed; the mass is then to be exposed to a very great heat, and in that state left for nearly thirty hours, so that the cooling may be gradual. Numerous establishments in Germany and France, are now engaged in the manufacture of the strass and coloured pastes, each of which possesses secrets acquired by experience, for producing these articles in the greatest perfection. I will now mention a few imitations of some of the most precious gems, and shall in the second part of this essay always allude to those which are imitated, with the receipts for producing such imitations, obtained from the best sources and my own experience; viz :—

A, *Artificial Topaz.* Take of perfectly white Strass one ounce and six drachms, glass of Antimony thirty-seven grains, and cassius purple one grain; or add to six ounces of strass, half a drachm of crocus martis.

B, *Artificial Ruby.* This may be obtained from the preceeding mixture for the Topaz by the addition of eight parts more of strass, and left for thirty hours in fusion; when taken out and fused before the blow-pipe, it yields a most beautiful Oriental Ruby. Five ounces strass and one drachm oxide of manganese may be employed for the same purpose, but will not make so fine

a Ruby. Or by calcining ammoniacal alum with chromate of potash and lampblack, which forms the composition of

97 parts alumine,
1 " oxide of Chrome,
2 " silica and Lime.

C, *Artificial Emerald.* To one pound of strass, add one drachm of verdigris and fifteen grains crocus martis.

D, *Artificial Sapphire.* Add to eight ounces of strass, fifty-two grains pure oxide of cobalt.

E, *Artificial Amethyst.* To eight ounces of strass, add thirty grains oxide of manganese, twenty-four grains oxide of cobalt, and forty grains cassius purple; or to one pound of strass, twenty grains oxide manganese, and one grain oxide of cobalt.

F, *Artificial Aquamarine.* To six ounces of strass, add twenty-four grains glass of antimony, and one and a half grains oxide of cobalt.

C, *Artificial Syrian Garnet.* To one thousand grains of strass, add five hundred grains glass of antimony, four grains cassius purple, and four grains oxide of manganese.

It will now be necessary to show the distinguishing characters between the real and artificial gems, as they so closely resemble each other that a superficial inspection will not always enable the examiner to discriminate between them; they are as follows:—

1. The hardness; which may be tested on the grinding machine; with fine quartz sand it will immediately attack the pastes, or by scratching with a real onyx, to which the pastes will immediately yield.

2. The small air bubbles in the pastes, may more or less be detected with a good magnifying glass.

3. The cold touch will never remain for any length of time on the pastes as it will on the real gem.

4. The breath remains much longer on the pastes, on account of their bad conducting power, than on real gems. The specific gravity and electricity, may likewise indicate the difference,—but I never depended on them alone, and I will mention that I once examined the specific gravity of an artificial Topaz which fully corresponded with that of a Brazilian Topaz. The electricity will indicate the difference between real and artificial gems by the length of its continuence; for real gems retain, after being rubbed,

their electricity for from six to thirty-two hours, whereas, the artificial ones only retain it from forty to sixty minutes.

B, *The Doublets.* This mode of imitating the real gems is called the doubling, when a quartz, cut and polished, is cemented by means of gum mastic to another coloured paste, whereby the whole stone assumes the colour of the lower paste. If a real gem is employed instead of the quartz, as the surface and the quartz or paste is cemented below, it is called *half doubling.* This adulteration is carried on to a very great extent in the East Indies, where they paste any thin gem to a paste corresponding in colour.

The *concave doubling* is effected by excavating the inside of a quartz or paste. The cavity being filled with a coloured fluid, and the other part afterwards cemented on it, will, when well executed, present so uniform a colour that it is difficult even for a judge to detect the deception. The surest method of detection is to put the specimen in question in hot water or alcohol, by which the gum mastic will be dissolved. When set, the only way of finding out the adulteration, is to put it reversly on the nail of the thumb, when the false refraction of light or the rainbow colours will, with certainty, determine their identity.

C, *The Burning.* This mode of adulterating the real gems, is performed by colouring cut and polished quartz specimens and throwing them into a solution of permanent pigments, such as a solution of indigo, decoction of cochineal, solution of ammoniacal copper; the small cavities produced by the heat will absorb the fluids. The Topaz is burnt by itself, with or without the absorption of a pigment, as also the Spinell, and the Quartz; Chalcedony is, however, frequently burnt to imitate the Onyx, and to engrave thereon the Cameos and the Intaglios.

It may be remarked, however, that since the introduction of coloured pastes, very few adulterations of this kind are now practised, and we see but rarely such doublets and burnt stones.

§ XLV. PRICE OF AND TRADE IN GEMS.

It is difficult to determine the price of gems without reflecting upon all the circumstances relating to them, such as beauty and uniformity, the play, the lustre, and the vivacity of the colours, as also on the perfection of the cut, the polish, the rare locality, the size of the individual gems. It depends upon the trade of the

various countries whence they come, and are sent to the staple, and what quantity of such valuable gems may be had at one time at any of the great cities: so we find that Diamonds were often sold at a much less price in London and Paris than in Brazil. The principal trade, however, is as yet carried on in Brazil and the East Indies, although it is in no comparison so prosperous as in former years. The gems are sold by weight, such as carat and grain. One carat is equal to four grains, and forty-four carats are equal to one ounce. The name carat is derived from the word Kuara, the coral tree, (Erythrina,) the red pods of which, when dry, were formerly used for weighing gold dust, and each of them weighs four grains, which is equal to one carat.

§ XLV. GEMS FOR OPTICAL PURPOSES.

A few years ago, Messrs. Trecourt and Oberhauser laid before the Parisian Academy lenses of diamond, sapphire, and ruby, which were used in connection with glass lenses in microscopes; they were of nine-tenths millimetre, in diameter. The diamond lens magnified two hundred and ten times, that of sapphire two hundred and fifty-five times, and that of ruby two hundred and thirty-five times, in a linear extension.

A letter was lately published from Sir David Brewster, on a curious optical phenomenon that had occurred in the construction of diagonal lens. The Diamond, previous to working, had all the appearance of internal brilliancy; but, after being polished, it presented a series of stratified shades, which rendered it useless for the required purpose. It afterward appeared that lapidaries were acquainted with this appearance, which rendered them extremely unwilling to take the risk on themselves, of cutting up Diamonds for optical purposes. On a minute examination of this phenomenon, it appeared that these different shades occurred in regular strata, each section being about the one-hundredth part of an inch, and each stratum having a different focus, and being of a different degree of hardness and specific gravity. The inferences drawn from the above facts were:—that the Diamond was a vegetable substance, and that its parts must have been held in solution and subjected to different degrees of pressure at different stages of existence. If, on the contrary, as it has been generally believed, subject to the laws of crystallization, its crystals must

rily have been homogeneous.

TREATISE ON GEMS.

PART II.

CONSIDERATION OF THE INDIVIDUAL GEMS.

I. DIAMOND.

We will now proceed to the consideration of the different gems, which have mostly been arranged according to their hardness.

Diamond: Diamant (German), Adamant (of the ancients), Almas (Oriental), Diamant (French). The name Diamond is derived from the Greek, Adamas, meaning invincible, and referring to the hardness of the gem. The Syrians are said to have first known the Diamond, and it was in early ages the subject of trade to the people of the East. The Carthagenians are said to have carried on their trade with the Etrurians, who procured Diamonds from the interior of Africa. Pliny mentions six species of Diamonds, among which, however, the Indian are to be considered the true, in contradistinction to the quartz crystals, which were likewise called Diamonds in those times. The Diamond was highly esteemed, and many medicinal virtues were attributed to them, particularly against mania, and as an antidote for poisons; and the Diamond was worn in the rough state. The art of cutting it with its own powder was discovered in 1476, by Lewis Van Berghen. In the beginning, they cut it in the table form, with one row of facets on the surface: afterwards, in 1520, they made use of the rhomb cut; and the form of brilliants was invented in the reign of Louis XII. The Cardinal Mazaria was the first who had Diamonds polished in this form, some of which yet belong to the crown of France. For a long time philosophers vainly speculated as to the nature of the Diamond; first it was considered as a mineral, consisting of silica; but Newton was the earliest (1675) who

expressed himself as to the constitution of Diamonds. He judged from the great refraction of light, that it must be a combustible body; and a series of experiments with it, tested afterwards by different naturalists, proved the same to be pure carbon. The first trial was made in 1694, by the members of the Academy at Florence, by whom Diamonds were volatilized within the focus of a mirror; Bergman first classified the Diamond among combustible bodies, and mentions having cut the head of the gems off.

Various views existed in regard to the origin of the Diamond: some considered it as a secretion of a vegetable substance; others as originating from volcanic or plutonic revolution. The Indians believe Diamonds are continually regenerating and growing to this date; and the inhabitants of Pharrah, in Hindostan, affirm that the quantity of Diamonds by no means decreases, but on the contrary, the soil will yield a new supply fifteen or twenty years from the time it was exhausted.

Numerous experiments have been instituted to produce an artificial Diamond from several substances which contain carbon, and by the application of a high degree of heat. Dr. Hare, in Philadelphia, succeeded in melting down mahogany charcoal so as to produce a metallic appearance, by his deflagrator. Professor Silliman likewise made similar experiments with plumbago, which produced small globules, some of which were so transparent that they could not be distinguished from the genuine Diamond. Professor Vanuxem, who examined the globules obtained from fused charcoal, found them to contain iron and carbon, which led him to the conclusion that the charcoal had not undergone a real fusion. Cagniard de Latour pretended to have discovered the ingredients for imitating Diamonds of some size; but Thenard proved those small crystals of the appearance of Diamonds to be some silicates of peculiar composition, which, according to Arago, polarized the light in a different angle from that of Diamonds. All speculative experiments to imitate this most precious gem by the various compounds of carbon, have hitherto proved abortive.

The Diamond is found crystalized mostly in the form of an octahedron, (composed of two four-sided pyramids, united by their bases) or rhombic dodecahedon, rarely of a cube; but the planes of the angles are often rounded or bevilled. The foliated passages are distinctly parallel to the faces of the octahedron, in which

direction they may always be split. The fracture is conchoidal; surface smooth, often rough or striped, and sometimes covered with a scaly crust; it is transparent, also semi-transparent; of an exceedingly vivid lustre, called the Diamond or adamantine lustre; and when polished of splendid fire; it is limpid, and likewise passing into the greatest variety of shadings from white and gray, sometimes from yellow, green and brown, but more rarely tinged with orange, red, blue or black.

The Diamond being the hardest of all substances, yields to no file; its streak powder is white or grayish; it becomes phosphorescent by the rays of the sun, and electric by rubbing, which property it retains for half an hour; ite specific gravity is 3.5—3.6; it does not alter before the blowpipe; it burns, however, at a high degree of heat, and in atmospheric air with a bluish flame; its touch is very cold; it consists of carbon. The Diamond bears the same name in trade, but is changed according to its cut: the blackish and brownish Diamonds are called the Savoy Diamonds (Diamand Savayards.) The original bed of the Diamond is not yet known, and on this point opinions are much divided: in the East Indies we find it in a conglomorate of sandstone, consisting of quartz grains, and disintegrated by the ferruginous sand; and in the mountain chain Ralla-Malla, in Hindostan, between 95° and 98° E. L. Some of the celebrated Diamond mines consist of a breccia from argillaceous slate, quartz, lime and sandstone; the boulders and the sand of deserts and rivers yield Diamonds mostly rounded or in a granular form. The richest Diamond mines are those of Roalcorda, at the junction of the rivers Bimah and Ristna; Golconda, along the shore of the Pennar, Sumbhulpra and Bundelkened, in the neighbourhood of Pannah, where one thousand labourers are kept employed. Visapur, Hydrabad, &c., on the island of Borneo, yield likewise Diamonds; and, according to Jameson, Diamonds were found in the Indies in the coal formation.

In Brazil, they were discovered in 1728, by chance, having been always thrown aside with the flint and other refuse of the washings of gold, until an inhabitant, who had some knowledge of rough Diamonds, collected a large number, and carried them to Portugal, and acquired by their sale a great fortune. Another, who was informed of the operations of the first, shared an equally good

fortune. The government's attention was drawn to the matter, and it was declared in 1730, that all Diamonds found there belonged to the crown.

Diamonds are found in the talcose chlorite schist, and in a breccia, consisting of ferruginous clay, quartz pebbles, sand, and oxide of iron fragments; and also in a secondary bed, accompanied by gold, platina, topaz, beryl, chrysoberyl, or tourmaline. They are found particularly in the valley of Sejues, along the rivers Jequetinhonha and Pardo, which run into the Diamond district; these carry most Diamonds by. The dykes and brooks of the district contain more or less rich Diamonds, which are found there in recent and older beds. Beyond the Diamond district, the Diamond is likewise found in the province of Minas Geraes on the Serro de St. Antonio, in the Serro Frio and in the rivers Aboite, Andaja, da Saneno, da Prata, and several other places.

In Russia, the first Diamond was discovered in July, 1829, by Humboldt and Rose, when on their journey to Siberia, on the west side of the Uralian mountains, in the gold washing establishments of Krestowosdwisheaski, belonging to Count Schuwalow. The locality, in connection with the other circumstances of the place where the Diamond was found, bears a striking resemblance to the Diamond district of Brazil. The predominating rock of the spot on the Uralian mountains is a quartzose chlorite, talcose schist (ita columnit) with an admixture of iron pyrites and mica, wherein we find beds of red oxide of iron, talcose schist, limestone and dolomite. In the valley of Poludenka and Aedephskoi the Diamonds are found among the debris of the mountains, accompanied by quartz, itacolumnit, brown hematite, talcose slate, dolomite, chalcedony, anatase, gold and platina; it is not yet decided to what formation this rock originally belongs. The production of the Diamond is two-fold; either they are dug out from the earth, or they are collected in the sand of rivers. If by the latter way, they are more or less rounded, wedged and rubbed off: whereas the former appear coated with an earthy, pale gray, yellow or rose-red, rarely with a blue or green crust. Many valuable mines have been relinquished in the East Indies since the discovery of Diamonds in Brazil. The locality of the finest Diamonds is at present in the neighbourhood of Sumbhulpore. Two tribes, called the Thata and Tora, living in sixteen villages, occupy themselves particularly

with searching for Diamonds, beginning in the month of November, and continuing until the commencement of the rainy season, more especially in the bed of the Mahanudi on its left shore, where some other small rivers, Maund, Reloo, Eeb, &c. empty into it. Four or five hundred individuals, consisting of men, women and children, are examining continually all the spots of the river from Cauderpoor to Longpoor, a distance of about one hundred and twenty miles, till the stream is impeded by the rocks; and likewise all excavations or other cavities of the beds where any alluvial deposites may be traced. All their implements consist of a pickaxe (ankova), a board five feet in length, excavated three inches in the middle, but provided with its border (daer), and a smaller similar implement, called by them kootla, both of the shape of a shovel. The process is very simple: they first dig the earth with the axe, and let it accumulate in heaps along the shore: the women afterwards take it on their large shovels, and allow the water to run over the earth; they then pick the flints and coarse gravel out of it, and bring the residue on the smaller shovels, spreading it out, and examining it very carefully, separating from it the Diamonds and grains of gold. Another method pursued in the East Indies is to surround a small plain where the Diamonds are expected to be found, with a wall two feet high, under which water is permitted to run by several openings; after having thrown a good deal of earth within the wall, and the water has been allowed to pass through two or three times, the larger stones are picked out, the residue dried, and the Diamonds selected as before.

The washing establishments of the Diamond in Brazil, particularly in the celebrated district Tejuco, on the Rio San Francisco and its adjoining smaller rivers, are conducted in the following manner:—

In order to get at the bottom, or soil of the river, means are used for leading the water at a certain spot into a different direction, and then that part of the bed of the river is allowed to dry out, and the sediment found, consisting of a conglomerate of quartz pebbles, kept together by oxide of iron, is brought to one place for washing it out. It is a large bench of triangular form, so as to keep from twenty to thirty negroes busy: in the middle of this bench is a gutter, with which is connected a trough, inclined somewhat, in order that the water may run down voluntarily, but so

that it may be stopped by putting loam at the end; and another gutter with a trough is joined further down. The negro who has collected in the dry season a large quantity of the sediment, is occupied in the rainy season in putting from fifteen to eighteen pounds at a time in the trough, spreading it there, and allowing so much water to run over it, until it runs off quite clear from the lower trough, but at the same time keeping the trough continually moving. He begins then to pick out the larger stones from the earthy part, and then the smaller, until he comes to grains, fully suitable to detect the smallest particles, which he examines with the greatest care, on account of the Diamonds. As soon as a negro has found one, he must make it known by clapping his hands, and the surveyor, who is seated on an elevated chair, so that he can oversee the work, takes and deposits it in a dish filled with water, into which all those found during the day are collected. They are then delivered over to the superintendant, who counts and weighs them, and enters the result, with other particulars, in a book kept for that purpose: he keeps them in a bag until he delivers them, which he does twice a week, to the government at Tejuco.

Every superintendant has to live in the neighbourhood of the principal washing establishments, which were formerly leased for a certain sum by the government; but the impositions practised were so great, that she took the superintendance upon her own account in 1772, and has guarded the Diamond districts along their lines by strong sentinels, who will not allow strangers to pass through without the permission of the general superintendant; and even the inhabitants, when crossing the line of the Diamond districts, have to procure written permissions from the above authority; and every body must, on leaving the district, submit, without any dispensation, to a personal and strict examination and search by the soldiers; foot passengers are always arrested by sentinels and spies continually on the alert. St. Antonio de Tejuco, forty leagues from Villa Rica, is the capital of the Diamond district, and the seat of the superintendance of the Junta Diamontina, consisting besides of a confiskal, two cashiers, one inspector-general and a book-keeper. All the procured Diamonds are delivered up yearly to the government at Rio Janeiro.

From four to five thousand negroes were engaged in the years 1772 to 1775; in the year 1818 but one thousand: among them

were the feitores or surveyors, one hundred in number, in the latter year; likewise ten superintendants, whose business it is to conduct the mining department and the collection of the Diamonds.

In order to encourage the negroes, presents of tobacco, cloth, &c. are awarded, according to the price of the Diamonds which they find; the one who finds, for instance, an Eighth (17 carats and 2 grains) receives his entire liberty; they are severely punished for any offence, and if repeated are not allowed to be at this work. Notwithstanding the most rigorous regulations and the most watchful attention of all the officers, the frauds in stolen Diamonds are very considerable; and it is estimated that the smuggling amounts to one-third of the whole income. The smugglers, who are runaway slaves, examine the most remote parts of the district, or steal the Diamonds at night from the working establishments; others, again, who understand it, will take the stolen Diamonds from the negroes, and devise means of escaping with them, either in the soles of their boots, or in hollow canes, &c.; and it is a remarkable fact, that all Diamonds obtained from the smugglers are invariably larger and more beautiful than those which are brought into market by the government. The thieves practice all manner of tricks and impositions, even in the presence of the surveyors: for instance, they conceal the good Diamonds, during the washing hours, between the fingers, the toes, in the ears, in the mouth or in the hair: they also throw them away with other stones, in order to pick them up in the night; they often even swallow them.

The soldier who arrests any smuggler, receives a reward; the property of the latter is confiscated, and he is sent to Angola as a prisoner, for upwards of ten years.

The pure transparent Diamond, which is cut in the different forms already mentioned, loses generally one-third to one half of its original weight by this operation.

In purchasing rough Diamonds, every precaution ought to be used to prevent getting false Diamonds instead of real ones, and faulty ones instead of pure Diamonds. The officers of the Junta Diamontina test the rough stones by holding them whilst rubbing together, close to the ear, and listening to the tune produced, which gives them ample satisfaction of their being genuine, as it is only to be observed in real Diamonds. It requires however, considerable practice to distinguish them with accuracy by this test. Strangers

particularly, are imposed upon by the negroes in Brazil, by purchasing from them gems cut and polished with the facets, resembling those of the Diamond; and although any one acquainted with the Diamond will soon detect the imposition by the want of specific weight, the peculiar lustre, fire and hardness, he requires to be on his guard. If, however, the Diamond is ascertained to be genuine, we have to examine particularly its purity, colour, form and size, these being the qualities by which the price of a rough Diamond is to be determined.

It requires considerable experience to determine from a rough Diamond whether any of its faults are at the surface or in the interior, whereby often the Diamond, in removing all its faults, may be diminished to half its size. We often, however, judge the rough stones by their colour; those turning towards the green colour are considered to be the best; those of a reddish colour to be good stones; the black colour indicates a hard stone; and we judge a yellowish or grayish colour as making bad Diamonds. The natural form of a Diamond, likewise gives a characteristic to the purchaser of rough stones; for a flat, thin, or triangular stone would lose much in the grinding, and not be so high as to give it sufficient fire; and likewise we are not sure of the result of the cutting, and the hemitrope crystals are very difficult to work. The best forms of Diamonds for cutting are the octahedron, which is principally found in the East Indies, and is called Pint by the diamond grinders, and the rhombic dodecahedron, which is found principally in Brazil; cheese-stones are the names of amorphous Diamonds, given to them by the diamond grinders.

According to the quality of the Diamonds, they are divided in Sumbhulpur into four classes, which correspond with the deities of the Hindoos — the Bramins, Tschettri, Wassiers (Bysh), and Tschadrie. The native jewellers are very expert in estimating the value of these Diamonds.

The value of the polished Diamonds depends on the following conditions:

1st, *The Colour.* The limpid Diamonds command the highest price, and twice as much as those that are coloured; the blackish, brownish, yellowish, brown, steel-gray, and impure bluish ones, stand in no value, and are often rejected for working.

2d, *The Purity, Faultlessness and Transparency.* The

Diamonds ought to be, according to the technical terms of the jewellers, free from ashes, gray spots, rusty or knotty places, veins, fissures, scratches, feathers, flaws, sand, grains, and faint yellow or vitreous spots. The Brazilian Diamonds exhibit sometimes, in their interior, designs resembling mosses, like those of the Mocha stones and agates; and we may often observe it in the green Diamond; if a limpid Diamond plays somewhat in the brown colour, it is called *shrugging*, and this diminishes its value: *paunched*, are those Diamonds which are neither pure nor clear.

The transparency and clearness of the Diamond are divided into three degrees, viz:—

A, *of the first water*, as in those Diamonds which are free from even the slightest faults, and stand highest in price.

B, *of the second water*, as in those Diamonds which, although clear and limpid, are marred by some dark spots, clouds, or flaws.

C, *of the third water*, as in those Diamonds having a gray, brown, yellow, green, blue, or blackish colour; or those that are limpid, but are injured by several material faults.

In order to determine accurately the nature of Diamonds, it is well to breathe on them, whereby they lose for a moment their lustre, and the eye is then better enabled to examine them and distinguish their faults. The real Diamond becomes clear much sooner than the false.

3d, *The Cut.* The perfect and regular cut of the Diamond increases its value considerably; a Brilliant, for instance, of one carat, is worth twice as much as a rough Diamond of equal weight. It depends upon the proportions of the height to the circumference of the Diamond, and that the planes and faces stand in a regular proportion, for should this not be the case, the Diamond would lose much of its fire. Likewise, the form of the Diamond influences the price. A Brilliant is dearer than a Rose Diamond, and this again is dearer than the thick and tablestone. The faces of the Brilliant also influence the price: *once cut*, is a Brilliant that possesses no cross facets on the lower part of the stone; *twice cut*, there is one row of facets on the collet-side: *thrice cut*, the Brilliant possesses the facets on the bizel and collet side, according to the rule of cutting. The more rows of facets a Brilliant displays the higher price is put upon it.

4th, *The Size and Weight.* The price of a Diamond

depends considerably upon its size; those Diamonds which are of great splendour and size are called Paragons or Nonpareils, the Ne Plus Ultra; the less weighty ones are valued according to their actual weight. The weight employed in Sumbhulpur is the rutta and masha. Seven rutts is equal to one mash, and one rutt is equal to two grains. In Brazil the weight is specified by carats (quilates.) Seventeen and a half quilates are equal to one dram (octava); thirty-two vintenes are equal to seventy grains (graos); one carat is equal to four grains.

The price of Diamonds is determined in trade by examining accurately their character as above stated, and then the price is fixed: the weight of the Diamond is at first multiplied by itself, and the sum obtained multiplied again by the price of one carat. A Brilliant, for instance, would weigh two carats, and on examining its properties, if good its price would be found to be forty-four francs. We proceed in the following manner to get at the full value of the Diamond :—$2 \times 2 \times 44 = 176$ francs. We do not always, however, arrive at the correct result. If the Brilliants are very large, and exceed the weight of eight or ten carats, it is difficult to arrive at a standard. I will endeavour to give below a table of the prices of the Diamond in Holland, France, England, and Germany, as far as ascertained, and as near to the actual price current as I could be informed.

Rough Diamonds fit for cutting, are worth ten or twelve francs per carat: any Diamond exceeding the weight of one carat is estimated by the square of its weight multiplied by eleven or twelve francs as the avarage price.

For a Brilliant of one carat and first water, the value in Germany is forty-four francs; of the second water, twenty-eight francs.

Rose Diamonds of first water and one carat				20 francs.
"	"	second,	"	13 "
Tablestone,		-	- -	14 "
Brilliants, 30 to 35 pieces to the carat			-	22 "
"	20	"	" "	40 "
"	10	"	" "	38 "
	5	"	" "	35 "
	4	"	" "	36 "

Brilliants of three grains are in much demand, and are worth

fifty francs per carat. Those of three carats, used for centre-pieces in necklaces, are sometimes worth four hundred francs. Rose Diamonds for mounting, and forty to the carat, are worth twenty francs the carat; if a little larger, thirty-five francs per carat.

Diamonds unfit for cutting, and used by glass-cutters or glaziers, are worth from ten to fifteen francs per carat, and still smaller ones are worth less; they are now employed by the lithographers for their engravings and etchings.

According to Netot, Pujoux, and Lucas, the price of Diamonds of the first water, were three hundred francs per carat, and second water, one hundred and fifty.

Diamonds of one grain and less	96	francs	per carat.
The double cut, first water,	125	"	"
" " 6 to a grain,	150	"	"
Of 2 grains, - - -	170	"	"
Of three grains, - -	200	"	"
Of one carat, - -	260 to 280	"	"
A Diamond of 6 grains, -	600	"	"
" 8 " -	1000	"	"
" 10 " - -	1400	"	"
" 12 " - -	1800	"	"
" 15 " - -	2400	"	"
" 18 " - -	3500	"	"
" of 6 carats - -	5000	francs	per carat.

The above prices are from Brard's *Mineralogie appliquée aux Arts.*

At a most extensive sale of Diamonds which took place in the summer of 1837, at the auction of Rundell and Bridges, London, there were twenty-four lots put up, which produced the sum of *forty-five thousand eight hundred and eighteen pounds*, nearly *two hundred and twenty-nine thousand dollars!!* Some of the prices were as follows:—The celebrated Nassauck Diamond, which weighs three hundred and fifty-seven and a half grains, and is of the purest water, was purchased for thirty-six thousand dollars. It is considered to have been sold at a price considerably under its value. A magnificent pair of brilliant ear-rings, weighing two hundred twenty-three and a half grains,

formerly the property of Queen Charlotte, were bought for fifty-five thousand dollars, a price infinitely below their usually estimated value. A sapphire, seventy-five and a half carats, set with brilliants for a brooch, two thousand four hundred and sixty-five dollars. Brilliant ear-rings, three thousand seven hundred and fifty dollars. A brilliant necklace, four thousand three hundred dollars. Drop emerald ear-rings, two thousand three hundred and twenty-five dollars. Brilliant ear-rings, four thousand two hundred and fifty dollars. A Turkish dagger, mounted with brilliants and rubies, four thousand dollars. A single brilliant, eight hundred dollars. A brilliant drop, seventy-nine and a half grains, five thousand nine hundred dollars. An oblong brilliant, one hundred fifty-one and a quarter grains, fourteen thousand dollars. A brilliant necklace, eight thousand dollars. Brilliant ear-rings, twelve thousand five hundred dollars. Brilliant necklace, twelve thousand five hundred dollars. Brilliant drops, formerly belonging to Maria Antoinette, eight thousand eight hundred and seventy-five dollars. A Rose Diamond, eight thousand five hundred dollars. A brilliant drop, ten thousand five hundred dollars. A round brilliant, seventeen thousand five hundred dollars. A lozenge brilliant, three thousand five hundred dollars, etc. etc.

On comparison with the prices of those now in market, it is certain they have much declined, which is partially to be attributed to the immense stock which has been brought from their native locality. According to Spix and Martius, there have been produced in Brazil, from 1772 to 1818, 1,298,037 carats of Diamonds, that is in the time of the Royal Administration; but that during the Lease, only 1,700,000 carats were produced, which together make 2,998,037 carats, or 1301 1-4 pounds; thus averaging from fourteen to fifteen pounds per year; those brought into market by contraband being excepted. The value of the above Diamonds, (8,000 reis per carat,) produced in Brazil, amounts to 23,984,276, 000 reis, or about 40,000,000 francs; this sum bears no comparison to the expenses of procuring them, since the government lately paid forty francs, fifty cent. per carat, whereas they only yielded from eighteen to nineteen francs. On this account, the administration at Rio de Janerio has been induced to lease the mines to private individuals. Owing to this decrease in the production, the number of labourers is reduced. The richest production was

in 1784, when fifty-six thousand one hundred and forty-five carats were washed out, and the poorest in 1818, when they procured but nine thousand three hundred and ninety-six carats. In Brazil, large Diamonds are much rarer than in the East Indies, where they are in general of much better quality than in Brazil. In the latter country, from 1772 to 1811, they found but thirty-six Diamonds, weighing upwards of seventeen carats, and from 1812 to 1818, but eighty-three Diamonds weighing over eight carats. In the East Indies, according to Breton, from the year 1804 to 1818, there were found in Mahanues, twenty large Diamonds, the aggregate weight of which amounted to four hundred and thirty-six carats and one grain. The largest was found in 1809, and weighed six hundred and seventy-two grains, but was of the third water; another of three hundred and eight grains, and another of two hundred and eighty-eight grains.

As it has already been stated that the artist and amateur have to be on their guard against imposition in the purchase of Diamonds, it may be well to state that there is the one-half brilliant, having the form of a brilliant above (the upper pyramid) but no lower pyramid; or another stone is pasted on by means of mastic. The character of the stone is readily detected when taken out of the mounting.

Sapphires, Hyacinths and Topazes are sometimes slightly calcined and sold for Diamonds. The first two are heavier than the Diamond; they are, however, harder, and possess more fire. The Topaz is distinguished by its property of becoming electric when heated.

Rockcrystal is much lighter, but brilliant and hard; and the same character is applicable to the strass.

The following list shows the size and weight of the most interesting Diamonds in the possession of different sovereigns.

I. The largest Diamond is in the possession of the Grand Mogul, and according to Tavernier, resembles in form and size half a hen's egg. Its weight is two hundred and ninety-seven and three-sixteenths carats. It was found in 1552, in the mine of Colore, a short distance to the east of Golconda, and is valued at four millions of francs. It is cut as a Rose Diamond, and is perfectly limpid, with the exception of a small flaw at the end of the girdle.

II. The Diamond in the possession of the Rajah of Mattan, in Borneo, weighs three hundred and sixty-seven carats: it was found on that island. It is of an egg form, has a cavity towards the thinner end, and is of the first water.

III. The Diamond belonging formerly to Nadir Shah, Sultan of Persia, and now in the possession of the Russian crown, weighs one hundred ninety-four and three-fourths carats. It is of the first water, without flaws or faults of any kind. Its form is that of a flattened oval, about the size of a pigeon's egg, cut in a pyramidal form; it is one inch three lines in diameter, and ten lines high. It was purchased by the Empress Catharine for about ninety thousand pounds, cash, and an annuity of four thousand pounds, but is considered of more value.

IV. The Diamond in the treasury of Rio Janeiro, was found in 1771, at Rio Abaite, by three criminals, who delivered it to the government, for which they were pardoned. It weighs one hundred and thirty-eight and a half carats.

V. The Austrian crown possesses one which weighs one hundred and thirty-nine and a half carats, and is valued at one hundred and nine thousand two hundred and fifty pounds. It is beautiful and well formed, but its colours turn towards the yellow.

There is another belonging to the crown, which was formerly in the possession of Charles the Bold, of Burgundy, who lost his all in the battle of Granson, and likewise this Diamond, which was at that time the largest in Europe. A Swiss soldier, who was the robber thereof, sold it for a crown dollar to a priest; and after passing through several hands, it was purchased by Pope Julian II. for twenty thousand ducats.

VI. The Regent or Pitt Diamond, now belonging to the crown of France, is said to have been in Malacca, and was purchased by Mr. Pitt, then governor of Bencoolen, in Sumatra, and sold by him to the Regent duke of Orleans, by whom it was placed among the crown jewels of France. It weighs one hundred and thirty-six and three-quarters carats; is cut in the form of a brilliant, and is of the first water, being absolutely faultless. When rough, it weighed four hundred and ten carats, required two years labour in cutting, and is worth, according to the value put by a commission of jewellers, in 1791, twelve millions of livres.

VII. Another Diamond, the Sancy, one of the largest and most

beautifully coloured, likewise belongs to the crown jewels of France. It is of a pear form, cut as a double Rose Diamond, and weighs one hundred and six carats. It was bought for six hundred thousand livres.

VIII. Another Diamond, belonging to the crown jewels of France, is of a rich sky-blue. It weighs sixty-seven and an eighth carats, and is valued at three millions of livres.

IX. A rough one, found in the river Abatio in Brazil, is in the possession of the Prince Regent of Portugal, which weighs an ounce troy.

X. The two large Diamonds belonging to the Shah of Persia, have already been mentioned in the first part, with accompanying figures.

XI. The Turkish crown has two very large Diamonds; one of eighty-four carats, and the other of one hundred and forty-seven carats. The latter is valued at eighty thousand ducats.

XII. One found in Brazil, in 1780, weighs seventy-two carats and three-fourths grains. Another, found in 1803, weighs seventy carats. They are both at Rio Janeiro.

XIII. The largest of all known Diamonds is said to be in the possession of the king of Portugal. It was found in Brazil, in the diamond district, and is as yet in its rough state. It is of the size of a chicken's egg, weighing one thousand six hundred and eighty carats, (above eleven ounces); and is estimated in value at fifty-seven million pounds sterling. It is now the general opinion of jewellers and mineralogists, that this is a white Topaz.*

Description of the Crown Jewels of Queen Victoria I., worn at her coronation, 28th June, 1838:—

The crown in which her majesty appeared at the ceremony of the coronation, was made by Messrs. Rundell and Bridges. It is exceedingly costly and elegant; the design is much more tasty than that of the crown of George IV. and William IV. which has been broken up. The old crown, made for the former of these monarchs,

* I have been informed by Mr. Featherstonehaugh, the U. S. Geologist, that he has discovered perfect crystalized Diamonds (a green and a white) south of the Potomac; and Mr. Thomas G. Glemson, of Philadelphia, kindly exhibited to me his Diamond, found in North Carolina, weighing one and a half carats, and having a distinct octahedral form,

weighed upward of seven pounds, and was much too large for the head of her present majesty. The new crown weighs little more than three pounds. It is composed of hoops of silver, enclosing a cap of deep purple, or rather blue, velvet; the hoops are completely covered with precious stones, surmounted with a ball, covered with small diamonds, and having a Maltese cross of brilliants on the top of it.

The cross has in its centre a splendid Sapphire; the rim of the crown is clustered with brilliants, and ornamented with fleurs-de-lis and Maltese crosses equally rich. In the front of the Maltese cross which is in front of the crown, is the enormous heart shaped ruby, once worn by the chivalrous Edward the Black Prince, but now destined to adorn the head of a virgin Queen. Beneath this, in the circular rim, is an immense oblong sapphire. There are many other precious gems, emeralds, rubies, and sapphires, and several small clusters of drop pearls. The lower part of the crown is surrounded with ermine. It is upon the whole a most dazzling and splendid crown, and does infinite credit to those by whom it has been designed and put together. Her majesty has expressed herself highly pleased with it.

The following is an estimate of the value of the jewels:

20	diamonds round the circle, 1,500*l.* each, -	30,000
2	large centre diamonds, 2,000*l.* each, - -	4,000
54	smaller diamonds placed at the angles of the former,	100
4	crosses, each composed of 25 diamonds, - -	12,000
4	large diamonds on the tops of the crosses, -	40,000
18	diamonds contained in the fleur-de-lis, - -	10,000
18	smaller diamonds contained in the same, -	2,000
	Pearls, diamonds, &c., on the arches and crosses, -	10,000
141	diamonds on the mound, - - - -	500
26	diamonds on the upper cross, - - - -	3,000
2	circles of pearls about the rim, - - -	800
		£111,000

CORUNDUM.

The above name was applied to a different species from that of Sapphire; but these terms are now generally acknowledged to be synonymous; not so, however, the emery, which does not belong to this species.

Both occur in rhomboids, often too in crystals of secondary form. They scratch all other gems except the Diamond. Their streak and powder are white; and the specific gravity is 3.9–4. They acquire electricity by rubbing, which is retained for several hours. They are not fusible before the blowpipe. With difficulty, by means of borax, they form a clear limpid glass. Acids have no effect on them. Their chemical constituents are alumine, silica, and oxide of iron.

II. SAPPHIRE.

This name is derived probably from the Hebrew, as it is often mentioned in the Bible. It is not certain whether the ancients were acquainted with merely the blue variety of this gem, and were ignorant of other blue stones, such as Lasulite, Fluorspar, &c. It was not used by them as a gem, probably on account of the difficulty of working it; but as a medicine, many peculiar virtues were ascribed to it. This species has hitherto been usually divided according to its different colours. The name of Ruby has reference to a red colour, and was applied by the ancients to the Carbuncle. Sapphire occurs in crystals, in rounded grains and pebbles. It is generally transparent; but sometimes only translucent, or displays a shine of light of six rays, resembling the form of a star. It possesses double refraction in a slight degree, and a vivid vitreous lustre, which sometimes turns to that of mother of pearl. Its fracture is from conchoidal to uneven. Its principal colours are blue and red, with their various shadings; sometimes white, gray, yellow, green, brownish-green, and black.

If the red Sapphire (Ruby) is exposed to a great heat, it becomes green, but when cold, returns to its original colour: the green Sapphire undergoes no changes.

The various names given to Sapphire, according to its colour, are:—

1st. Ruby, (oriental Ruby) of a dark crimson red, cochineal or carmine, and rose-red mostly inclining to violet-blue.

a. Oriental Hyacinth, aurora-red.

2d. Oriental Amethyst, paleish violet-blue. Playing sometimes in rose and purple-red, like the common Amethyst, except in its superior lustre.

3d. White Sapphire, limpid and perfectly transparent; vivid lustre, resembling the Diamond.

4th. Sapphire, Oriental Sapphire, from the darkest to the lightest blue with different shadings, whence it is denominated by different terms, such as *Male Sapphire*, of a perfectly clear Berlin or smalts blue; *Female Sapphire*, full blue, with a tinge of white; sometimes sky-blue, with streaks or specks. *Water Sapphire*, very pale-blue, and sometimes discoloured. *Cat-Sapphire*, blackish or greenish blue, often not transparent.

5th. Oriental Topaz; lightly yellow, lemon or brownish straw-yellow; sometimes playing into green; it is distinguished from the common or true Topaz by colour and lustre; but it occurs likewise much larger, and is seldom less free from faults than any other species of Sapphire.

6th. Oriental Aquamarine; greenish blue, pure and transparent; possessing a higher lustre and greater hardness than the common Aquamarine.

7th. Oriental Chrysolite, or Peridote; yellowish-green, resembling in colour the Chrysoberyl, but may be distinguished from it by its higher lustre.

8th. Oriental Emerald; green, more or less dark, inclining to yellow; it does not equal in colour the real emerald, but possesses a higher lustre, and is at the same time very rare.

The Sapphires which sometimes display a peculiar play of light, are divided into:—

1st. Star-Sapphire, (Asteria, Opalescent, or Chatoyant Sapphire.) Some translucent Sapphires display, if held before the sun, or a burning taper, a white light running in six rays, resembling three white planes, or stripes crossing themselves at one point. This property is thus visible when the Sapphire is cut convex (or cabouchon), and when the principal axis of the crystal stands perpendicular to the base of the convex cut stone; these Star-Sapphires are either called Ruby-Asteria, Sapphire-Asteria, or Topaz-Asteria, according to the colour they bear.

2d. Girasol-Sapphire, Oriental-Girasol, Sunstone, Sapphire, or

Ruby cat's-eye, have a yellowish, reddish, or bluish shine, or reflection of light, generally of a lighter colour than the stone itself, displayed when moved or turned on the convex surface. The different varieties of Sapphires are found in the sand of rivers, or in boulders, with Garnets, Zircons, and other gems, in Ceylon, China, Siam, Brazil, Bohemia, France, Saxony and the United States. It has been observed that the blue Sapphires are frequent in Ceylon but not the Rubies: and that in Pegu it is the reverse. We also find the Sapphire in basalt. The most celebrated mines of Sapphire are at Mo-gaot and Kyat-Pyan, five days journey from Ava. The Boa, or emperor of the Birmans, retains all the larger Sapphires.

For cutting a Sapphire an iron mill is used, and for polishing, a copper mill, or one made of an alloy of lead and tin, to which a horizontal motion is given by a very simple machinery; its surface is charged with diamond powder and oil, or with fine emery and water. A thick peg or guage of wood, pierced with small holes in all directions, is set upright on the lapidary's bench, close to the mill. The stone, being placed on the surface of the mill, and the opposite end of the stick to which it is cemented being inserted in one of the holes of the guage, the mill is put in motion by turning a winch, and the stone kept steady on it.

When the stone has all the facets, the cutting mill is taken out and replaced by one of brass, on which the polishing is performed by means of fine emery and rottenstone, in the same manner as before. A good judgment is required in determining the form and proportions best adapted to set off any particular stone to the best advantage. If the colour is full and rich, its transparency perfect, and its refractive power considerable, the best form to give it is the brilliant. If, on the contrary, the colour is dilute, the most advantageous method of cutting it is, to cut the table side (pavilion) brilliant fashion, and the collet side (culasse) in steps; by this means the table itself will be left dark, while all the light reflected from the steps on the under side of the stone will be thrown up into the facets, by which the table is surrounded. The French lapidaries cut the most perfect Sapphires in a square or octagon form, with a single delicate step between the table and the girdle, and three or four steps between the girdle and the collet.

If the Sapphires possess a varying chatoyant lustre, or are of a

small size, their form is always hemispherical or elliptical, without any flat facets; the flater the ellipse, the more the varying lustre is diffused over the surface of the stone; whereas with a high ellipse it is condensed on a single spot.

In setting Sapphires, we always use foil answering to their colour. The Ruby is set with a reddish gold foil, or a foil of copper or red glass: the blue Sapphire with a silver foil, or blue-coloured foil, or with feathers of blue ducks, pigeons, or peacocks, and the water Sapphire in a black back; but all perfectly pure Sapphires are set *à jour*.

Many Sapphires may be deprived of their specks by a careful calcination in a curcible filled with ashes or clay, and they assume then a more agreeable and purer colour and greater transparency.

Sapphires are very favourite gems, and are extensively used by jewellers for setting in pins, rings, &c. In China, the ladies' slippers are mounted with Rubies.

The blue Sapphires have of late been employed as lenses for microscopes with great success. According to Brewster, it is, for its refracting power, second only to the Diamond, and superior to all other gems. A new use has lately been made of the Sapphire for drawing wires; it being cut in the form of a wedge, through which, by means of a Diamond-point, a circular hole is drilled and then fastened on a brass-plate; the wire is drawn through the smaller aperture of the Sapphire towards the wider, by which process it is reduced to a thinness never otherwise attained.

The price of Sapphires is very relative, but their proportional value is next to that of the Diamond. The Oriental Ruby stands highest in value, and when perfect, and exceeding three carats, is generally as dear as a Diamond of equal weight and quality. After the Ruby, blue Sapphire stands next in value; and as this is not so rare, and occurs in large specimens, it is not so high in price. Some put the price of the blue Sapphire equal to that of the coloured Diamonds. Others put the price at half that of a Brilliant under similar circumstances. Sometimes the value is fixed by multiplying half the price of a Sapphire weighing a carat, with the square of its weight. It is therefore very difficult to come at an exact price current; and the following average prices come nearest to their commercial value:

RUBY,

Of 1 grain weight	- - - -	2	francs.
2 "	" - - - -	5	"
3 "	" - - - -	12	"
1 carat	" - - - -	20	"
2 "	" - - - -	60	"
3 "	" - - - -	150	"
4 "	" - - -	250	"
5 "	" - - - -	350	"

BLUE SAPPHIRE.

1 carat	- - - - -	10	francs.
2 "	- - - -	20	"
3 "	- - - - -	30	"
4 "	- - - -	45	"
5 "	- - - - -	60	"
6 "	- - - -	80	"
8 "	- - - - -	100	"
10 "	- - - -	200	"
Smaller stones 8 to 1 carat are worth	-	8	"
12 to 1	" " - -	6	"
16 to 24 to 1	" - - -	4	"

In order to show the various prices of the Rubies, we cite the sale at auction of the Marquis de Dree's collection, at Paris :—

For a cherry-red Ruby of	- 2 carats, -	1000	francs.
For a darker Ruby of	- 1 1-2 " -	400	"
For a bluish-red Ruby	- - 2 1-2 " -	1400	"
For a lighter Ruby	- - 3 " -	1200	"
For a blue Sapphire	- - 6 - " -	1760	"
For an Indigo-blue do.	- - 6 3-4 " -	1500	"
For a light blue do.	- - 4 - " -	123	"
For a white do.	- - - - 4 1-2 " -	400	"
For an Oriental Amethyst	1 1-2 " -	400	"
For a fine yellow Topaz	- 6 1-2 " -	620	"
For a lighter Topaz	- - 6 1-4 " -	71	"

There are numerous faults and defects to which Sapphires are subject, and which always influence their price, such as clouds, milky or semi-transparent specks, like Chalcedony, white stripes, fissures or knots, &c. The Sapphire, particularly the red and blue varieties, being great favourites in commerce, are often imitated,

not only by means of other coloured gems resembling them, but also by substituting pastes. Instead of Ruby, we sometimes get the Spinelle, Garnet, Hyacinth, red Quartz, calcined Amethyst, red-burnt Brazilian Topaz, red Tourmaline ; and instead of the blue Sapphire, we get the Disthene, Cyanite, and the Cordierite,—the hardness is the best test.

NOTICE OF SOME LARGE SAPPHIRES.

Tavernier describes two large Rubies said to have belonged to the king of Visapur, one of which weighed fifty and three-quarter carats, and the other seventeen and a half carats. The first was valued at sixty thousand francs, the other at seventy-four thousand five hundred and thirty francs.

The king of Pegu and the monarchs of Siam monopolize the fine Rubies, as the sovereigns of the peninsula of India have done the Diamonds.

The finest Ruby in the world, is in the possession of the first; its purity has passed into a proverb, and its worth, when compared with gold, is inestimable.

The Subah of the Divan is also in the possession of a prodigiously fine one, a full inch in diameter.

The Empress Catharine, of Russia, possessed one Ruby of the size of a pigeon's egg.

Blue Sapphires are described by the English embassy to Ava, of the weight of nine hundred and fifty-one carats. Mr. Mawe saw a blue Sapphire of three hundred and ten carats. In the crown jewels of France, there is one rhomboidal crystal of one hundred and sixty-six carats.*

III. COMMON CORUNDUM, DIAMOND SPAR.

This mineral was formerly brought from China only, when not so well known as at present, and bore the name of Common Corundum, but it is now considered as belonging to the general family of Corundum. It occurs in crystals which are generally coated with some crust; it has a conchoidal fracture, is translucent,

* A most valuable collection of rough and polished gems, and particularly of the Sapphire family, I have seen in the possession of Robert Gilmore, Esq., of Baltimore. Mr. Featherstonhaugh exhibited to me a rough Ruby with a native grain of Platina from North Carolina. In Mr. Clemson's collection of Cameos is an antique head, cut in a large Sapphire of about twelve carats.

and has a lustre between unctuous and mother of pearl, either gray, red, blue, green, brown, or whitish in different shadings. It is mostly inclosed in granite, mica slate, dolomite, or magnetic iron, and is found in Piedmont, Cananore, Campo Longo, the East Indies, and Sweden.

All the Corundums, possessing fine and pure colours, are used and cut as jewels, and the impure pieces are pulverized and used for cutting and polishing harder stones, or glass and metals, particularly so in the East Indies and China, and it is called, in Madras, the grinding-spar.

IV. CHRYSOBERYL.

The name of this gem is derived from the Greek, and is expressive of its colour; it is also called Cymophane. It was formerly classed with the Beryl family, but was separated from that by Werner.

It occurs, crystallized, in a prismatic form, also in boulders and grains; is transparent to translucent, and possesses double refraction in a high degree; its lustre is between unctuous and vitreous; fracture conchoidal; its colour asparagus, and olive-green with a tinge of brown, yellow, gray or white. Some specimens display, sometimes, a milky or bluish-white lustre. Chrysoberyl scratches Topaz, and Rock-crystal very distinctly, but is attacked by Sapphire; the streak-powder is white, specific gravity, 3.59—3.75. It becomes electric by rubbing, and retains this property for several hours: it is infusible by itself before the blow-pipe, but is slowly fusible into a glass bead with borax. Its component parts are,—alumina, silica, and glucia, with some oxide of iron and titanium. In commerce Chrysoberyl is called Oriental Chrysolite, and that displaying the lustre is called Opalescent Chrysolite.

Chrysoberyl is mostly found in loose crystals or in boulders in the sand of rivers associated with other gems, such as Spinelle, Sapphire, Topaz, Beryl, &c. In Brazil, particularly in the diamond district, and more frequently in Termo Minas Novas, Pegu, Ceylon, and Siberia: likewise in Connecticut, (at Haddam,) and in New York, (at Saratoga,) embedded in coarse granular granite, and accompanied by Garnet and Beryl.

The Chrysoberyl is cut on a brass wheel with emery, and polished on a pewter wheel with rotten stone; it is very often cut

en cabouchon, and if perfectly pure and transparent in other forms, is set with gold foil, and is used for rings and pins.

The Chrysoberyl is in no great estimation on account of its indifferent fire and colour, but taking a high polish, and occurring transparent and pure in colour, those of varying lustre, are of some value; it is particularly worn in Brazil. At Paris a Chrysoberyl of fine green colour, oval cut, seven lines in length, and five and three-quarters in breadth, was sold for six hundred francs, and a very fine Opalescent Chrysoberyl nearly five lines long and four broad, cost six hundred and three francs.

For Chrysoberyl, has been substituted Apatite, Fluorspar, and pastes; but it is harder than all; Chrysolite bears a great resemblance to Chrysoberyl in its external appearance, but is much lighter and softer. A green Chrysoberyl was found in Termo of Minas Novas, which weighed sixteen pounds, the largest known. It is in the possession of the crown at Rio de Janeiro.

V. SPINELLE.

This gem was called by the ancients, Carbuncle. It only occurs crystalized, and mostly in the form of an octahedron, and its modifications. The crystals are smooth, solitary, or grown together as hemitropes, loose, often rounded like grains; its fracture is conchoidal; it is transparent and translucent; it possesses simple refraction of light; is of a high vitreous lustre; and its colour is red, turning into the greatest variety of shadings of blue, brown, and yellow. Sometimes we find, likewise, blue, black, and green Spinelle, which, however, have no commercial value, on account of their impure colour and want of transparency.

Spinelle scratches Quartz, and is attacked by Sapphire; becomes electric by rubbing; its specific gravity, 3.48 to 3.64; is infusible before the blowpipe. According to Berzelius, the Spinelle of Ceylon when heated, grows first brown, then black, and then opaque, which on cooling, passes into green and limpid, and ultimately into its original red. Acids do not affect it; its component parts are magnesia and alumina. The Spinelle is classed by the jewellers and lapidaries according to its various colours.

1. Ruby Spinelle, or Spinelle Ruby; of a light or dark red, and no milky lustre; shows, if held near the eye, a tinge of rose-red colour.

2. Ruby Balais, or Balais Ruby; pale-red or rose-red, sometimes with a tinge of brownish or violet.

3. Almandine Ruby; of a cochineal-red colour, bordering on blue, violet-blue, and reddish-brown; it is distinguished from the Garnet, likewise called the Almandine, by its lighter colour, stronger lustre, and greater hardness.

5. Goutte de Sang, is a fine cochineal or blood-red Spinelle.

Spinelle is found in clay, and in the sand of rivers, with Sapphire, Garnet, Tourmaline, and other gems. In Ceylon, Pegu, and Cananore, it is cut on an iron or brass wheel, with emery or pulverized diamond, and is polished either on the same or on a copper wheel, with oil of vitriol.

Spinelle is cut in the same form as the Diamond, and is set with a foil of copper or gold. Its colour is often made more intense, and its faults, such as flaws and specks, removed, by calcining it carefully.

Lustre, colour, and hardness, have made the Spinelle a very favourite gem, which is used in a great variety of ways, as in rings, pins, necklaces, &c.

As to the price of Spinelles, it is difficult to determine with accuracy, as so much depends on their properties. If in perfection, it exceeds four carats, it is usually worth half the price of an equally large Diamond. The Spinelle Ruby and Balais Ruby are the most esteemed Spinelles, and if of twenty-four to thirty carats, are worth from two hundred to four hundred francs; and such gems are often sold for the true Rubies, (Sapphire.)

Zircon is of greater specific gravity and less hardness than the Spinelle, and shows strong and double refraction of light. Calcined Topaz is distinguished by its electric properties. Burnt Amethysts are lighter, and are scratched by Spinelle. Pastes are likewise substituted for the Spinelle, such as glass coloured with gold-purple; but as the Spinelles are always harder and heavier, the adulterations may soon be detected.

VI. TOPAZ.

It is not determined whether the ancients meant by Topaz the same gem as we describe, since the Greeks understood the Topaz to be of a transparent gold-yellow, and the Romans of a transparent green-yellow. The name, which, according to Pliny, is derived

from Topazos, an island in the Red Sea, has no reference to its colour. Topaz was, in former times, thought to possess great medicinal virtues; for example, as a remedy for mania, and as a strengthening medicine. The Topaz occurs crystallized in a rhombic prism, but mostly in very complicated forms, particularly the Brazilian, Siberian, and Saxonian, and is also found in boulders. Its fracture is conchoidal; it is transparent and translucent; possesses some double refracting powers; a very vivid vitreous lustre; clear, straw, sulphur, wine and gold-yellow colours, sometimes with a tinge of violet-blue, greenish and white. Topaz scratches distinctly Quartz, but is attacked by Sapphire. Its streak-powder is white; specific gravity is—3.49 to 3.56; it is phosphorescent when heated, with a bluish or yellowish lustre, in small fragments. It becomes electric either by rubbing, heating, or by pressure, and retains the property for more than twenty-four hours. Before the blowpipe at a strong heat, it is covered with many small bubbles, and partly loses its colour. It is dissolved, fusing slowly with borax, into a white bead: acids have no effect upon it. Its component parts are alumina, silica, and fluoric acid.

In commerce, Topaz is distinguished by the following names:—

1. Water Drops, pebbles (gouttes d'eau) clear, limpid.
2. Siberian Topaz, white, with a bluish tinge.
3. Brazilian Topaz, gold-yellow, with a touch of reddish.
4. Saxon Topaz, pale wine-yellow.
5. India Topaz, saffron-yellow.
6. Brazilian Ruby, light rose-red.
7. Brazilian Sapphire, light blue.
8. Aquamarine, sea and mountain green.

Topaz belongs to primitive rocks, and is found in chlorite slate, gneiss on gangues, argillaceous shiste, &c.: in Siberia, (Mursinsk and Miask,) Brazil, Scotland, Saxony, Bohemia, and in the United States, (at Huntington, Conn.)

In Brazil, it is found in a decomposing chlorite slate, (and is there called malacheta,) within brown hematite cavities or quartz gangues, and are of one inch to one and a half feet thick, and are overlaid by indurated talc, and white and brown kaolin, that is sometimes intermixed with quartz crystals and micaceous iron, which are the surest indications of Topaz. Such Topaz localities are at Villa Rica and Capao and Lana. Little attention is paid

during the dry season to the digging of Topaz; but with the beginning of the rainy season, the searches for Topaz are undertaken, and the operation for washing and procuring them is performed like that of the diamond, mentioned under its proper head.

In places where the Topaz is found in company with tin ore, it is picked out, but where it forms a part of the rock, it is wrought by mining operations, as in Saxony.

Topaz is cut on a leaden wheel, either with emery or pulverized Topaz, and is polished on a copper wheel with rotten-stone. Care has to be taken in slitting the foliage. The forms which it is to receive depend upon its qualities and purposes. The white Topaz is cut in brilliant form, with a small table; the bluish Topaz, however, is cut with a mixed form, but it is to be observed that the table-side requires to be higher than usual, the table smaller, and the collet-side, with its steps, must be attentively wrought in proportional distance. The yellow Topaz is mostly cut as brilliant or table stone, and in setting, its back is supplied with a gold foil, and the pale with a red-coloured foil. Many species of Topaz are set *à jour*. Topaz assumes by calcining a different colour, and also by colouring fluids, as already stated in the introduction.

The Topaz is in general use by jewellers for setting in rings, pins, ear-rings, seals or necklaces. Its fragments are pulverized and used for grinding the softer precious stones; this is effected by calcining them first, then throwing them into water, and afterwards pulverizing them. Topaz is generally of less value now than formerly, owing to the yearly supplies obtained from Brazil, which is about forty pounds. The mine at Capao has yielded about twelve thousand dollars worth, and the supply has been accumumulating at Rio de Janeiro and Bahia to such a degree, that it is disposed of at a less price there than at the mines.

Those most esteemed are the rose-red and the white, or water drops, *pingos d'agoa*. A Topaz of the size of a bean is sold at Chapada in the Termo of Minos Novas, at one dollar; one of one carat, is disposed of at an average rate, for eight dollars; a yellow one, for three dollars; and a yellow burnt one, for five dollars. In Brazil, very large, fine and lustry ones bring thirty dollars.

The Saxonian Topazes are less valued, yet good yellow or crimson-coloured ones, nine lines long and seven broad, bring four hundred and twenty francs.

Aquamarine and Chrysolite are sometimes substituted for Topaz; but it may easily be distinguished from them, not only by its hardness, fracture, and specific gravity, but more especially by its property of becoming electric by rubbing. This will prevent the substitution of either of the above, or those most resembling them; such as the yellow quartz, chalcedony, or other yellow-coloured stones.

According to the account of Tavernier, the Grand Mogul possesses an octangular polished Topaz of one hundred and fifty-seven and three-quarters carats weight, which has been purchased for sixty thousand dollars.

M. d' Eshwege notices a Topaz crystal ten inches in length and four inches in diameter. The United States (Connecticut) yield Topazes of an opaque colour, pale, dark orange, and yellow, twelve inches in length. One of the finest Brazilian Topazes I have seen, is in the rare collection of Robert Gilmore, Esq., of three inches length, and perfectly terminated.

EMERALD.

The proper Emerald and the Beryl belong to this mineral species, and are distinguished by their colour and crystalline form. The Emerald occurs in six-sided prisms with their modifications; it scratches quartz, and is scratched by Topaz. The streak-powder is white; its specific gravity is 2.73 to 2.76; it becomes electric by rubbing; it is rounding before the blowpipe, and forms an opaque black, but becomes a green or limpid glass, having the hardness of borax. Its constituents are glucia, alumina, and silica.

VII. (A.) THE PROPER EMERALD.

The Emerald appears to have been known in the most remote ages, and was the third stone, according to Calmet's arrangement, on the high-priest's breast-plate of judgment, with the name of Zebulon inscribed on it. In the time of Pliny, this stone was held in such high estimation, that it was seldom if ever engraved upon. The moderns, however, did engrave on the same, as we find in the royal collection at Paris a head of Henry IV., and one of Louis XIV. It has been excavated from the ruins of Rome and from Herculaneum and Pompeii. But the ancients often included under this name other gems of the same colour; such as the green fluor,

Aquamarine, Jasper, Malachite, &c. They appear to have obtained the Emerald from Egypt. Cailloud has in modern times succeeded in finding the old Emerald mines in the Theban deserts, on the Arabian Gulf, which have been noticed by the ancient authors and by the traditions of the Arabs, as coming from the mountains of the Zaharah, when sent on an exploring expedition by the Pasha of Egypt. He mentions having found subterranean mines, capable of allowing four hundred men to work; and he likewise found tools, ropes, lamps, and other utensils. He judged from the ruins of the architecture of the temples of a city which he discovered, that they were of Egyptian or Grecian form, and about one thousand years old.

Among the church treasures of the ninth and tenth centuries, we find the Emerald, which came into particular notice after the conquest of Peru, where an Emerald of the size of an ostrich egg is said to have been idolatrized by the savage inhabitants. The Emerald was formerly used as medicine, and was worn as a preventive against epilepsy.

The Emerald occurs in somewhat depressed six-sided prisms; the lateral faces of which are smooth; the fracture is conchoidal to uneven; it is transparent to translucent; displays double refraction in a slight degree; has a vitreous lustre; is green and emerald-green with its different shades.

It is scratched by an English file, and scratches strongly white glass, and slightly quartz. Its specific gravity is 2.73 to 2.77. Its colour is owing to the oxide of chrome. An Emerald when calcined, and thrown into water, crumbles into pieces of different colours. The purest Emeralds are called the Peruvian.

The Emerald is found in micaceous shiste at Salzburg, in the Zaharah mountains, on gangues in Peru, in the argillaceous and in hornblende slate. Formerly, the finest Emeralds came from Warta, in Peru; but the mine is either exhausted, or the Indians have filled up the mines before they left them at the conquest. The best are now found in the valley of Tunca, in Santa Fee, where they occur in granite. The Emerald has lately been discovered in Siberia, in the micaceous shiste, and is equal to the Peruvian in every respect.

The Emerald is sawed into pieces with emery, cut on the copper

wheel, and polished on a finer wheel with rotten-stone, pumice-stone, tin ashes and water. The step-cut, and the mixed step-cut, or the table-cut, are mostly used, yet it is sometimes cut as a brilliant or rose-cut. They are set with a green foil or green satin on their back; or sometimes in a back coloured with mastic, and very black; but if perfectly pure, and of fine colour, they are set *à jour*. On exposure to air, Emeralds grow by degrees paler.

The Emerald is, on account of its agreeable green colour, a very favourite ornament; and is used for the most expensive kind of jewellery. Its value depends altogether upon its pure and fine colour, vivid lustre, and the size of the specimen. The price of Emeralds was much higher before than it has been since the discovery of Mexico; the product of the mines of Peru reduced their price considerably; now they are getting again dearer, and command always a good price. A small box of fair Emeralds from Peru, which I saw a few years ago, at the office of the American and Foreign Agency, in this city, which weighed from three to four pounds, was sold afterwards at Paris for nine thousand francs. A good Emerald, of fine colour, is worth twelve dollars per carat: and the price increases according to its interior qualities. The price of the best Emeralds of

4	grains	is	18	dollars
8	"	"	30	"
16	"	"	200	"
24	"	"	300	"
48	"	"	1000	"

An Emerald of 24 grains, and good colour, was sold at the auction of the Marquis de Dree, for two thousand four hundred francs. Emeralds of indifferent pale colour, are sold for two dollars per carat. The faults which the Emeralds are subject to are, inequality of colour and transparency, dark or white spots, fissures and feathers.

For Emerald, there is sometimes substituted the green Tourmaline and Apatite; the former is easily detected by its property of becoming electric by heating; but in general all these stones do not possess the lustre and hardness of the Emerald. The pastes in imitation of the Emerald, are so well manufactured, that it is often difficult to discriminate the genuine from the false. The following yields the best imitation of Emerald:—

1000 parts of discoloured strass,
8 parts of pure oxide of copper,
.02 " oxide of chrome.

An Emerald is said to have existed at the Chapel of our Lady at Loretto, in Italy, larger than a man's head, and for which an Englishman offered ninety thousand crowns.

The sultan of Onde, in the East Indies, is said to have given to the king of England, among other presents, an Emerald of the size of a hen's egg.

The treasury of Vienna is said to contain an Emerald of two thousand two hundred and five carats, valued at three hundred thousand crowns.

The most magnificent specimen of Emerald was presented to the cathedral of Loretto, by one of the Spanish kings. It consists of a mass of white quartz, thickly implanted with Emeralds, more than an inch in diameter. An Emerald belonging to the crown of Russia, is noticed in the *Mémoires du regne de Catherine, Imperatrice de Russie*, as being of the size of a hen's egg. A fine crystal in the matrix, is in the museum at Dresden, which I examined in 1827.

VIII. (B.) BERYL, AQUAMARINE.

This gem was likewise known to the ancients, who considered and described it as a sea-green precious stone, and called the yellow varieties of this mineral the Chrysoberyl. It was used by the Romans as ornaments for cups, also for cameos. The crystals of the Beryl are six-sided, terminated by six-sided pyramids, they also taper gradually from one end to the other; the lateral faces are striated; the fracture is conchoidal or uneven; they are transparent or translucent at the angles, with indistinct double refraction, and vitreous lustre: the colours are green, bluish-green, yellowish-green, or greenish-white; bluish, sky, smalts or indigo-blue; straw, wax or honey-yellow; all pale colours: specific gravity 2.67 to 2.71. According to its colour and transparency, it is designated the common and precious Beryl: under the first are generally comprised the greenish and blue varieties, which are also called the Aquamarine, whereas the yellowish varieties are exclusively called the Beryl, and are generally divided thus:—

1. Aquamarine, pure pale sky-blue.

2. Siberian Aquamarine, pale greenish-yellow, of a vivid lustre, faint colour.

3. Aquamarine Chrysolite, greenish-yellow, and yellowish-green, vivid lustre.

The Beryl belongs to the primitive formation, is found in quartz veins and granite, (graphic granite,) and is associated with Garnets, Quartz, Chrysoberyl, Schorl, Topaz, &c. The most magnificent Beryls come from Siberia and Rio de Janero, in Brazil, Aberdeenshire in Scotland, and Limoges, in France. The common and translucent Beryl occurs all over the globe, and in the United States in great abundance, where it is without mercantile value. The granite rocks of New Hampshire, (at Acworth,) have brought fourth gigantic Beryls, perfect six-sided crystals, three feet in length and four feet in circumference, and weighing upwards of three hundred pounds, and some with a distinct termination of the crystals. Specimens of this description may be seen in the collection of the Lyceum of Natural History, New York, in Mr. Gilmore's collection at Baltimore, and in the author's collection. Large quantities of Beryl crystals have also been found in Chester county, Pensylvania.

The Beryl is cut on a leaden plate with emery, and polished with rotten-stone on a tin plate, and generally of the brilliant cut, on account of its not possessing much lustre in the interior.

The foil that is required in mounting, depends upon the colour of the stone; the greenish variety, for instance, is set with a greenish-blue foil, the pale is set in a black ground, like the Diamond, or on a silvery foil.

Beryl is employed in jewellery for rings, pins, ear-drops, seals, &c.: but on account of its softness, it is rendered less lasting, and, as by wearing, it loses all its beauty, it does not command a high price in market, being much below that of the Emerald.

A Beryl of a carat, avarages about one dollar and fifty cents, and the price increases in the same ratio with the number of carats. The Beryl is subject to such faults as spots, feathers, and fissures.

For the Beryl, is sometimes substituted Chrysolite, which is softer, however; it is also imitated by paste, which is likewise softer than Beryl.

One of the largest transparent Beryls, weighing five hundred

and ninety-five carats, was once in the possession of a mineralogist at Vienna. In 1811, a Beryl of fifteen pounds and one of four pounds, pure, were discovered in Brazil. In 1825, a beautiful rounded Brazilian Beryl, of four pounds weight, was offered for sale for six hundred pounds sterling.

Mawe describes a pure transparent Beryl altogether free of faults, seven inches long and three quarters of an inch thick.

IX. ZIRCON.

Zircon and Hyacinth were formerly separated, until the improvement in chemical analysis, which proved the same constituents to exist in both, particularly the Zirconia, a peculiar earth: they have, therefore, ever since been considered as two varieties of one and the same mineral. Zircon is also called Jargon, and this name is either of Ceylonese or French origin. The ancients considered the Hyacinth as that gem which is now known by the name of Carbuncle, and meant by their true Hyacinth a dark Amethyst. The Zircon was formerly used as a celebrated medicine.

The Zircon crystallizes in four-sided prisms, terminated by four-sided pyramids, with various modifications; the crystals are either smooth, rough, or uneven; it occurs likewise in rounded pebbles; it is transparent and translucent; possesses double refraction in a great degree; and has a vivid vitreous lustre, approaching sometimes to adamantine. Colour, from hyacinth-red to yellow and brown; also, red, gray, white, brown, and greenish-gray. It scratches, tolerably, quartz, but is attacked by the Topaz; its streak yields a white powder; specific gravity is 4.41 to 4.60; it becomes electric by friction; is infusible before the blowpipe, but loses its colour at a low heat: the yellowish-brown, however, becomes redder; acids do not act upon it. Its chemical constituents are Zirconia and Silica, with about two per cent. oxide of iron, which is the colouring principle.

1st. The Zircon, called by the jewellers Ceylonian Zircon, fire-red, yellow, yellowish-green, and gray.

2d. The Hyacinth is called by the jewellers the Oriental Hyacinth, which is of a hyacinth-red, deep red, with a touch of the brown, and sometimes orange-yellow colour. The Zircon occurs in primitive rocks, and forms a part of the Zircon Sienite

of Norway and other countries. It is also found in gneiss, granite, amygdaloid, and basalt. It is likewise found in the beds of rivers; and there are localities in Ceylon, Pegu, Madras, France, Bohemia, Saxony, Italy, Siberia, Scotland, the Canadas, North Carolina, &c.

The Zircon is cut with diamond-powder, or emery on a copper wheel; and is polished with rotten-stone on a tin plate, and generally is cut in the rose, table, or thick-stone, and sometimes the brilliant form. The foil generally used in mounting, is that corresponding to its colour; or it is mounted in a black ground. If the Zircon is calcined in a crucible filled with lime, it loses its colour almost entirely, and has then the appearance of a pale straw-yellow Diamond, for which it may also be substituted. It is employed in jewellery for rings, breast-pins, and ear-rings, or for ornamenting watch-cases and snuff-boxes; also for jewelling watches and for supporting fine balances. The value of the Zircon depends principally upon the purity of the colour, and that of the Hyacinth is preferable to that of the Zircon: a carat of the first is worth from fifteen to twenty dollars. The Zircon is imitated with pastes, which may easily be detected by their lustre, hardness and specific gravity; likewise the burnt Topaz may be substituted for it.

X. GARNET.

The Garnet was well known to the ancients, who considered the Carbuncle as the same mineral, representing the whole species. It was found among the ruins of old Rome in a variety of cut forms. But the name Garnet is of modern origin, and probably was bestowed on this mineral from being found mostly in grains.

The Garnet crystallizes in dodecahedral forms, with many modifications; the crystals are sometimes flattened into tables; it is also found in round angular grains, and massive; the structure is imperfectly lamellar; fracture, more or less conchoidal, sometimes uneven and brittle; lustre, shining vitreous; it is transparent and translucent; the colour is blood, cherry, or brownish-red, but almost invariably mixed with a violet or blue tinge; sometimes, however, we find the Garnet of a yellow, green, brown, or black colour.

The red Garnet scratches quarts faintly, but is attacked by

Topaz, and even by the file; its powder is reddish-green; specific gravity is from 4 to 4.03; it becomes electric by friction; heated by itself, the Garnet grows darker, but resumes its colour when cooled; it fuses before the blowpipe into a black pebble. Its chemical constituents are silica, alumina, and the protoxides of iron and manganese.

The Garnet has its names according to the different shadings of colour:—

1st. Syrian Garnet, which is also called the Oriental and precious Garnet, Almandin, Carbuncle; this is of a blood-red, dark crimson colour.

2d. Bohemian, or Ceylonese Garnet, called the Pyrope; wine-red, nearly orange-yellow, deep coloured.

3d. Vermeille or Aplome, having a deep shade of orange-yellow.

The red Garnet occurs in granite, gneiss, mica, talcose and chlorite shists, and serpentine; also in loose crystals, small boulders, grains, and in alluvion. It is found in Saxony, Bohemia, Tyrol, Syria, Corinthia, Spain, Norway, Greenland, Ceylon, Hindostan, and in the United States, viz:—New York, Connecticut, Massachusetts, New Hampshire, and other places.

The Garnet is mostly obtained by digging and collecting the alluvion; such grains are more useful to the lapidary than those occurring in the rocks. In Bohemia, where there is a considerable trade in Garnets, they are separated from the earth by levigation, then assorted into different sizes, afterwards washed over again, and assorted as to colour and quality, and according to the quantity required for balancing a certain weight, such as half an ounce: they are called 32, 40, 76, 100 to 40; very seldom they find them 16—20, weighing together half an ounce.

The larger Garnets are cut on the leaden wheel with emery, or their own powder, and polished with rotten-stone or oil of vitriol, on a tin plate, in the form of brilliants, roses, table-stones, or en cabouchon, or with two rows of facets at the girdle; and very often Garnets are brighter, and more agreeable by excavating them circularly on the bottom; they are then called Garnet-cups. I have in my possession several large excavated Garnets, and I saw at Berlin, in 1828, such Garnets of two and three inches size.

Fine Garnets are set *à jour*, others are set with a gold or violet foil at the base. Smaller Garnets are wrought on a large scale in

manufactorics for that purpose. They are perforated with the Diamond, by means first of a small point, and then of a larger, and at last a finer point; they may perforate daily one hundred and fifty Garnets.

The first Garnets are cut in Brilliant form, and with regular facets, on a plate of fine sand-stone, with sweet oil and emery. One man can finish thirty such Garnets in one day. The polishing on wooden or leaden plates, with rotten-stone or oil of vitriol, is performed by women and children. More than twenty thousand Garnets are yearly carried to market from a single manufactory.

Garnets are much worn in jewellery, as rings, breast-pins, ear-rings, necklaces; and sometimes snuff-boxes are cut out of the larger ones from Greenland, Syria, or Tyrol; the inferior pieces, unfit for cutting, are calcined and reduced to powder, and employed as material for polishing other gems.

The value of Garnets is determined by their degree of perfection, as well as colour, purity, and size. On account of their peculiarly deep colour, they are to be cut very thin; and all such Garnets as retain their fine colour, without being cut too thin, are held in high estimation, and stand in value near the Sapphire. A Syrian Garnet eight and a half lines long, and six and a half lines broad, and cut octangular, was sold at the auction of the Marquis de Drée for three thousand five hundred and fifty francs. A fire-red oval Ceylonese Garnet, eleven lines long and seven broad, was sold for one thousand and three francs. They are generally sold by the pound, holding from sixty to four hundred, valued at about eight to ten dollars per pound. But a set of one thousand of the best selected Garnets, well cut, is sold at about sixty dollars. The Garnet is harder than the Idocrase, and the oxide of tin; but the latter is heavier.

The Garnet is very well imitated by pastes, which are, however, softer and lighter, and differ in many other respects.

The following composition yields a superior imitation of the Syrian Garnet:—

To 1000 parts strass, add
500 " glass of antimony,
4 " cassius purple,
4 " oxide of manganese.

XI. ESSONITE, CINNAMON-STONE.

This gem was formerly considered identical with the *Hyacinth*, under which name it passes yet in commerce, and among the manufacturing jewellers; and in France it is called Hyacinth de Ceylon; it also is called in mineralogical works Cannel or Cinnamon-stone, which name it received from the Dutch gem-dealers, on account of its resemblance to the oil of cinnamon. Werner was the first who gave this stone the above name.

Essonite occurs in crystals and grains; its fracture is conchoidal and uneven; it is transparent and translucent; has simple refraction of light; the lustre is between vitreous and resinous; its colour is deep-red, hyacinth-red, and orange-yellow; it scratches glass and quartz indifferently, but is attacked by Topaz; its powder is white; specific gravity is 3.5 to 3.6; it becomes electric by rubbing; acts sometimes on the magnetic needle; fuses easily before the blowpipe into a clear greenish glass; borax and acids do no affect it.

Essonite is found in the sand of rivers, and in the primitive rocks of Ceylon; also in Scotland.

It is treated like the Garnet, by being cut on a copper plate with emery, and polished on a tin wheel with rottenstone. It also receives the form of other gems, and when set, it is mounted with a foil answering to its colour.

It is used for rings and breast-pins. Essonite is distinguished from the Zircon by its less hardness, smaller specific gravity, diminished lustre, and simple refraction of light. Garnet is heavier and Idocrase is lighter than Essonite.

XII. TOURMALINE.

This mineral is as yet very little known among jewellers, and the trade in general, although it has been in commerce for a number of years past, but under other names, such as Red Tourmaline, or the Siberite, brought from Siberia, and sold in the trade as Oriental Ruby.

The Tourmaline was first introduced as a gem by the Dutch, who imported it from Ceylon. The Tourmaline occurs in crystals and crystalline masses, and its forms are six—nine and twelve-sided prisms, with various truncations and terminations, which commonly differ in the number and size of the faces at the two ends. The crystals are long, striated and complete; or aggregated

into irregular masses; the fracture is conchoidal and uneven, semi-transparent to opaque. It has a double refraction of light, which, however, is only visible in small pieces; it has a vitreous lustre; the colours are blue, red, green, and brown, of different shades. Several colours may often be observed in one and the same crystal; as, for instance, in the Rubellite from Paris, in Maine, and Chesterfield, Massachusetts, enclosed by the green Tourmaline; and the colour often varies in its different layers.

Tourmaline scratches glass slightly, but is scratched by Topaz; its powder is white; its specific gravity is 3.0 to 3.3; it becomes electric by rubbing, that end having the greatest number of faces being positive, the other negative. Before the blowpipe, it intumesces more or less, does not fuse, but vitrifies on the edges; turns green, then yellow, then red, then milk-white, then blue, and then black. Borax dissolves it pretty easily into a clear bead. The chemical composition of Tourmalines varies greatly: they are composed of alumine, silica, oxide of iron, oxide of manganese, and boracic acid; those from different localities contain, either potash, soda, lithia, or calcia. The following are the different varieties, not including, however, the white, yellow, and black Tourmaline or shorl, they not being used as gems.

1. Siberian Tourmaline, (Siberite, Rubellite, Apyrite,) which is of a carmine or hyacinth-red, purple or rose-red, passing into violet; sometimes, by looking through in one direction, the red colour changes into a blue colour:—

2. Indicolite, (Brazilian Sapphire,) of an indigo, lazulite, or Prussian-blue colour.

3. Brazilian Tourmaline, (Brazilian Emerald,) of a grass-green or olive-green colour.

4. Ceylonian Tourmaline, (Ceylon Chrysolite,) of a greenish-yellow colour.

5. Electric Shorl, of a yellowish, reddish, liver or blackish-brown colour.

The Tourmaline occurs in rocks, such as granite in layers and gangues and in boulders; it also occurs in the beds of rivers, and the localities are Siberia, St. Gothard, Ceylon, Brazil, Sweden, Saxony, Moravia. In the United States, Tourmalines are abundant, but there are very few localities of the better varieties, such as at Paris in Maine, and Chesterfield and Goshen in Massachusetts.

The Tourmaline is cut on a brass or leaden wheel with emery, and polished with rottenstone on a tin plate; it receives various forms, such as the step and table-cut. If of a pure colour, it is set *à jour*, otherwise with a foil corresponding to its colour; but the Electric Shorl is sometimes set so that it can be removed from its mounting in order to perform experiments with. The value of the Tourmaline depends upon its colour, purity, and size. The Siberite and Rubellite stand highest in estimation. A Siberite, as large as five lines, is worth about an hundred and fifty dollars; and one of four to twelve lines, good colour and pure, is worth about fifteen hundred dollars. The Rubellite from Paris, Maine, has become very rare, and it is much to be regretted that no more attention is paid to obtaining a fresh supply, as the crystals are of an exceedingly fine purple colour, and perfectly transparent. I have a few polished Rubellites and green Tourmalines, in my cabinet, which I value equally as high as any gems.

The dark-green Tourmalines six lines long and four broad, are sold in Paris for eighty francs, and the light green, of the same size, for forty francs. The most splendid Siberite is at the British Museum, having been presented by the king of Ava to Colonel Symes; it is valued at one thousand pounds sterling.

Tourmalines may at all times be readily distinguished from other gems or pastes, which are sometimes substituted for them, by their property of assuming polaric electricity after being heated.

QUARTZ.

This mineral is diffused all over the globe. Its varieties are very numerous, and many of them are employed in jewellery, and for divers ornamental purposes. It occurs massive, in concretions, in confused crystalline masses, and in crystals, of which the form is the six-sided prism, terminated by six-sided pyramids; also, the dodecahedron, or double six-sided pyramid. Quartz scratches glass and Felspar, but is attacked by Topaz. Its hardness is 7.0, and its specific gravity, 2.5 to 2.7; it is by itself transparent, and possesses a vitreous lustre; becomes electric by rubbing; is infusible before the blow-pipe. Acids, except the fluoric acid, do not act upon it. Silica is the only essential component part of quartz: but some varieties contain iron, alumine or lime.

XIII. (A.) ROCK CRYSTAL.

This mineral was known in early ages. It was highly esteemed by the Greeks on account of its purity and very regular formation. Theophrastes states that it was cut principally as seals, and the ancients made great use of it for ornaments, particularly before the art of making glass had reached much perfection. Among the many vessels which were cut in the form of cups, vases, &c., were two fine bowls and chalices in the possession of the tyrant Nero, who had purchased them at a large sum. The Rock Crystal was also used as a medicine.

It is found crystallized, in the primitive form, which is the rhomboid, extended to a six-sided prism, and in a great variety of forms and modifications, such as with a truncation or replacement of the edges, or solid angles, &c. It is frequently found in groups, also in the cavities of other minerals, or in incrustations, as small, but very perfect crystals, the pyramidal terminations of which have a high polish, and the specimen appearing as if it was studded with gems. Many specimens of this description were brought from Vermont but a few years ago, and were eagerly purchased by the jewellers of this city for rings, ear-rings, and breast-pins. Rock Crystal has a conchoidal fracture; is translucent and transparent; possesses a double refraction of light; a perfect vitreous lustre; is limpid, white, brown, black or yellow; scratches glass; specific gravity, 2.65. The electricity acquired by rubbing lasts for thirty minutes. Before the blow-pipe, when coloured, it is made limpid. The following varieties of it are made known by their names and characters:—

1. The Pseudo Diamond, (Bohemian or occidental Diamond,) which is the limpid, colourless Rock Crystal, cut and polished.

2. The Iridescent Quartz is that variety of Rock Crystal, the interior of which is replete with fissures and cracks, so that the refraction of the rays of light produce the rainbow colours.

3. Citron, (Bohemian Topaz, Occidental Topaz, yellow Quartz, Scotch Pebble,) which is of a pale, ochry, gold, white, lemon-yellow or brownish-yellow colour. The false Cairngouram of Brazil is a beautiful variety of yellow Quartz.

4. Smoky Topaz, (Cairngouram or true Scotch Pebble, brown Quartz, smoky quartz,) is of a smoky or brown colour.

5. Morion, is of a charcoal black or brownish-black colour.

6. **Hair or Needlestone**, or such Rock Crystal as has, in its interior, foreign substances, as rutil, (red oxide of Titanium,) manganese, iron, chlorite, amianthus or asbestos; when the stone is so cut as to represent the hair or needles in an upright position, they are called either Venus' hair (*cheveux de Venus*) or love's arrows (*flèches d'amour.*)

Rock Crystal occurs in gangues, rock cavities in the oldest geological formations; it is also occasionally found in some modern rocks.

The principal localities are the highlands of Tyrol and Switzerland, Madagascar, Dauphiny, Cornwall, Hungary, Scotland, Ceylon, and Siberia; in the United States, on the islands of Lake George and at Trenton Falls, in the State of New York, very perfect and completely terminated transparent crystals are found, with their endless modifications; some of them five inches long, and some containing drops of water. It is also found in Windham, Vermont, where the drusy variety occurs, which is extremely beautiful and of variegated colours. About two years ago, it had a great many admirers, and was quite generally worn in brooches, rings, &c. It is also found in Maryland, Massachusetts, and on the Catskill mountains.

It is obtained in Switzerland and some other countries by mining after it; those cavities geologically or mechanically traced by the veins from the Quartz veins, are sounded by them in granite veins or other rocks by means of instruments, and when hollow, extensive preparations are made for procuring the whole produce of the cavities, which sometimes amount to several tons. It is likewise procured from the sand of rivers, and it passes then under the name of Flints; also in gangues or veins of other minerals. The smaller and clearer transparent ones are generally employed in jewellery and for ornaments; but the larger specimens are first assorted and then split or cleaned, and the smaller pieces are sawed through with a copper wire, emery and oil, into the desired sizes, when they are ready for being cut on copper or leaden discs, with emery and water, and polished on tin plates with rotten-stone, putty, bole, or other fine powder; or they may be polished on wooden wheels, lined with fur or leather. The forms which they generally receive from the lapidary, are the brilliant, rose, or table. The Iridescent Quartz, and the Hair or

Needlestones, are only cut concave. Those specimens that have a full pure wine-yellow colour, are best cut in steps. When mounted, they are either *à jour*, or with a black foil. Those which are spotted or of an irregular colour, may be discoloured by careful calcination in crucibles, with lime, sand, or pearlash, which process likewise increases the lustre. The crystal may be bored with a diamond point, also engraved, and figures may be etched in it by means of fluoric acid. It is mostly used for pins and rings; also, for the base of the doublets; likewise, for a very great variety of ornaments, such as seals, gems, snuff-boxes, cane-heads, &c.: likewise, for imitating the real gems, by being coloured and immediately immersed in a solution of colouring water, whereby the colour is very closely imitated. It is moreover the base of all the pastes or strass.

Its value is by no means so high as formerly, when the demand for it was great for setting in buckles, buttons, &c. Articles made of large pieces of it, or those containing slender needles, hair, moss, or other incrustation, or imitation of other substances, are yet somewhat esteemed. In their natural state, if quite clear, as they are received from Madagascar, Switzerland, and Brazil, they are sold for from one to ten dollars per pound; but when cut for seal-stones, or breast-pins, they are sold mostly by the jewellers of this country, as white Topaz, and command a fair price. Well-cut seal-stones are sold at from five to twenty dollars. Those of the brilliant-cut are sold from fifty cents to a dollar a piece. The largest Rock Crystal is said to be in the collection of M. Rafaelli, artist at Rome, and a large candelabra of Iridescent Quartz, in the Vatican. The proprietors of the American Museum of this city, can boast of having one of the largest specimens of Rock Crystal from Brazil. It weighs two hundred and twelve pounds, is two feet and a half high, and one foot in diameter, and is a perfect six-sided prism.

Rock Crystal may be easily distinguished from white paste, called strass, as the latter is heavier on account of the metallic oxides contained in the composition.

XIV. (B.) AMETHYST.

This gem has been known since the earliest ages of Greece and Rome; the name is of Greek origin. Its colour is considered

that of new wine. The ancients believed that wine drank from an Amethyst cup would not intoxicate; hence its name, expressive of that belief. This name occurs in Scripture, being that of the ninth stone in order on the high-priest's breast-plate of judgment, with the name Issachar engraved thereon. Amethyst was always used for engraving. The bust of Trojan, in the Royal Library at Paris, and the Appollo Belvidere, the Farnese Hercules, and the groups of Laocoon, are splendid specimens of it. It occurs massive in boulders, or in hexahedral prismatic crystals, terminated by hexahedral pyramids. Its crystals are rarely as distinct as those of quartz, being, for the most part, laterally aggregated by the whole prism, the terminal pyramids alone being separated from each other; its fracture is from conchoidal to splintry; it is transparent to translucent; of a vitreous lustre; colour, of a high and dark violet-blue, and from its richest tinge to almost colourless on one and the same specimen. It scratches white glass, gives fire with steel, but yields to the file. Its specific gravity, 2.75; becomes electric by rubbing, which lasts, however, but half an hour. Before the blowpipe, it loses its colour. Its component parts are pure quartz, coloured by manganese and iron. It occurs in veins of the older formations, and studding the interior of agate balls or geodes in the amygdaloid and trapp rocks of Hungary, Silesia, Saxony, Tyrol, Oberstein, and as boulders of splendid specimens in Ceylon, Siberia, and Brazil. It is wrought in the same manner as Rock Crystal, being cut on a copper wheel with emery, and polished on a tin plate with rotten-stone. In order to raise its lustre, many faces, and very frequently those of a rose-diamond, are given to it in cutting. It is sometimes cut in the form of a brilliant, and when set, it is supplied with a blue or red foil, provided the Amethyst is pale, for the deep-coloured ones do not require any artificial assistance. It is used in almost every description of jewellery, such as rings, ear-rings, and breast-pins; but to its best and most showy advantage, it is set in necklaces, and is the only coloured gem which may be worn with mounting, an advantage which adds to its value. The Amethyst is no longer in such estimation as formerly, but the colour, when intense and uniform, as also the size, contribute greatly to its value; and good well-cut Amethysts, of one carat, are worth from three to five dollars, and so on in proportion to their size: and Amethyst

fifteen lines long and eleven lines broad, exquisitely fine, was valued at five hundred dollars.

The best Amethysts now in commerce come from Ceylon, Siberia, and Brazil; the first are commonly called Oriental Amethysts, which, however, must be carefully distinguished from a much more valuable gem, the true Oriental Amethyst, which is the violet Sapphire. I have in my collection a quantity of the Brazilian Amethysts which are of an intense violet colour, and of a very large size.

The Amethyst is often imitated with fluorspar or violet-blue lime-spar; both, however, are softer than Amethyst: the lime is lighter, and the spar is heavier than Amethyst. But it is imitated very strikingly by pastes, so that with great difficulty the real is to be distinguished from the imitation; the latter, however, is somewhat heavier, on account of the metallic oxides contained in the composition. The following is the best receipt for imitating the Amethyst: add to

1000 parts of strass
8 " of oxide of manganese,
0.2 " purple of cassius, and
500 " oxide of cobalt.

One of the largest geodes of Amethyst was brought into England in 1819, weighing one hundred and fifty pounds; it was two feet long and fourteen inches broad, and contained the most magnificent crystals, which were of the deepest violet colour. On account of having been set down at too low a price at the custom-house, which was sixty-five pounds sterling, it was confiscated.

XV. (C.) COMMON QUARTZ.

But a few varieties of the common Quartz are used in jewellery, which are:—

a. The Rose Quartz,
b. The Cat's-eye,
c. The Prase, and
d. The Avanturine.

a. ROSE QUARTZ.

This mineral generally occurs massive; is but semi-transparent, and translucent on the edges; has a vitreous lustre; conchoidal

and splintry fracture; is of a rose-red colour; sometimes giving a shine of mother-of-pearl. It scratches glass; has a specific gravity of 2.64 to 2.67; its colour, which is derived from the oxide of manganese, becomes paler before the blow-pipe.

Rose Quartz occurs in gangues of granite and gneiss, particularly fine in Sweden, Bavaria, Bohemia and Siberia; also of a beautiful dark colour in New Hampshire and Massachusetts.

Rose Quartz is cut and polished for jewellery; such as rings, breast-pins and snuff-boxes; it is cut on a copper wheel with emery, and is polished with rotten-stone and putty, on a tin plate, receiving the form of a cabochon or table, and when set requires a foil, coloured by carmine or solution of gold, as it fades when exposed a long time to the light. The Rose Quartz is not held in great estimation; the colour as well as the lustre may be resuscitated in faded Rose Quartz by being left for some time in a moist place.

A vase of Rose Quartz was in the possession of the Marquis de Drèe, ; nine inches high and two inches in diameter.

XVI. (C. *b.*) CAT'S-EYE.

The name of this mineral is derived from the peculiar play of light perceptible on its surface, by which it resembles the rays of light in the eyes of a cat; it is not ascertained whether the ancients knew the same, and whether it was comprised in their Asterias; but it is well known that Cat's-eye is in high estimation among the Malabars and Moors; and it is worn through the whole East, where it is employed as an amulet, being believed to possess the virtue of enriching the wearer.

Cat's-eye occurs massive, and in more or less roundish pieces; has a conchoidal fracture; is translucent and transparent sometimes on one end; it has a shining lustre, between vitreous and resinous; gray and brown, green, red, and yellow colour; it presents a peculiar floating light, which is particularly visible if cut in high cabochon, as it usually is when brought to market; it scratches glass; has a specific gravity of 2.56 to 2.73, and contains, besides silica, some alumina, calcia, and oxide of iron, as 95 silex, 1.75 alumina, 1.50 lime, and 0.26 oxide of iron. In many specimens, there may be observed small parallel white fibres, which are supposed to be the cause of its peculiar play of light; but the semi-

transparent varieties, which are equally chatoyant as the more opaque ones, present no such appearance. This leads to the conclusion that amianthus in its finest fibres occasions the phenomenon, and the chemical analysis of the latter corresponds with the additional constituents of the Cat's-eye. By exposure to a strong heat, it loses its lustre and transparency; and, in small fragments, is fusible before the blow-pipe. Cat's-eye is found in the fragments of gangues and boulders, of very small size, never larger than a hazel-nut, in Ceylon, on the coast of Malabar, in the Hartz mountains, Bavaria, and in this country, (in Vermont, New-York, &c.) Ceylon, where the finest Cat's-eyes are found, sends them abroad already cut and polished en cabochon; but very often they are cut over again on a copper wheel, with emery, and polished on a tin plate; it receives in setting a gold foil. The value depends principally upon its intrinsic properties, size, colour, and degree of play of light. Of the nearly opaque varieties, the red and the almost white are the most esteemed, and such are sold usually from ten to twenty dollars; and a stone of the size of a square inch, and otherwise perfect in its properties, is worth from eighty to one hundred dollars.

In the imperial cabinet of Vienna, a five-inch long Cat's-eye, of a yellowish-brown colour, may be seen.

XVII. (C. *c.*) PRASE.

This mineral is mentioned by Pliny; but it is not certain whether he meant the same substance that we do: more probably he alluded to the Emerald; for the same mineral is at the present time called the Emerald Mother or Matrix by the jewellers. Prase occurs massive and crystallized; it has a conchoidal fracture; is translucent on the edges; between vitreous and resinous in lustre; and of a garlic-green colour, the cause of which is, that actinolite is intermixed with the silex. It scratches glass, has a specific gravity of 2.66 to 2.88, and is composed of silex and alumina, oxides of iron and manganese. It is found in Saxony, Tyrol, Styria, Hartz, and the island of Elba. It is used for rings and pins; also, for snuff-boxes and other jewellery, and is cut en cabochon, and set with a gold foil at the base, by which its colour is heightened, and rendered more agreeable. It is used in mosaic works, as in the foliage, and likewise in the mounting of Rubies, in order to raise their

colour. Prase does not stand in great estimation; for although it assumes a very good polish, it loses the same on long exposure to the air, and grows spotty.

XVIII. (C. *d.*) AVANTURINE.

This mineral received its name from bearing a resemblance to a glass paste, formerly manufactured in Italy. It is a brown or red quartz, which is massive and translucent, or opaque; it has a resinous lustre, and its fracture is splintry and uneven: it is penetrated with gold or brass-yellow glistening fissures, caused by the refraction of light, or by innumerable mica leaves. It scratches white glass, has a specific gravity of 2.64 to 2.68: silex, with some alumina and water, are its constituents.

The Avanturine is found in the Uralian mountains, Styria, near Madrid, Nantes, Scotland, &c. It is used for ring-stones, ear-rings, and snuff-boxes. It is cut on a copper wheel, with emery, and polished with rotten-stone on a tin plate; it is cut semi-lenticular or oval, does not take easily a good polish, but may be improved by rubbing the stone with oil of almonds. The value of the Avanturine is much depreciated of late, and its imitation of glass paste, which is generally called the *Goldstone*, is by far superior to the real stone, which has nothing but hardness in its favour. This paste is manufactured in great quantities in France, by throwing the finest impalpable powdered brass into a quantity of colourless strass, or into a composition of

105	parts	quartz,
85	"	purified potash,
230	"	tin and lead alloy,
50	"	brass powder.

XIX. (D.) JASPER.

This mineral is of oriental origin, and is very often mentioned in the Bible. It was the sixth stone in the plate of the high-priest. Jasper was well known to the Greeks and Romans; and according to Pliny, who has described several varieties, the best came from Scythia, Cypria, and Egypt. The lapidaries formerly made use of it in their works, particularly the Egyptian Jasper, which afforded them abundant materiel; the column of Memnon and the foundation of the column of Pompey were constructed of it; and we find

daily among the excavations of Herculaneum and Pompeii fragments of ruins composed of Egyptian Jasper.

Jasper occurs in enormous masses; has a conchoidal fracture, is opaque; its lustre is slightly resinous, like wax, often dull; it is of white, red, yellow, green, blue, brown, and black colours. It scratches glass, but yields to rock crystal. Its specific gravity is 2.31 to 2.67.

It is found in gangues, more seldom in strata, in Egypt, Bohemia, Saxony, Tyrol, Hungary, France, Italy, Spain, Siberia, and in the United States, principally in Florida, North Carolina, Massachusetts, &c.; also, in Nova Scotia.

According to their varieties, which are very numerous, that is in colour and structure, they receive their names; but they may still be classified into the following two divisions:—

a, Egyptian Jasper, (Egyptian Pebble,) which occurs in spheroidal pieces, of a gray-brown or red colour, and the form of which may mostly be cut and polished in annular representations around its centre. It is found in Baden, Upper Egypt, and other places; among the pebbles of the river Nile it is frequently discovered; and in the year 1714, it was found near the village of Incheric by Paul Lucas.

b, Ribband or Striped Spar. It occurs in masses, with nearly conchoidal fracture, around which parallel straight or twisted stripes of a gray, green, yellow, red, or brown colour may be perceived: it is principally found in Siberia, the East Indies, Corsica, Tyrol, and the Hartz mountains; also, some of the West India islands produce most splendid specimens.

Jasper is principally used for seals, snuff-boxes, vases, table-plates, and for some architectural purposes.

When in lumps, it is divided by means of copper saws and fine sand, and then cut on copper or leaden wheels with emery, and polished on tin plates with rotten-stone, colcothar, or charcoal; or it may first be polished on wood with pumice-stone, and lastly on a tin plate with rotten-stone and water.

The yellow Jasper is often employed in mosaic works in Italy, and the striped Jasper as cameos. The Jasper has no great value in trade, excepting it be of exquisite quality, and fine objects be made of the same. It generally commands the best price in China, where the emperor has a seal cut of it. A vase of red Jasper, with

white veins, and one of black Jasper, with yellow veins, may be seen in the Vatican. Chatouilles and other boxes of considerable size are frequently found in the jewellery stores of France, England, and the United States.

XX. (E.) HORNSTONE.

Hornstone occurs massive, globular, stalactiform, and in pseudomorphous crystals of carbonate of lime, and also in the form of petrified wood, (wood-stone or agatized wood.) Its fracture is either conchoidal or splintry; it is opaque or transparent on the edges; has a dull or shining lustre; deep gray, brown, red, yellow, or green, and rarely a pure colour. Often it has several colours in one and the same specimen, such as points, spots, and stripes. It scratches glass, and has a specific gravity of 2.53 to 2.65.

It is mostly found in gangues of the older formation; also, in the old red sand-stones and alluvial formations; in Bohemia, Saxony, Sweden, Siberia, Hungary, and a number of other places; in the old red sand-stone of Thuringia. I have traced one stem of the red agatized wood eighteen feet in length and two feet in diameter. The price of Hornstone is very low; it is used for snuff-boxes, seals, crosses, mortars, and principally as knife and fork handles. It is now used by the silver-smiths to mount butter and dessert knives and forks, which are imported from Germany in considerable quantities.

XXI. (F. *a.*) CHALCEDONY.

This mineral was held in great estimation by the ancients, who received their principal supplies from Egypt and other parts of Africa. In Rome, much use was made of it for cameos, many of which may yet be seen in collections. The inhabitants of Iceland are likewise said to value it very highly, and to attribute many medicinal properties to the same. It is found in crystals, such as cubes, but mostly massive, botryoidal, stalactiform, globular, or reniform, &c. The fracture is even, sometimes running into conchoidal or splintry; it is semi-transparent or translucent, of little lustre or dull; of white, gray, blue, yellow, brown, or green colours, which are all of a light shade, and variously figured, striped, spotted, &c.

It scratches white glass, and has a specific gravity of 2.58 to 2.66. It is distinguished into the following varieties, viz :—

1. Chalcedony proper, or Chalcedonyx, wherein white and gray stripes alternate with each other.

2. Mocha or Tree stones are such Chalcedonies as display black, brown, or red dendrolical figures.

3. Rainbow or Agate Chalcedony, is Chalcedony of thin and concentric structure, which, cut across and kept towards the light, displays an iridescence.

4. Cloudy Chalcedony, has a light gray and transparent base with dark and cloudy spots.

5. Plasma, dark grass-green. This mineral was very often employed by the ancients for cutting.

6. Semi-Carnelion or Ceregat, is generally called the yellow Chalcedony.

7. Sapphirine, is the sky or sapphire blue Chalcedony.

8. St. Stephen's Stones, is the white Chalcedony with blood-red spots.

There are many more varieties, and in my own collection I have polished Chalcedonies, among which, perhaps, as many again may be enumerated.

Chalcedony is found in gangues, and in the cavities of many rocks, also in boulders and pebbles. Localities exist in Saxony, Hungary, Faroe Islands, Ceylon, on the shores of the Nile, in Nubia, Nova Scotia ; the United States, (in Connecticut, Massachusetts, Pennsylvania, Ohio, New Jersey, Missouri, Florida,) and in other countries ; but the best specimens are brought from Oberstein, Iceland, and the Faroe Islands.

The finer specimens are employed in jewellery, for rings, pins, bracelets, necklaces and seals ; the more common for snuff-boxes, vases, buttons, &c. The larger masses are cut by means of a copper wire, with emery and oil on a copper wheel ; they are polished on a tin plate with rotten-stone, putty-powder and pumice-stone. The cutting is generally done on a large scale, like that of agate. Many are susceptible of receiving figures artificially, by means of the nitrate of silver. By Oriental Chalcedony is generally understood the better qualities ; those Chalcedonies of two or three divisions, called Onyx, are used for cameos.

The value of the Chalcedony depends on its quality, such as

purity, colour, and the figures and drawings displayed on it; and among all the varieties of Chalcedony, the Mocha stone stands the highest in price, and also the Onyx, which is principally employed for cutting cameos, and according to its size, commands a high or low price. Mocha stones are sold in France at from five to eight francs. The cabinet of Dresden contains a plate of Onyx, about three inches broad and long, which is estimated at twenty-five thousand dollars.

XXII. (F. *b.*) CARNELION.

This stone was known to the ancients by the name of Sarda; which, according to some, is derived from a place in Lybia or Sardinia, and according to others, from the Arabic word *sarda*, meaning yellow; it has been employed very frequently for cutting intaglios or bas relief gems.

Carnelion occurs massive or in pebbles; its fracture is conchoidal; lustre resinous; it is semi-transparent and translucent; of a blood-red and yellow-brown, and yellow colour; frequently dark at the outside, growing paler towards the inside; the colours are sometimes changing striated; it scratches white glass, and has a specific gravity of 2.59 to 2.63. There are two varieties known by the lapidaries and jewellers which are better than the others; those having a pale colour or yellowish tinge, and those having a dark-red colour; the latter are in the highest estimation, and are called by the French *Cornalines de vieille roche.*

Sardonyx is called a Carnelion, having as its principle colour the dark-brown or orange-yellow, interchanged with layers of a white colour.

Carnelion Onyx, has a blood-red base, marked with white stripes. The finest Carnelions come from Siberia, India, Arabia, Nubia, Surinam, Oberstein in Germany, and Tyrol; they occur mostly as pebbles or in cavities of rocks; in the United States they are found near Lake Superior, in Missouri, and in Massachusetts. The Carnelion is used for numerous articles in jewellery, such as seals, rings, watch-keys, &c.; it is cut on a leaden plate with emery, and is polished on wood with pumice-stone, and obtains its highest polish on a plate composed of lead and tin with rotten-stone and water. The form of its cutting is that of pavilion or step-cut on the upper part, and either quadrangular, hexagonal or

octangular, or also round; and for raising its lustre or colour it is furnished with a silver or gold foil, or with a red paint on its base. The colour of the Carnelion is also improved by calcination; the yellowish kind, for instance, by calcining it in a moderate heat and cooling it slowly, may assume a good red colour. It is said that the ancients boiled the Carnelion in honey in order to heighten its colour. Coloured figures or drawings may successfull be represented by a mixture of white-lead, colcothar, or other metallic oxides and gum-water, which is the material for drawing on it, and by burning the same under a muffle.

The faults of the Carnelion are fissures, unequal colour, and flaws from other stones. The Carnelion is, on account of its being less brittle, more useful for engraving and cutting cameos; and generally the white layers are used for the figures of the cameos and the red for the base. Sometimes such Carnelions as are cut with bas relief objects, are filled out with coloured strass; and we receive from India, very frequently, cameos with the most singular drawings, and which are made by the inhabitants in the following manner: the whole Carnelion is covered with carbonate of soda, and then exposed to the fire for a few minutes, whereby a strass is formed, which serves for cutting such figures upon. The value of the Carnelion is much higher than any chalcedony, but yet depends on all its qualities of colour, transparency, equal division of colour, and freedom from any faults, such as fissures, clouds, dark spots, &c. For a perfect Sardonyx, a very high price is generally given, particularly when the layers are very distinct and run quite parallel, and are pretty thick, so that they are fit for cutting cameos or intaglios. The blood-red is second in value, and the pale-red, third; but the cheapest are the yellowish, brownish, or whitish kinds; the prices vary from twenty dollars to twenty cents per piece. There exists a cameo of Sardonyx, representing the portrait of the celebrated father Fontanarosa, having its face white, with the base, cap, and cloak black, so that it may distinctly show the Dominican monk.

XXIII. (G.) HELIOTROPE, BLOODSTONE.

This stone derives its name from the Greek language, having been used in ancient times for observing the sun; Pliny speaks, likewise, of the Heliotrope. It occurs in massive and obtuse

angular lumps, of a conchoidal fracture, is translucent on the edges, of a resinous lustre, and leek-green colour, with red and yellow spots. It scratches white glass, has a specific gravity of 2.61 to 2.63. The Heliotrope is found among amygdaloid, in Tyrol, in the United States, (in New-York, near Troy,) Scottish Islands, Siberia, Faroe Islands, Egypt, Barbary, Tartary, &c. It is principally employed in rings and seals, watch-keys, snuff-boxes, and other articles of jewellery; also for sword and dagger handles, and is wrought like Chalcedony, but sometimes cut on brass plates; its forms are various; as en cabochon and pavilion.

The Heliotrope has been greatly admired in modern times; its price depends upon the colour and quantity of red spots contained in the same. From one to twenty dollars is the usual price for good and large specimens.

It is said that superstitious people in the middle ages valued the Heliotrope, with many red spots, very highly, thinking that Christ's blood was diffused through the stone.

XXIII. (H.) AGATE.

This stone was well known to the ancients, and used for various purposes of jewellery. In Rome, it was principally used for cutting cameos from the striped kind, the onyx. It has also been worn as an amulet, with different characters engraved on it. Its name is derived from a river in Sicily, where the ancients procured it. The Agate is a mixture of several species of quartz, which are combined variously together; Chalcedony or Carnelion usually forms the principal part, and is mixed with Hornstone, Jasper, Amethyst, Quartz, Heliotrope, Cachelong and Flint; and according to the predominating substances, it is sometimes called Chalcedony, Jasper, or Carnelion Agate. Its colour, as well as its other characters, depends upon the nature of the mixed parts; likewise its hardness; but it usually scratches white glass, and has a specific gravity of 2.58 to 2.66 at the utmost.

According to the different figures represented in the Agate, it receives its various names.

1st. Riband, or Striped Agate, representing layers variously coloured, and alternating with one another. *Onyx*, or Agate Onyx, are such Agates as have the colours beautiful and distinct, and whose layers run with the larger surface in a parallel direction;

whereas the common Riband Agates display their various layers on the surface, without being parallel. If the stripes run together around the centre, it is called the *Circle Agate*, and if in the same stone the centre shows more coloured spots, it is called the Eye Agate, or *Eyestone*.

2d. *Fortification* Agate is that brownish Agate, the various coloured stripes of which run in zig-zag, or irregular lines and angles, representing the ground plan of fortifications.

3d. *Rainbow* Agate; the curved stripes have the property of displaying rainbow colours when held towards the sun, or candle-light, and the more distinctly if the stone is cut very thin.

4th. The Cloud, Landscape, Dendritic, Figure, Moss, Punctated, Star, Petrifaction, Shell, Coral, Tube, Fragment and Ruin Agates are all the various forms in which the Agate is displayed, according to its figure or drawing; a Ruin or Fragment Agate may be pasted together from the fragments of a common Riband Agate, so as to make it represent old walls, whereby it receives the name of Breccia Agate; and sometimes the Rainbow Agate occurs in connection with the Shell Agate, where the moss surrounding the petrified shells forms the Rainbow Agate.

The Agate is found in gangues, on gneiss or porphyry, and amygdaloid; also, as boulders and pebbles, in rivers, &c. It is found in Baden, Oberstein, Saxony, Bohemia, Hungary, the Faroe Islands, Siberia, the West Indies, and in the United States, (Massachusetts, Rhode Island, New Jersey, Indiana, Missouri, Maryland, Georgia.) Those occurring in amygdaloid are mostly in the form of geodes or balls, hollow at the inside, and coated with quartz or amethyst; when the rock begins to disintegrate, these balls, becoming loose, fall scattering around the soil, and are then collected by persons who make it a business of either selling or cutting them.

The Agate is used, not only for various purposes of jewellery and ornaments, such as seals, snuff-boxes, crosses, cases of various descriptions, ear-drops, &c., but also for numerous other useful purposes, on a large scale; such as slabs, mortars, vases, instruments, knife and fork handles, playballs, &c. The manufacturing of them forms a considerable branch of industry in a part of Germany. The Agate, after having been reduced to suitable sized pieces, by means of a saw, chisel, or hammer, is then cut on a copper wheel, by means of emery, powdered Garnet or Topaz,

and is afterwards polished on a tin plate, with rotten-stone, putty or pumice-stone.

Oberstein, a small place in Rhenish Bavaria, in the north of Germany, has five large manufacturing establishments for the sole purpose of cutting and polishing the common gems or semi-precious stones; and it is the only place where this branch of business is carried to any great extent. Twenty mills are constantly driven by water, and more than one hundred thousand dollars worth of work is turned out yearly for export; a sum which is small in comparison with the enormous quantity of goods manufactured and set afloat, but pretty considerable for such places, where labour is so cheap, and the best of workmen may be had for one dollar and fifty cents per week. At Oberstein the business is divided into two branches; the one is devoted to the cutting and polishing of the Agate, and the other to the boring; and the workmen are called the Agate lapidaries and the Agate borers. The cutting is performed in the large Agate mills on sandstone; each mill has generally five large sandstones, five feet in diameter and fourteen to fifteen inches in thickness, fastened upon a shaft, which causes them to revolve vertically, and which are continually moistened by a stream of water. The workman leans with his body on a peculiar bench, the seat of which is called the cuirass, and with his feet presses himself against a pole, whence he continually pushes the larger lumps of the Agate towards the mill-stone; this, however, is often made so smooth, from the friction, that it is necessary to make it rough by knocking it with a sharp hammer, according to the kind of work, whether fine or coarse. They are either polished on sandstone or on wood, by means of fine clay or powdered chalk; they are polished sometimes, also, on wooden wheels, covered with lead or tin. Snuff-boxes and other articles of Agate, which are hollow, are polished on smaller sandstone wheels, which diminish in size as the work advances. Agates which require to be bored, belong to a particular branch, distinct from the other. The boring is performed by means of a Diamond point, and as described by Mr. Mawe. The Onyx varieties are mostly employed for cutting cameos, and are prepared there in such a manner that the darker layer is cut for the base, and the lighter for the intended objects.

Next to Oberstein, in Germany, there is in Siberia, at Kathe-

rineburgh, the largest manufactory for grinding and polishing the Agate and other gems. Many varieties of the Agate are used for engraving other stones, and also for the Florentine or stone mosaic work. Since the Agate has always been, and is yet, a favourite stone, it has been attempted to improve either its colour or other external appearance by artificial or mechanical means; these are either by the use of metallic solutions or by boiling in oil of vitriol. The colour has often been improved also by giving to the stone, before it is polished, several strokes in succession, the small fissures thereby produced, displaying an iridescence or some other phenomenon, if held towards the light; this operation, however, may easily be detected by wetting the stone, when the water, entering into the fissures, will destroy the effect; it will show itself again when dry. On some Agates black and white layers are produced, in order to use or sell them in the place of real onyx; this operation is performed by the lapidaries, who boil certain varieties in oil of vitriol, which turns some very soon into a black colour, and renders others clear or still paler; the polished Agates are, however, only used for this purpose, and the cause appears to lie in the oil absorbed by them during the operation of polishing; on which account Agates are by some first boiled in oil before submitting them to the operation of the oil of vitriol.

The value of the Agate, although much reduced in comparison to former days, and a good deal depending upon the purity and perfection of colour and peculiar figures, commands a pretty good price in the market; it is particularly the Onyx which is yet at high sums, and on that account the same is imitated by pasting thin plates of Chalcedony, Jasper, Agate, &c. together, and making them by their different colours appear like real onyx; this deception may, however, be easily detected by putting it in hot water, which disengages the plates one from another; the Onyx is likewise imitated by pastes, and very happily, but may readily be distinguished from them by the hardness and other characters prominent in the real stones.

The greatest collections of antique Onyxes, engraved as cameos and intaglios, are in Vienna and Berlin; in the first is to be seen the apotheosis of Augustus, which is ten lines broad and six high, and contains twenty perfect figures; this was purchased by the Emperor Rudolph at Frankfort on the Maine for fifteen thousand ducats.

The celebrated cameo in the Vatican Museum at Rome is of Agate, and represents Augustus. Italy has always been the great emporium for genuine antique Onyxes and cameos, and occasionally we still behold fine specimens of art in the possession of travellers coming from Europe. A very fine collection of antique cameos and intaglios in precious gems and antique pastes; likewise, cameos and intaglios of modern artists, I have seen in this country, in the possession of Thomas G. Clemson, Esq., of Philadelphia.

I have in my collection a good Onyx of the Emperor Vitellius; a splendid cameo of Bacchus, of two and one-fourth inches long and one half inch thick; one of Antony and Cleopatra; also, a splendid intaglio.

In Paris are several celebrated cameos, worthy the notice of travellers going to Europe: the Brunswick Vase, representing Ceres in search of Proserpine; Agrippina and her two children, composed of two layers, brown and white; the Quarrel of Minerva with Neptune, which consists of three layers; Venus on a sea-horse, surrounded with Cupids, &c.

Some modern works of cameo, from the hand of the celebrated Puckler, are in the collection of Robert Gilmore, Esq., at Baltimore, and in that of W. J. Lane, Esq., of this city.

XXIV. (I.) CHRYSOPRASE.

The ancients by this name designated a stone of a green colour, with a yellowish tinge; but it is not certain whether that which goes by this name, at the present day, is the same. We find, in the fourteenth century, this stone used as ornaments in churches and other places; but it was not known by the above name until 1740, when it was discovered by a Prussian officer in Silesia. Frederick the Second ornamented his palace Sans Souci with this mineral.

The common people of Silesia wear the Chrysoprase around the neck, as a charm against pains.

Chrysoprase occurs massive and in plates; the fracture is even and splintry; it is translucent; lustre, resinous; sometimes dull colour apple-green, grass-green, olive-green, and whitish-green. It scratches white glass distinctly, but is not so hard as true Chalcedony. Specific gravity is 2.56; it is infusible before the blow-pipe,

but loses its colour when heated. It consists of silex with a little carbonate of lime, alumnina, oxide of iron, and nickel; its colour is imparted by the latter substance. This mineral is found in the Serpentine of Silesia; also, in Siberia, and in the United States, (in New-Hampshire.)

Chrysoprase is used in jewellery and for various ornamental purposes, such as breast-pins, rings, bracelets, necklaces, seals, &c.; and the larger masses are used for snuff-boxes, cane-heads, table-plates, &c. The cutting is pretty difficult, and the greatest care is required for finishing the same with facets, as it is easily fissured: it is done on tin or lead plates with emery, keeping the first constantly wet with water; it is polished on a tin plate with rotten-stone, but the lapidary has always to be cautious not to let it become hot, as it easily splinters, grows opaque and gray. The usual cut is the table or en cabochon, with facets on the border; in setting, a foil of green satin is often used for a back, but when pure and of good colour it is mounted *à jour*. Inferior specimens are painted on the back with a mixture of verdigris, white-lead and gum-mastic, or with sap-green.

The Chrysoprase loses its colour by wearing; heat and sun-light likewise cause it to fade, and render it dark and cloudy; but the colour may be restored by keeping it in a wet or moist place, such as a cellar, in wet cotton or sponge, or even by dipping it in a solution of nitrate of nickel, which serves likewise to improve the inferior qualities.

Very fine imitations in paste may be made by mixing

1000 parts of strass with
5 " of oxide of iron, and
8 " of oxide of nickel.

The Chrysoprase is subject to a great many faults, such as fissures, either natural or received in cutting; oily whitish spots, pale gray flaws and stripes, and sometimes small grains of clay of reddish colour intermixed in the interior of the stone; but when pure, the Chrysoprase has always been a great favourite. A good seal or ring-stone may be worth from twenty-five to thirty dollars, and smaller specimens from one to five dollars. The apple-green variety is most valued, and a specimen one line long by one-half broad, has been sold at from fifty to one hundred and fifty dollars. At Paris, an oval Chrysoprase, eight lines long and seven lines

broad, was sold for three hundred and ten francs. The price generally has decreased of late, on account of the great quantity cut from the mines, which have recently been covered up, in order to raise its value again. At the royal palace of Potsdam, in Prussia, are two tables of Chrysoprase, the plates of which are three feet long, two feet broad, and two inches thick.

XXV. CHRYSOLITE.

The name of this stone is of Greek origin, and was well known to the ancients, although it is undecided whether they understood the same mineral by this name as we do at the present time, for they make it in their writings to be either the Topaz or Goldstone, or the transparent gold-yellow stone.

The Chrysolite occurs in prismatic forms, generally a right prism with rectangular bases; also, in angular rounded crystalline grains or massive; the fracture is conchoidal; it is transparent and translucent; it possesses powerful double refracting power; its lustre is vitreous and resinous; the lateral planes of the crystals are sometimes striated; the colour is olive-green, turning to yellowish and brownish; it scratches glass indistinctly, and is attacked by Topaz; its specific gravity is 3.33 and 3.44; becomes electric by rubbing; is infusible by itself before the blow-pipe, but is dissolved into a transparent pale-green bead with borax; acids do not affect it; it consists of magnesia, silica, and oxide of iron. The Chrysolite is found particularly in basalt, trap, green-stone, porphyry, and lava; sometimes in alluvial deposites and the sands of rivers; its principal localities are Brazil, Upper Egypt, Isle of Bourbon, and Bohemia.

The Chrysolite is cut on a leaden wheel with emery, and is polished on a tin plate with rotten-stone or oil of vitriol. Sometimes pale stones are finally polished with some olive oil, which raises the colour considerably: this last operation is applied to restore its lustre, after the Chrysolite becomes dull by wearing. The form is that of a rose or table-cut; also, en pavilion; and when set, gold foil is used for its base: the pale-coloured Chrysolites look well with a green-coloured copper foil; dark Chrysolites may be rendered clearer by a careful calcination.

The Chrysolite is used for rings and pins, but does not stand in high estimation, not possessing either a distinguished colour, strong lustre, or great hardness, and losing its polish by wearing; on

account of its softness, it wears off at the edges. Very good specimens of the Peridote from Brazil were brought into this country from France, and commanded a good price a few years ago, viz: from ten to fifteen dollars a carat.

XXVI. IOLITE.

This mineral has for a long time been brought from Spain, but has lately been made more known and brought into notice by Cordier, after whom it received the name *Cordierite;* it is called likewise *Steinheilite*, and has several other names, which I will mention, in order that the reader may not be confused when the same mineral is presented as a gem, under different names; the most appropriate name is *Dichroite*, from its property of displaying two colours when held in different directions; it is also known as *Peliome* and Prismatic Quartz.

It occurs in regular six and twelve-sided prisms; also, in crystalline grains, massive, and in pebbles; its fracture is conchoidal and uneven; it is transparent, exhibiting an indigo-blue colour when held in the direction of its axis, or viewed by transmitted light, and appearing brownish-yellow when held at right angles; it possesses some double-refracting power. Sometimes a ray of light, resembling that of the Star-sapphire, may be perceived in the Iolite, particularly when cut; it has a vitreous lustre; its colours are violet-blue and indigo-blue, sometimes with a tinge of black and bluish-gray. It scratches glass, and is attacked by Topaz; its streak-powder is white; it has a specific gravity of 2.88. By rubbing, it becomes electric, and assumes polarity by heating; it is difficult to fuse on the edges, and becomes then a grayish-green enamel: borax fuses it into a diaphanous glass; acids have no effect upon it; it consists of magnesia, alumina, and silica, with some oxide of iron and water.

It is often found under the names of Lynx and Water-sapphire, the first of a pale and the latter of a darkish-blue colour. It is found in primitive rocks; also, in blue clay, in copper pyrites, in quartz or felspar, and in small detached masses; the localities are Spain, Sweden, Norway, Greenland, Siberia, Ceylon, Brazil, Bavaria, and the United States, (at Haddam, Connecticut.) If the stone is perfectly pure, it is used for rings and breast-pins; is cut on a copper wheel with emery, and polished on a tin plate with rotten-stone,

and receives the form of a cabochon, in order to let it display its proper colours, and in a cube form: its price is not very high; the jewellers value it as an inferior quality of the Sapphire, without paying any regard to its phenomena of light. Good-sized specimens are sold at about eight to ten dollars a piece; at Paris, a good Iolite, ten lines long and eight and a half broad, was sold for one hundred and sixty francs. When, a couple of years ago, the Iolite was discovered by Professor Mather, at Haddam, Connecticut, it promised to be a valuable acquisition for American gems; but the supply was very scant, and its original locality appears to be exhausted. Professor Torrey possesses a fine seal, in the form of a cube, from that locality, which displays its properties to the greatest perfection.

A blue Quartz is occasionally sold for Iolite, but it may easily be distinguished by its colours and hardness. Sapphire is considerably harder than the Iolite.

OPAL.

The precious variety of this mineral was known to the ancients, and received its name on account of the play of colours which it has. The Opal has a great many varieties, which are all considered more or less gems, and find their application in jewellery; they will therefore be treated separately; but, as general characters, it may now be mentioned that Opal scratches glass but slightly, while it is marked by rock-crystal; it has a specific gravity of 2.06 to 2.11. It is infusible before the blow-pipe, but decrepitates and falls into splinters; it also dissolves with borax. Opal consists of silica with water, some oxide of iron, and sometimes alumina.

XXVII. (A.) PRECIOUS OPAL.

This gem derives its name from the Greek word signifying the eye, for the ancients believed that this stone had the power of strengthening the eye. It was highly esteemed by them, as we learn from Pliny, who thought that the play of colour originates from the beautiful colours of the Carbuncle, Amethyst, and Emerald. He also states that the Roman Senator Nonius chose to suffer banishment rather than part with a valuable splendid Opal to Mark Antony. A similar beautiful large Opal was in modern times excavated from the ruins of Alexandria.

The phenomenon of the play of colours in the Precious Opal has not yet been satisfactorily explained. Haüy attributes it to the fissures of the interior being filled with films of air, agreeably with the law of Newton's coloured rings, when two pieces of glass are pressed together. Mohs contradicts this theory upon reasonable grounds, which are, that the phenomenon would present merely a kind of iridescence. Brewster concludes that it is owing to fissures and cracks in the interior of the mass, not accidental, but of a uniform shape, and which reflect the tints of Newton's scale; but it is, in my opinion, sufficiently plausible, that the unequal division of smaller and larger cavities, which are filled with water, produces the prismatic colours, and for the simple reason that the Opal which grows, after a while, dull and opaque, may be restored to its former beauty if put for a short time in water or oil.

Although the Precious Opal was never found in the East, yet it bears the name of Oriental Opal among the jewellers: for in former times the Opals were carried by the Grecian and Turkish merchants from Hungary, their native locality, to the Indies, and were brought back by the way of Holland to Europe as Oriental Opals. The Precious Opal is found on small irregular gangues, nests of the trachytic porphyry formation, and its conglomerates in Hungary, particularly in the neighbourhood of the village of Czerwinceza; also, in the Faroe islands, Saxony, and South America. The Hungarian Opal is found of various qualities, and is obtained from mines which have been wrought for several centuries; and, according to the archives of that part of the country, there were, in the year 1400, more than three hundred workmen engaged at the mines near the above village; whereas there are but thirty at present engaged there, on account of the scarcity of large suitable specimens.

The Precious Opal is principally used for rings, ear-rings, necklaces, and diadems; the smaller specimens for mounting snuff-boxes, rings, chains, &c. It is ground on a leaden wheel with emery, and is polished with rotten-stone and water on a wooden wheel; and, in order to increase its lustre, it is lastly rubbed with putty, by means of buckskin, or a woollen rag and red chalk. Its form is generally that of a semi-circle, lens, or oval; sometimes of a table, and then also with some facets; but great care has to be taken that the edges, on account of the softness of the stone, do

not wear off. It is also apt to spring in a temperature suddenly changing. When mounted, it receives a coloured foil, or a variegated silk stuff, or a peacock-feather on the back, but it looks best in a black casing.

Cracks and fissures may be removed by leaving the Precious Opal for sometime in oil. Very frequently the Precious Opal is distributed in small particles in the matrix, called Mother of Opal, which is cut by the jewellers as boxes, and other ornaments; and very often, too, this matrix is plunged in oil, and is exposed to a moderate heat, whereby the base grows blacker, and the true Precious Opal retains its ray of colours. In order to preserve the surface of the Precious Opal against wear and tear, it is covered with a thin plate of quartz crystal. The Precious Opal still stands in very high estimation, and is considered one of the most valuable gems. The size and the beauty displayed by its colours determine its value; those playing in the red and green colours bear the highest price. Its value has latterly increased on account of the scarcity of the larger specimens. Formerly, a solitary large Precious Opal, playing in the red colour, was sold for two to three hundred ducats; and one playing in both red and green colours, about five lines long, was sold at Paris for two thousand four hundred francs; and lately a single Opal, of fine colours, and the size of a dollar, was sold near the locality for three hundred thousand florins; in this country the Precious Opals are sold by the importers at the rate of four to ten dollars per carat, and single specimens, suitable for pins or rings, from two to twenty dollars. The mother of Opal is, however, much cheaper; one of five lines size is sold for three to five dollars.

All experiments for imitating the Precious Opal have hitherto proved fruitless; they were made either by preparing an enamel and adding several metallic oxides, or by affixing to the back of a clear or common Opal or enamel, a polished thin plate of the mother of pearl, which may sometimes deceive the ignorant.

The imperial mineralogical cabinet at Vienna, contains the most celebrated specimens of Precious Opal; one, particularly, may be mentioned here, which is the largest known; it is four and three-quarter inches long, two and a half inches thick, and weighs seventeen ounces. It was discovered about 1770, at the above locality, and transported to Vienna. It displays the most magnificent colours;

is perfectly pure, and not accompanied by any matrix. Half a million of florins were offered for it by a jeweller of Amsterdam, and refused on account of its uniqueness; and the Viennaians have not yet dared to put even any approximative value upon it.

XXVIII. (B.) FIRE OPAL.

This mineral was first brought into notice by Baron Humboldt, who found it in Mexico.

It occurs massive; has a conchoidal fracture; is transparent; of strong vitreous lustre; colour hyacinth red, running into honey, wine-yellow, showing carmine-red and greenish reflections; sometimes containing dendritic drawings. Its specific gravity is 2.02; loses one and a half per cent. by calcination, and leaves pale flesh-red fragments. It is found in the trachytic porphyry, in Mexico, and in the amygdaloid of the Faroe islands.

Since the Fire Opal is very little known, it has not yet been employed in jewellery, but bids fair to find applications. It is ground on a leaden wheel with emery, and polished with rotten-stone on a wooden wheel. The forms of cabochon, table, or pavilion, might suit very well as ring-stones.

The cabinet of the University of Bonn possesses a very large and fine Fire Opal, of the size of the fist. The largest specimen I have seen is in the royal mineralogical cabinet at Berlin, which was deposited by Baron de Humboldt on his return from South America, and which, if I recollect it well enough from the year 1827, must be at least six inches long and four inches thick. This is the largest specimen he ever found. A collection of six shades of Fire Opal, with six more varieties of the other Opals, was presented to me in the year 1828, when in Berlin, by the Counsellor Bergeman, who received at that time a considerable quantity of polished specimens from the Faroe islands, but all of small size. A splendid collection of fire Opals was brought from Guatemala some years ago to this country.

XXIX. (C.) COMMON OPAL.

This mineral occurs massive and in rolled pieces; also as stalactites; has a conchoidal fracture; is translucent and semi-transparent; has a strong vitreous and resinous lustre; its colours are milky, yellow, reddish, greenish-white, honey-yellow, wine-

yellow, flesh, brick-red, and olive-green; sometimes dendritic, (Moss Opal.) Its specific gravity is 1.9 to 2.1.

The Wax and Pitch Opal are subordinate to this variety. It is found in the same rocks as the Precious Opal, in Hungary; in the hematite rocks of Saxony; in the Serpentine of Silesia; in cavities, of trapp and the amygdaloid rocks of Iceland; Faroe islands; and in the United States, (Pennsylvania and Connecticut.)

It is used for rings, pins, and cane-heads; but is, on the whole, not a favourite among the jewellers, and has no great value, because it is soft and brittle; the paste, which may be made from white enamel, is sometimes much prettier than the real stone.

XXX. (D.) HYDROPHANE.

The name of this variety of Opal has reference to its peculiar property of becoming transparent, and opalescent after immersion in water. The ancients called this stone Lapis Mutabilis, and Achates Oculus Mundi. It is a common or Precious Opal, of porous texture; adheres strongly to the tongue; is translucent, and absorbs water with avidity, giving off at the same time air-bubbles; it thus assumes a high degree of transparency, and sometimes the property of displaying the finest prismatic colours, equal to the Precious Opal. This phenomenon tends strongly to explain the display of the prismatic colours of the Precious Opal; the more so as the Hydrophane loses this property on getting dry.

It has, when dry, a white, yellowish, or reddish colour, and a specific gravity of 1.95 to 2.01; and according to Haüy, a Hydrophane, having been immersed for four minutes in water, gained thirty-four centigrammes.

The Hydrophane is found in the porphyry of Hungary, France, Iceland and the Faroe islands. Large pieces of good and fine specimens of Hydrophane are wrought and used in the same manner as the Precious Opal.

It is said that the Hydrophane becomes much quicker transparent in warm than in cold water; the quickest in spirits of wine; after which, it loses this property the sooner; but when boiled in oil, it retains it, to a certain extent, for years.

If the Hydrophane is well dried and soaked in melted white wax, or spermaceti, it assumes the property, when warmed, of becoming translucent, and of displaying browish-yellow or gray colours; it is then called Pyrophane.

The Hydrophane was once coloured violet or red, by means of a decoction of logwood and alum.

The price of the Hydrophane is very high, on account of its great scarcity, and because it is very seldom found in large lumps.

XXXI. (E.) SEMI-OPAL.

This variety of Opal was formerly considered to be a pitch-stone, and if it assumes the form of petrified wood, it is called Wood Opal. It has a conchoidal and even fracture; it is translucent and opaque; of a resinous and vitreous lustre; its colours are yellowish, grayish, and brownish, the colours running mostly into one another; sometimes the colours divide themselves riband-like. The Wood Opal is mostly brownish, and displays, more or less, a ligneous aspect, with the forms of asts, or branches.

The Semi-Opal is found on gangues, in the trachytic porphyry in Hungary, in the Serpentine in Silesia, in the amygdaloid on Iceland and the Faroe islands; likewise in Moravia, Saxony, France, Greenland; and in the United States, (Maryland and Pennsylvania.)

The Semi-Opal, on account of its taking a high polish, is used for many purposes in jewellery. There is an establishment for manufacturing snuff-boxes from Wood Opal, in Vienna, and lately the varieties of Wood Opal, with layers of Chalcedony, or Semi-Opal, have found a useful application for the cutting of cameos. The Semi-Opal is ground and polished like the Precious Opal, but with more difficulty, on account of its being more brittle. The form which it easily receives is en cabochon, but without facets. The price of the Semi or Wood Opal is low.

XXXII. (F.) CACHELONG.

According to Blumenbach, the name of this mineral is of Mongolian derivation, meaning "a pretty stone;" and according to Phillipps it bears its name after the river Cach, in Bucharia, on whose shores it occurs frequently in loose conglomerates. This mineral was hitherto arranged under the head of Chalcedony, but properly belongs to Opal.

It occurs massive, as a covering of other minerals, rarely reniform, often traversed with fissures in different directions. It has a conchoidal fracture; is opaque, and of a pearly lustre; milky-

white, turning sometimes to a yellow or a red colour; and exhibits dendritic figures of manganese or green earth. It scratches white glass; has a specific gravity of 2.2; it decrepitates when first brought before the blow-pipe, but yet undergoes no change; dissolves with borax, slowly, at a white heat.

It is found in the same manner as the Chalcedony, sometimes encrusting or penetrating it; in the amygdaloid of Iceland, Greenland, the Faroe islands, the Hematite of Corinthia, the United States, (Massachusetts,) and Nova Scotia; in Bucharia, in the sand of the river Cach, it is found loose.

Cachelong is much used in jewellery for rings, seals, &c. The Calmucks of Bucharia manufacture of it tools and other domestic articles. It is cut on a copper wheel with emery, en cabochon, and receives the polish on lead plates, by means of rotten-stone and putty. The price of the Cachelong is pretty considerable, on account of its beauty and scarcity; as the specimens most frequently found in the above localities are seldom in layers of more than one-quarter of a line, alternating with Chalcedony.

XXXIII. (G.) JASPER OPAL.

This mineral stands between Jasper and Opal; and, although considered by Werner as belonging to the first, ought, nevertheless, more properly to be arranged with the Opal, on account of its containing water in its composition.

The Jasper Opal occurs massive, in specks, stalactiform, and in geodic masses; it has a conchoidal fracture; is translucent on the edges, or opaque; is of a strong resinous lustre; its colours are gray, yellow, red, and brown. Its specific gravity is 2.0 to 2.1. It consists of silica, water, and oxide of iron, amounting to forty-seven per cent. It is found in the trachytic breccias of Hungary; also, in Saxony and Siberia. The best light and pure specimens are used for dagger and sword handles in Turkey. The price of Jasper Opal is low.

XXXIV. OBSIDIAN.

This mineral was very familiarly known to the ancients, and its name is said to be derived from a Roman, who first brought it to Rome from Ethiopia. Pliny states that the Romans manufactured mirrors and gems from it; and the Mexicans and Peruvians manu-

factured their knives, razors, and sword-blades from the Obsidian, which appears to have served as a complete substitute for other materials with those nations, who were yet unacquainted with the use of gems for weapons and utensils of various kinds. The Baron Humboldt says that Cortez mentioned, in his letter to the Emperor Charles V., having seen razors of Obsidian at Tenochittan; and the above naturalist likewise discovered himself, on the Serro de las Nabajaz, in New Spain, the old shaft that was used for raising the rough Obsidian, with relics of the tools and half-finished utensils.

The inhabitants of Quito manufactured magnificent mirrors from Obsidian, and those of the Azores and Ascension islands, and Guiana used splinters of the Obsidian as points for their lances, razors, &c.

Specimens of arrows and other articles, such as octangular wedges, were presented a few years ago to the New-York Lyceum of Natural History, being relics from the ruins of Palenque. In the collection of Columbia College are some razors, or sacrificial knives, the gift of the Hon. J. R. Poinsett.

Obsidian occurs massive, in roundish or obtuse lumps, balls, and grains; has a conchoidal fracture; is semi-transparent and translucent on the edges; it has a strong vitreous, and sometimes even metallic lustre; its colours are either pure black, grayish, brownish, greenish-black, yellow, blue, or white, but seldom red; it sometimes displays a peculiar greenish-yellow shine, when it is called the iridescent Obsidian; there is rarely more than one colour in the same specimen with stripes and specks. Obsidian scratches white glass indifferently, but is scratched by Topaz; its streak-powder is white: it has a specific gravity of 2.34 to 2.39. Obsidian is sometimes magnetic, so that small pieces show their magnetic poles. Before the blow-pipe, the black variety is fusible with much difficulty; and even at a white heat it does not melt into a solid glass; but the gray and brown variety (Marekanite) swells readily into a spongy mass.

Obsidian consists of silex, alumina, with a little potassa, soda, and oxide of iron.

The names, Iceland Agate, lava, black-glass lava, volcanic lava, are all synonymous, and the mineral called Bottlestone, in round grains of the size of a pea, is nothing but a green Obsidian.

The Obsidian, sometimes, forms the cement of whole moun-

tain chains, often deposites in the trachyte and the streams at the foot of some volcano; also, among the volcanic ejections, and occurs in loose lumps in the sand of rivers, and at the foot of mountains. It is found in Iceland, Teneriffe, the Lipari islands, Peru, Mexico, Sicily, Hungary, Asiatic Russia, the Ascension islands, and on all the volcanos of former and present times.

In the New-York Lyceum of Natural History are several interesting specimens, presented by Don Correa, of Tobasco, from the ruins of the city of Palenque; such as concave or triangular wedges, and other masses of Obsidian from various localities.

It is employed for several useful and ornamental purposes; such as the making of ear-rings, necklaces, brooches, snuff-boxes, knife-handles, &c. It is particularly worn as mourning jewellery; it requires, however, much care in working, being extremely brittle. It is ground on lead wheels with emery, and polished with rotten-stone. It is kept in favour by the jewellers on account of its high polish; but its value is very indifferent, excepting that of the iridescent Obsidian, which commands a high price, and is sometimes seen cut en cabochon, and set in rings.

There is no doubt but what Obsidian is of volcanic origin, being mostly found in the neighbourhood of volcanos, and that it is a glass, produced by the volcanic fire, as it is a combination of silex and alkaline substances. The Neptunic theorists have endeavoured to prove that it is occasionally found with the remains of decomposed granite, gneiss, and porphyry, with which it even alternates in layers.

XXXV. AXINITE.

The name of this mineral is derived from a Greek word, signifying an axe, and was applied to it on account of the resemblance of its crystals to that implement; it is also called by some English mineralogists Thumer-stone, from its first locality. The Axinite occurs in a variety of crystalline forms, to be reduced to the rhombic forms, viz: an oblique rhomb, or four-sided prism, so compressed that the edges appear sharp, like the edge of an axe; likewise, massive and in specks; its fracture is uneven; it is translucent on the edges, or transparent; has a simple refraction of light; its lustre is vitreous; also, resinous; its colours are violet-blue, brown, gray, and yellow; it scratches white glass, but is scratched by

Topaz; has a white streak-powder; its specific gravity is 3.27; it becomes electric by rubbing or heating; before the blow-pipe it fuses into a grayish-brown glass; acids have no effect upon it; it consists of lime, alumina and silex, with oxide of iron and manganese. It occurs on gangues and layers of various formations, principally the primitive; and is found in Dauphine, Pyrenees, Gothard, Saxony, (Thum,) Norway, &c.

This mineral takes a very high polish, particularly those specimens from Dauphine, but has hitherto, on account of its scarcity, not found much application in jewellery, but will hereafter be a great acquisition, as it may be used for rings, pins, and other small ornaments.

FELSPAR.

The varieties of this mineral are mostly crystallized, and in very numerous forms; but they are all distinguished by two great characters, which are, the foliated structure and peculiar lustre; the principal form is an oblique prism with unequal sides. Felspar scratches glass and is scratched by rock-crystal; its streak-powder is white; it has a specific gravity of 2.5 to 2.6; before the blow-pipe it fuses with difficulty; on charcoal it becomes vitreous and white; fuses with difficulty on the edges to a translucent white enamel; the acids have no effect upon it; it consists of potash, alumina, and silex.

XXXVI. (A.) ADULARIA.

This mineral occurs in crystals, crystalline fragments, and solid masses; its fracture is uneven; it is translucent on the edges; has double refraction of light; the lustre is vitreous and pearly, more especially when cut and polished; it throws out greenish and bluish-white chatoyant reflections from the interior; it cleaves in two directions; the crystals often present the hemitrope form, which in polished specimens becomes obvious from the different directions of the laminæ; its colours are limpid-white, greenish, grayish, and bluish, frequently with a peculiar pearly shine, and sometimes it is iridescent.

In commerce, the Adularia goes under various names, such as Moon-stone, Sun-stone, Girasol, Fish-eye, Ceylon or Water Opal. In the Moon-stone the colour is white, with small bluish or green-

ish shades, but the base is semi-transparent and milky; whereas the Sun-stone shows a yellow and reddish play of colours. The Adularia is found in gangues and cavities of the granite and gneiss, and limestone, and in pebbles from Ceylon, Greenland, Bavaria, St. Gothard, Tyrol, Dauphine, and in the United States, particularly at Ticonderoga, (New-York,) near Lake Champlain, Maryland, Pennsylvania, Connecticut, and Massachusetts. The Adularia from St. Gothard is found in very large masses; I saw, in 1827, in the cabinet at Zurich, in Switzerland, groups of crystallized Adularia, measuring two feet in length and one foot in thickness, the splendor of which dazzled my eyes.

Adularia, displaying a good colour, and strong pearly reflections, is now much used in jewellery, for rings, pins, and other smaller ornaments. Generally specimens which possess these qualities are cut out of large lumps, then ground on a lead wheel, en cabochon form, and polished with rotten-stone; they are, in general, mounted in a black case, whence it best shows its reflections. The Moon-stone commands a good price; exquisitely fine specimens, of the size of a bean, are worth from five to ten dollars, and some of them were sold at Paris, of six lines diameter, for seven hundred and five francs, and four lines for two hundred and three francs.

The largest Moon-stone, in a brooch, three-fourths of an inch in length, I have seen in the possession of Francis Alger, Esq., of Boston; and rough specimens, with most splendid reflections, I have admired in the collection of Dr. M. Gay, of the same city. Both these gentlemen are fortunate in possessing uniques in this country, which are of no ordinary scientific and commercial value.

XXXVII. (B.) COMMON FELSPAR.

This Felspar occurs in crystals, massive, and disseminated; its fracture is uneven and splintery; is translucent; has a pearly and vitreous lustre; its colours are white, gray, red, yellow, and green, in their various shades, sometimes with a variegated bluish, greenish, or reddish play of colours: its texture is compact, or minutely foliated.

The Amazon Stone, or green Felspar, is from Siberia; likewise splendid grass-green Felspar was found in the United States, at Southbridge and Hingham, Massachusetts, and Cow-Bay, New-

York; of apple-green colour at Topsham, Maryland, and near Baltimore. Also, the American glassy or vitreous Felspar, found in Delaware, which ought properly to be quoted as a distinct species, is arranged with this variety.

Felspar is widely diffused all over the globe, and with a few exceptions is more common than any other mineral; it forms a constituent part of most primitive rocks, such as gneiss, granite, &c.; is the principal ingredient of the Syenites, Porphyry, and, in fact, with a small per centage of other minerals, forms whole mountain ranges and chains in various parts of the globe: such we see in Siberia, the north and west of Scotland, &c., all of which are surrounded by Felspar. Immense beds exist in the United States: around Wilmington, in the State of Delaware, is an inexhaustible deposite of exquisite and perfectly pure Felspar; and in Connecticut and on the North River we see beds of the foliated Felspar extending for miles. Sweden, Norway, and Greenland are likewise great depositories for the common Felspar.

The Amazon-stone is used in jewellery for rings, pins, seals, snuff-boxes, &c. It is principally cut at Katherineburgh, Siberia, where it is ground on a leaden wheel with emery, and polished with rotten-stone on a wooden wheel; its form is that of en cabochon, and sometimes the mixed and pavilion-cut, when the table is to be cut pretty large, and arched, in order to display more distinctly its peculiar colours.

Common Felspar is of no great value, and only the Amazon-stone is used in jewellery, which commands a good price. Cut specimens, suitable for ear-rings or brooches, are worth from three to five dollars.

A very fine specimen of the Amazon-stone, in its rough state, may be seen in the New-York Lyceum of Natural History. The imperial cabinet of St. Petersburgh possesses two vases of this stone, which are nine inches high and five and one half inches in diameter. Although our vitreous Felspar has not yet been brought into use for the purposes of jewellery and other ornaments, yet it bids fair to contribute, at one day, much to the national wealth of this country, for it is the best material for porcelain, china, and earthenware. Already have many cargoes of this beautiful mineral been shipped to France and England, (six hundred tons of the Connecticut, Middletown, Felspar were, according to Professor Shephard,

last year shipped to Liverpool, and one hundred tons to the Jersey porcelain manufactory,) where the manufacturer appears to appreciate better the purity of ingredients for the purposes just mentioned. Instead of receiving, as hitherto, the manufactured goods from abroad, made of our own raw material, it is earnestly to be hoped that we shortly will acquire skill and exert sufficient industry to compete with foreign manufacturers in the art of making porcelain, with the superior material which Nature has so abundantly lavished on this continent. I possess a splendid slab of the vitreous Felspar, of one square foot, free from any admixture, and imposing in appearance.

XXXVIII. LABRADOR.

This mineral was heretofore considered as a variety of Felspar; but it has latterly been separated from it, and ought, therefore, no more to be called Labrador Felspar, the name by which it is known in all mineralogical works.

The Labrador was first discovered by the Moravian missionaries on the island of St. Paul, on the coast of Labrador; and according to others, by Bishop Launitz, in 1775, when it was brought to Europe. The Labrador occurs in crystalline masses, massive, and in boulders; it is of an uneven and conchoidal fracture; its lustre is vitreous, and in one direction pearly; it is translucent; its colours are gray, with its various shades, such as blackish or whitish-gray, with spots of an opalescent or iridescent vivid play of colours, consisting of blue, red, green, brown, yellow, or orange, according to the direction in which light is falling upon the specimen; sometimes several of these colours are perceptible at the same instant, but more commonly they appear in succession as the mineral is turned towards the light. These colours are said to originate in fissures which intersect the texture of the mineral, as they are only perceptible from that side where they fall together with the foliated structure, and not like the Opal, whose mass is supplied with fissures running in all directions.

The Labrador scratches white glass, is scratched by rock-crystal, and is somewhat less hard than Felspar; its specific gravity is 2.71 to 2.75; before the blow-pipe it fuses with difficulty, and is said to lose its play of colours; it consists of silex, alumina, lime, soda, with some oxide of iron and water. The Labrador is found as a

rock and boulder, in St. Petersburgh, Norway, Bohemia, Saxony, Sweden, St. Paul's Island on the coast of Labrador, and in the United States, in Essex county, (New-Jersey,) at the mouth of the North River, near Lake Champlain, New-York, where, according to the description given me by Archibald McIntyre, Esq., its splendid colours are seen on both sides of the water, but a few yards apart, and the effect of the rays of the morning sun falling upon the rock and water at the same time, is said to equal that of the prismatic spectrum thrown into a dark room.

The Labrador is used for rings, pins, buttons, snuff-boxes, letter-holders, cane-heads, and other ornaments, such as vases and larger articles; but care has to be taken in grinding, that the direction where the play of colours is visible is kept straight, and that it is cut en cabochon. The price of the Labrador is not very high, but soon after its discovery, a Doctor Anderson, having described the mineral as displaying all the variegated tints of colour that are to be seen in the plumage of the peacock, pigeon, or most delicate humming-bird, and specimens having been carried to England, so great was the avidity to possess it, that small pieces were sold for twenty pounds sterling. The present price of good specimens is from two to ten dollars; and a few years ago I purchased some letter-holders, which are beautiful specimens, for which I paid four dollars a-piece. The largest specimens of Labrador are in the collections of the Mineralogical Society, and in the museum of the Academy of Sciences at St. Petersburgh, which were found on the shore of the Pulkouka; one of them weighs ten thousand pounds. I have in my possession a rough specimen of the Labrador of this State, merely rubbed off on the surface, and its colours, I venture to say, equal, if they do not indeed excel, in every respect, those of the specimens from St. Paul's Island; and I anticipate the day when the citizens of New-York will take as much pride in possessing Labarador table and mantel-slabs, as they now do in employing the Italian and Irish marble for these purposes; for the resources appear to be inexhaustible in the rocky county of Essex. We do not see many specimens brought from the coast of Labrador, and I was informed by Mr. Audubon, on his return from that quarter, that he could not find any specimens. Mr. Henderson, of Jersey City, who presented me the above-mentioned rough specimen of Labrador, had likewise

splendid small polished specimens in breast-pins, displaying all the properties in their full beauty. The same gentleman, who travelled last summer in company with several scientific State geologists, mentions that they picked up beautiful specimens at the height of five thousand seven hundred feet above the level of the sea.

In the collection of Columbia College is a fine specimen of Labrador, brought from Gaspy, Lower Canada, by the Hon. Mrs. Percival.

XXXIX. HYPERSTHENE.

This mineral was formerly annexed to Hornblende, but has latterly been separated; its name is derived from the Greek, and means of superior strength, in reference to the great hardness and specific gravity which it possesses.

The Hypersthene is found in crystalline masses; it has an uneven fracture; it is opaque, and its colours are dark-brown, red, greenish or grayish-black; the cleavage is parallel to the sides, and shorter diagonals of a rhombic prism; its lustre is metallic, and when viewed in one certain direction, copper-red, light-brown, or gold-yellow, and in others it has a greenish play of colours. It scratches glass, has a darkish-green streak-powder, and has a specific gravity of 3.38; it is easily fusible before the blow-pipe on charcoal into a grayish-dark bead; acids have no effect upon it; it consists of magnesia, silex, alumina, and lime, with some water.

It is found forming a constituent of the Labrador rock, on the coast of Labrador, Greenland, and in the United States, on Brandywine Creek in Pennsylvania, and in Essex county, New-Jersey; fine specimens have been found in Hingham, Massachusetts. The French jewellers have lately begun to introduce this mineral for rings, pins, and other ornaments, on account of its high polish and beautiful colour. The best coloured pieces are cut out of the mass, and ground on a lead wheel with emery en cabochon, and polished with rotten-stone. Beauty of colour and other qualifications determine the price of this stone; at Paris a Hypersthene, en cabochon cut, eight to ten lines long and six lines broad, was sold for one hundred and twenty francs.

The mineral is, however, pretty rare, and has not yet been fully introduced.

XL. IDOCRASE.

This mineral occurs mostly crystallized, in the form of a four-sided prism, terminated by four-sided pyramids; also, massive; its cleavage is parallel to all the planes of the prism; it is transparent and opaque; possesses strong double refraction of light; its lustre is between vitreous and resinous; its cross fracture conchoidal; the crystals are all striated in length; its colours are yellowish or brownish-green, orange-yellow, sometimes blue and black. It scratches white glass and Felspar, but is scratched by Topaz. Its streak-powder is white, and it has a specific gravity of 3.8 to 3.4. Before the blow-pipe, it is fusible into a brownish glass. It consists of lime, alumina, silex, with some oxide of iron and manganese.

Idocrase is found in different geological positions in primitive and volcanic rocks, in the cavities of the Serpentine in the Alps, in Piedmont, Mount Somma, Vesuvius, Etna; also, Norway, Sweden, Spain; in the United States, at Worcester, Massachusetts; Salisbury, Connecticut; Cumberland, Rhode Island.

The Idocrase, of pure green and brown colours, and transparent, is used for rings and pins, and at Naples and Turin, it is principally cut for jewellery on a leaden wheel, and is polished on wood, with pumice-stone. The forms it receives are the brilliant, table, and pavilion, and if perfectly pure, it is mounted *à jour*; otherwise, with a suitable foil. The price of the Idocrase is not very high, as it is but little known among jewellers.

The Chrysolite and green Garnet are often substituted for Idocrase; but the first has a greater specific gravity and is of a more vivid colour; the latter is harder, and likewise of greater specific gravity.

The Italian Idocrase, which is cut at Naples, is mostly called the Italian Chrysolite.

XLI. HAÜYNE.

The name of this mineral was given in honour of the celebrated French mineralogist, the Abbé Haüy. It occurs in dodecahedral crystals, with brilliant faces; also, in grains and massive; it has a conchoidal fracture; is transparent and translucent; possesses a strong vitreous lustre; its structure is imperfectly foliated. Its colours are indigo, sky, and smalt-blue; also, white, green, gray, and black. It scratches white glass and is scratched by quartz:

white streak-powder; specific gravity is 2.47. Before the blow-pipe it loses its colour and fuses into a porous glass, and with borax into a diaphanous glass, which turns yellow on cooling; it forms a jelly with acids. It consists of lime, alumina, silex, protoxide of iron, sulphuric acid, and soda or potash.

It is found in slacked basalt, and ejections of mount Vesuvius, on Bodenmaise, on the Laach Lake, in Italy, and on the island Tiree, Scotland.

The Haüyne is not much known yet, but has lately been used for rings, ear-rings, brooches, &c.; it is cut like the Idocrase, but the price will always be high on account of its scarcity.

XLII. LAPIS LAZULI.

The name of this mineral is derived from the Persian language, and means blue colour, or with the Latin prefix, blue stone. The ancients were well acquainted with it, and have employed it as a substitute for other gems. The Greeks and Romans are said to have called it by the name of Sapphire, denominating that with specks of iron pyrites the Sapphirus regilus; Pliny called it the Cyanus. It was formerly used as a strengthening medicine.

The Lapis Lazuli very seldom occurs crystallized; its regular form is the oblique four-sided prism; it mostly occurs compact and in grains and specks, with an uneven and conchoidal fracture; it is translucent on the edges; its lustre is nearly vitreous and shining; structure foliated; its colour is fine azure-blue, with different shades, often interspersed with spots or veins of pyrites. It scratches glass, but is attacked by quartz and by the file; its specific gravity is 2.3: before the blow-pipe and on charcoal it with difficulty runs into a white glass, but with borax it fuses with effervescence into a limpid glass. It consists of lime, magnesia, alumina, and silex, with soda, protoxide of iron, and sulphuric acid.

It is generally called in trade the Armenian-stone.

It is found in gangues of the older formations, and on the Buchary; it exists in granite rocks, and is disseminated in all veins of thin capacity; on the Baikal Lake it is found in solid pieces; also, in Siberia, Thibet, China, and Chili.

The Lapis Lazuli is much used for jewellery, such as rings, pins, crosses, ear-rings, &c. The best pieces are generally cut out from larger lumps by means of copper saws and emery, then

ground with emery on a lead wheel, and polished with rotten-stone on a tin wheel. The rocks which yield the Lapis Lazuli, where it is contained in specks, are likewise cut for ornamental purposes, such as snuff-boxes, vases, candlesticks, cups, columns, cane-heads, &c.; also, for architectural ornaments and stone mosaic; the larger specimens, having the specks regularly disseminated on a white ground of the rock, are those selected for cutting. The most important use of this mineral is that of furnishing the celebrated and beautiful pigment called Ultramarine-blue, used by painters in oil, and said never to fade. The Lapis Lazuli takes a, very high polish, but becomes dull again after being used for some time. It is sometimes imitated with the Lazulite or Azure-stone, the blue carbonate of copper, which, however, is not near so hard and effervesces on testing with nitric acid. Those specimens having the iron pyrites enclosed are difficult to polish well, on account of the unequal hardness of the two minerals.

The value of the Lapis Lazuli, although depending upon its purity, intensity of colour, and size, has nevertheless much diminished when compared with its former prices.

The Chinese, who have for a long time employed the Lapis Lazuli in their porcelain painting, call the pure and sky-blue stone Zuisang, and the dark-blue, with disseminated iron pyrites, the Tchingtchang, preferring the latter to the former; they work the same for many ornaments, such as vases, snuff-boxes, buttons and cups.

In the palace which Catharine II. built for her favourite Orlof, at St. Petersburgh, there are some apartments entirely lined with Lapis Lazuli, which forms a most magnificent decoration. I have several slabs, three inches long, and of fine azure-blue colour, in my possession.

The production of Ultramarine has been known since 1502, and was already employed, under the name of Azurum Ultramarinum, by Camillus Leonarus.

The process of preparing the Ultramarine was known as early as the fifteenth century. The colour is now mostly prepared at Rome, in the following manner: those pieces which are free from pyrites specks, are first calcined and pulverized; the powder is then formed into a mass with a resinous cement, (pastello,) and fused at a strong heat; this is then worked with the hands in

soft water, whereby the finest colouring particles are disengaged in the water, which will soon be impregnated with the blue colour; a fresh portion of water is then taken, and the same operation is continued until the remains are colourless. The Ultramarine, after a short time, settles to the bottom of the vessels, and is carefully separated and dried. If the Lapis Lazuli was of the best quality, the product will be from two to three per cent. That colour which remains yet in the mass is of an inferior quality, and is called the Ultramarine ashes; it is of a paler and more reddish colour.

Good Ultramarine has a silky touch, and its specific gravity is 2.36. It does not lose its colour if exposed to heat, but is soon discoloured by acids, and forms a jelly. In order to distinguish the pure Ultramarine from numerous spurious and adulterating colouring materials, such as indigo, Prussian-blue, mineral-blue, &c., it is only necessary to test the article in question with some acid, when after a few minutes the real Ultramarine is discoloured, yielding a clear solution and a white residuum. The real Ultramarine has always been at a very high price, on account of the small product obtained from the material. An ounce of the purest Ultramarine is sold in France for two hundred to two hundred and fifty francs, which is not within the reach of all painters.

In the year 1828, the discovery was made by Professor Gmelin, in Tubingen, that sulphuret of soda was the proper material for imitating this precious and valuable pigment. By his experiments he succeeded in preparing this substance from silex, alumina, soda, and sulphur, producing a colour in every respect corresponding with the true colour of the Lapis Lazuli, and bearing the same relation to acids as the genuine Ultramarine. This, for economy, has become a great object to painters and colour-men, since a whole pound of it may be purchased in France for twenty francs. As it bids fair to meet with a great consumption, being even substituted for cobalt in bluing paper, thread, and other stuffs, several manufacturers have already been induced to engage largely in its preparation; and there is now a very extensive establishment in full operation by M. Guimet, three leagues from Lyons, who likewise claims the priority of its discovery: the royal porcelain manufactory at Meissen, in Saxony, also prepares it. The process for making the artificial Ultramarine, as it was first described by Gmelin, is

here given, as it was published in the *Annales de Chimie.* The whole process is divided into three parts:—

1. The pure hydrate of silica is prepared by fusing fine pulverized quartz or pure sand with four times its own weight of salt of tartar, dissolving the fused mass in water and precipitating by muriatic acid; also, the hydrate of alumina is prepared from alum in solution, precipitated by ammonia.

2. Dissolve the silex so obtained in a hot solution of caustic soda, and add to seventy parts of the pure silex seventy-two parts of alumina; then evaporate these substances until a moist powder remains.

3. In a covered Hessian crucible, a mixture of dried sal soda, one part to two parts of sulphur, is heated gradually, until it is fully fused, and to the fused mass add small quantities of the earthy precipitate, taking care not to throw in fresh quantities until all the vapours have ceased; after standing for an hour in the fire, remove the crucible, and allow it to cool. It now contains the Ultramarine, mixed with an excess of sulphuret, which is to be removed by levigation; and, if the sulphuret is still in excess, it is to be expelled by moderate heat. Should the colour not be uniform, levigation is the only remedy.

XLIII. KYANITE.

The name of this mineral is derived from the Greek, signifying blue, and was given to it on account of its blue colour. It has been known for many centuries, having been cut by a German lapidary, Cornellius, in the reign of James IV., under the name of Sappare, by which it is yet known among the French jewellers.

It occurs in masses composed of a confused aggregation of crystals, and in distinct crystals of four or eight-sided prisms, much compressed, with two broad shining faces. The crystals are generally closely aggregated, and are crossing or standing on each other in a hemitropic form, so as to present a singular and curious aspect. Some of the crystals are curved, others are corrugated or wrinkled, as though they had been pressed endwise, or had not room to stretch themselves at full length; others are pressed into triangular shapes, &c. It has a foliated structure; uneven fracture; is transparent and translucent; possesses simple refraction of light; its lustre is vitreous and pearly; its colours are azure-blue, passing into light blue or bluish-white and bluish-green. It scratches white

glass, and is attacked by Topaz or a good file; yields a white streak-powder; has a specific gravity of 3.63 to 3.67. It becomes electric by rubbing, and often exhibits positive and negative electricity in one and the same specimen; it is infusible before the blow-pipe, but, with borax, fuses with difficulty into a transparent limpid glass: acids have no effect upon it.

It consists of alumina and silex, sometimes combined with oxide of iron and water.

The Kyanite is found in micaceous, talcose, and argillaceous slate, at St. Gothard, and on the Tyrol, in Switzerland; in Styria, Corinthia, Bohemia, Spain, and Siberia; also, in the United States, of the purest azure-blue colour: large specimens in Litchfield, Haddam, and near New-Haven, (Connecticut;) Chesterfield, Conway, Granville, Deerfield, and Plainfield, (Massachusetts;) Grafton, Norwich, and Bellows Falls, (Vermont;) Oxford, (New-Hampshire;) East Bradford, East Marlborough, and Chester county, (Pennsylvania;) likewise, of a delicate light-blue, variously shaded, in Foster, (Rhode Island.)

The Kyanite has not yet been received as a favourite among the jewellers, (perhaps from not being generally known by them,) or else it would long since have been cut for various ornamental purposes, more particularly in this country, where the localities are so numerous and the colour so beautiful. When well cut, it may be substituted for the Sapphire. I indulge the hope that some jewellers or lapidaries may take a hint from this remark. In France and Spain, it has for some years past been used for rings, brooches, and other jewellery. It is generally ground with emery on a lead wheel, and with pumice-stone polished on a wood plate, receiving the last polish with rotten-stone. The form it receives is en cabochon or table-cut. Usually, the best parts of good uniform coloured specimens are picked out for cutting.

The price of this stone depends upon the hardness, colour, and polish: perfect specimens command a good price. Very fine cut specimens were brought from the East Indies, and sold in France as Sapphires.

XLIV. TURQUOISE.

The name of this mineral is probably derived from the country whence it was generally brought into market, which is Turkey.

In ancient times it was used as a remedy for several diseases, and was also worn as an amulet against disasters. It occurs in reniform masses and in specks; has a conchoidal fracture; is opaque; of a dull and waxy lustre; its colours are blue and green, from sky-blue to apple-green, sometimes yellowish; it scratches Apatite, but not Quartz nor white glass, and is easily attacked by the file; it has a white streak-powder; its specific gravity is 2.86 to 3.0; it is infusible before the blow-pipe alone, but loses its blue colour and becomes yellowish-brown; but it fuses with borax into a limpid glass. Muriatic acid has no effect upon it. It consists of alumina, phosphoric acid, water, oxide of copper, and protoxide of iron.

There are two kinds of Turquoise used in trade, which differ materially in their composition, and are from different localities:—

1. The Turquoise from the old rock, or the true Turquoise, which is generally called the *Oriental Turquoise*, that we receive from Persia, and is of a sky-blue and greenish colour.

2. The Turquoise from the new rock, the *Occidental* or bone and tooth Turquoise, which is either dark-blue, light-blue, or bluish-green; the surface of this mineral is sometimes traversed by veins which are lighter than the ground; it is of organic origin, consisting, probably of coloured teeth of antediluvian animals; it owes its colour, according to Bouillon Lagrange, to two per cent. of phosphate of iron, which is contained in it. It is easily distinguished from the Oriental Turquoise by its structure, internally foliated and striated, which is an indication of a bony composition; it does not take so high a polish, gets discoloured in distilled water, dissolves in acids, and is totally destroyed by aquafortis. Its localities are Siberia, Languedoc in France, and other places.

The true or Oriental Turquoise is found on small gangues of bog-ore and siliceous shiste, in boulders, &c. A mineral by the name of Kalaite, occurring as a coating to siliceous sinter, of Silesia and Saxony, was some years ago discovered. The Turquoise is brought to market by the merchants of Bucharia, ready cut and polished; and in Moscow it is wrought over, being ground on a lead wheel with emery, and polished with rotten-stone or pumice-stone on a tin wheel; and its last and best polish is received from the jewellers, by rubbing with a linen rag and rouge. Since it is often traversed with fissures and cracks in the interior, it requires great caution in grinding. It is mostly cut in the form en cabo-

chon; also, as thick or table-stones, and is used for numerous purposes in jewellery, such as rings, ear-rings, brooches, and also for mounting around the most precious gems.

The price of the Turquoise has, for the last ten years, much decreased; that of an Oriental is generally four times higher than the occidental: one, the size of a pea, is worth about five dollars; a good Turquoise, sky-blue and oval-cut, five lines long and four and a half lines broad, was sold in France for two hundred and forty-one francs; and a light-blue, greenish lustre, and oval cut, five and a half lines long and five broad, was sold for five hundred francs; whereas an occidental Turquoise, four lines long and three and a half broad, brought only one hundred and twenty-one francs. The Turquoise is very well imitated artificially, so much so as to render it difficult to discover the difference between that and the real, by adding to a precipitated solution of copper and spirits of hartshorn, finely-powdered and calcined ivory-black, and leaving the precipitate to itself for about a week, at a moderate heat, and afterwards carefully drying the same, and exposing to a gentle heat. This artificial Turquoise is softer than the real, and cuts with a knife in shavings, whereas the genuine yields a white powder. The real Turquoise displays in the day-time a sky-blue, and at night-time a light and greenish colour; is not attacked by acids, and resists the fire.

In the museum of the Imperial Academy at Moscow is a Turquoise more than three inches in length and one inch in breadth.

A jeweller at Moscow is said to have had in his possession a two-inch long Turquoise, of the form of a heart. This formerly belonged to Nadir Shah, who wore the same as an amulet, for which he asked five thousand rubles.

A short time ago, I beheld one of the largest and most splendid Turquoises at a sale, which was one inch in size, and of a blue colour; it is now in the possession of M. Livingston, Esq.

XLV. NATROLITE.

This mineral has been discovered of late years, and receives its name from the Latin Natron, *soda*, given to it on account of that alkali being contained in it; it occurs reniform, botryoidal, and massive, such as mamillary, and in alternate zones around the centre; it has a splintery fracture; is translucent on the edges; of

a pearly lustre; its colours are white, yellowish-white, or reddish-brown, and they often alternate in different layers; it scarcely scratches glass, but is scratched by Felspar; has a white streak-powder; its specific gravity is 2.16; it fuses before the blow-pipe into a colourless spongy glass; it consists of soda, alumina, silex, and water, sometimes a little oxide of iron. Its localities are Switzerland, Bohemia, Saxony, Scotland, and Nova Scotia. The Natrolite, on account of its susceptibility of a high polish, has been used for rings and other ornaments in jewellery, but has not yet been in much demand, and its value is also very inconsiderable.

XLVI. FLUORSPAR.

This mineral was well known to the ancients, but did not attract particular attention until the sixteenth century, when it was introduced as a flux. As early as 1670 the art of etching on glass by means of Fluorspar was practised at Nuremberg.

Fluorspar occurs mostly in crystals of various forms, the principal of which is the octahedron with its varieties, the cube and the rhomboidal dodecahedron; also, massive and in specks; it has an uneven or splintery fracture; is transparent or transluceut on the edges; possesses simple refraction of light; a vitreous lustre; its colours are purple, red, green, yellow, gray, blue, and white, in all its various shades, from the violet to the rose-red.

It scratches lime, but not glass; yields to the knife; has a white streak-powder; its specific gravity is 3.14 to 3.17; it becomes electric by rubbing; before the blow-pipe it fuses with ebullition into an opaque globule, but with borax, into a transparent glass; when pulverized and treated with heated sulphuric acid, it emits fluoric acid gas, which is employed in etching on glass; phosphoresces when thrown on hot iron; it consists of fluoric acid and lime. From the variety and beauty of its colours, it is known, when cut, in trade, under the various names of false Emerald, false Amethyst, false Ruby, and false Topaz according to the colour it exhibits. It is mostly found in metalliferous veins, and very rarely in the newer formations. Its localities are in Baden, Bohemia, Saxony, St. Gothard, at Derbyshire and Devonshire, in England, and the United States, in the last of which countries it occurs of most beautiful colours in fine crystals; from a late-discovered locality at Russy, in St. Lawrence county, State of New York, I have

specimens of crystals two feet long and five wide. It is found in Illinois, seventeen miles from Shawneetown; Blueridge, Maryland; Smith county, Tennessee; at Franklin Furnace, and Hamburgh, New-Jersey; Saratoga Springs, and at Alexandria, New-York; Middletown and Huntington, Connecticut; Thetford and Southhampton lead mines, Massachusetts, and on the White Mountains, New-Hampshire.

Fluorspar is cut for ring-stones and shirt-buttons, and particularly in such forms as are intended to be substituted for other gems; in Derbyshire there have been large mills for grinding, cutting, and polishing the Fluorspar into vases, cups, obelisks, plates, candlesticks, &c., ever since 1765, and there are now more manufactories, principally at Derby. That Fluorspar, which may be called the nodular variety, and the colours of which run in bands or zones, and which is known by the technical name of Derbyshire-spar or Blue John, is used for various ornaments, to be met with all over the world, in parlors or mineral collections. In order to heighten the various colours in the ornamental specimens, before they are polished, they are heated to a certain degree, when the dark spots, or tints, disappear, and the coloured bands become more distinct.

Fluorspar is often intermixed with lead ore, called Galena, which produces, when polished, a beautiful appearance. Ornaments of Fluorspar still command a high price, which, however, depends a good deal on the perfect qualities of the various specimens, their colour, size, &c.

A translucent variety of Fluorspar, called Chlorophane, found in Cornwall, England, in Siberia, and principally in the United States, at New Stratford, Connecticut, is of beautiful variegated colours, but principally blue, violet, and green; it is chiefly interesting on account of its phosphoresence; when put on hot iron in a dark room, it emits a most beautiful emerald green light. One of the first localities of Chlorophane discovered in this country, was at Seekonk, Massachusetts, near the summer residence of the Hon. Tristam Burges, about one and a half miles from Providence. It is massive, opaque, and of a deep purple colour. It phosphoresces readily on being projected upon a moderately heated shovel, when it loses its colour and becomes white. It also occurs of a crystalline structure in Wrentham, Massachusetts, near the Cumberland and Rhode Island line in the vicinity of Diamond Hill. A beautiful

vase of Derbyshire-spar may be seen in the collection of the New-York Lyceum of Natural History, as also crystalline groups.

XLVII. MALACHITE.

The name of this mineral is from the Greek, alluding to its colour; it was well known to the ancients; Theophrastus called it the Pseudo Emerald; it was worn by many as an amulet.

It occurs tuberose, globular, reniform, mamillary, and stalactiform; also, in fibres; it has an uneven conchoidal, and splintery fracture; it is opaque; of a dull and shining lustre; and has an Emerald or verdigris-green colour, alternating sometimes in stripes of different shades of green. It scratches lime, but not glass; its streak powder is of lighter colour than the mineral; its specific gravity is 3.67; before the blow-pipe, it decrepitates and turns black; with borax, it is reduced to a metallic grain; it effervesces with nitric acid; is dissolved, and forms a blue colour with ammonia; and it consists of oxide of copper, carbonic acid and water.

The Malachite is found in various rocks, primitive as well as secondary, on gangues and strata. The finest specimens are obtained in Siberia, Tyrol, France, Hungary, Norway, Sweden, England, Bohemia, and the United States, at a great number of localities, but either in small specimens, or as a coating of other copper ores, which will ever render it useless for ornamental purposes. The principal localities in this country are in New-Jersey, Connecticut, and at the various copper-mines; it is also found in the Island of Cuba, from which place I have seen some good compact specimens.

Some very fine specimens of compact Malachite from Siberia, were presented to the New-York Lyceum of Natural History, by Charles Cramer, Esq., of St. Petersburg. I have also seen some excellent specimens of Malachite in the collection of Dr. Martin Gay, at Boston.

The Malachite, when cut, takes a high polish, which well adapts it for various ornaments, such as rings, pins, ear-rings, &c. Likewise snuff-boxes, candlesticks, mosaics, &c. are made from it. In general the specimens are assorted, and the best pieces cut on a leaden wheel with emery, and polished with rotten-stone on a tin plate. Very large specimens are used for table plates and vases.

The value of the Malachite is not high, being very abundant;

yet much depends upon the size of the various specimens. At St. Petersburg, a very large slab, said to be in the collection formerly belonging to Dr. Guthrie, thirty-two inches long and seventeen inches broad, and two inches thick, was valued at twenty thousand francs. Many rooms in several European palaces are laid out with Malachite; and the Mineralogical Museum, at Jena, possesses the largest collection of Malachite I have ever seen, which was presented by the Grand Duchess of Saxe Weimar, a Russian princess.

An apartment in the Grand Trianon, at Versailles, is furnished with pier and centre-tables, mantel-pieces, ewers and basins, and enormous ornamental vases of Malachite, the gift of the Emperor Alexander to Napoleon.

XLVIII. SATIN SPAR.

This mineral occurs stalactiform, globular, reniform and massive; it is of a fibrous texture, (that is, of fine delicate fibres closely adhering together), a pearly lustre, and is translucent on the edges: the colours are, snow-white, yellowish-white, or pale-red, coloured by metallic oxides. It scratches gypsum, but not glass; has a specific gravity of 2.70; becomes electric by rubbing; before the blow-pipe it is infusible, and changes into quicklime, but borax reduces it to a clear glass. It effervesces and dissolves with nitric acid; and consists of lime and carbonic acid. Satin Spar is called by mineralogists fibrous limestone, and is found in the coal formations, and in the cavites of several limestones. The finest specimens are found in Cumberland and Derbyshire, England; in Hungary, and in the United States, near Baltimore, in Pennsylvania, also at Westfield and Newburyport, Massachusetts, where spendid specimens five inches long are obtained, according to Professor Hitchcock. It takes a fine polish, and is distinguished by its extraordinary fine satin lustre, and is therefore used for various articles in jewellery, such as ear-rings, necklaces, beads, and also for inlaid work; large specimens are used for snuff-boxes.

Satin Spar beads have been a great favourite as necklaces and ear-rings, and were sold a few years ago in England at very high prices. In modern times, the satin beads or pearls have been imitated to a great extent in France and Germany, in white and

deep-yellow colours: glass beads, of a bluish-white tinge, and hollow, are made to imitate the reflection of the Satin Spar, by means of the scales of a small river fish called the bleak, that are suspended in dissolved isinglass, and dropped into the bulbs, which are then turned in all directions in order to spread the solution equally over their interior surface; in this way the glass bulbs assume the natural colour and brilliancy of the Satin Spar; they are harder, however, and it is easy to detect them on that account.

Fine specimens may be seen at the New-York Lyceum of Natural History, also, in the collection of Dr. Gay, of Boston.

The Satin Gypsum, which bears the greatest resemblance to the Satin Spar, and only differs in its chemical constituents, (having sulphuric acid, instead of carbonic, as a component part,) is much used for the same kind of ornamental purposes, and is more abundant over the world. I have seen very splendid specimens at South Boston, in the beautiful collection of minerals belonging to Francis Alger, Esq., who brought them from Nova Scotia, and who (as also Dr. C. S. Jackson,) has given so valuable a description of all the mineral treasures of that Province.

The Satin Gypsum is, however, much softer than the Satin Spar, and is much easier scratched; for which reasons it is not so generally employed.

XLIX. ALABASTER.

This mineral is a compact Gypsum, and occurs massive, with a compact fracture; it is translucent; has a glimmering lustre, and its colours are white, reddish, or yellowish.

The purest kinds of this mineral are used in Italy for vases, cups candle-sticks, and other ornaments. It is found at Castelino, in Tuscany, thirty-five miles from Leghorn, at two hundred feet below the surface of the earth.

The yellow variety is called by the Italians, Alabastro Agatato, and is found at Sienna; another variety of a bluish colour, is obtained at Guercieto, and is remarkably beautiful, being marked with variegated shades of purple, blue, and red. The above Alabasters are carbonates of lime.

The principal manufactory of Alabaster ornaments is at Valterra, thirty-six miles from Leghorn, where about five thousand persons live by this kind of labour. In making, they require great

care, and must be preserved from dust, as the Alabaster is difficult to clean. Talcum, commonly called French Chalk, will remove dirt, but the best mode of restoring the colour, is to bleach the Alabaster on a grass-plat. Gum water is the only cement for uniting broken parts.

Plaster of Paris is likewise a compact Gypsum, but contains a small portion of carbonic acid, which makes it effervesce when treated with acids. It was formerly only exported from Montmartre, near Paris, hence its name; it is much used in ornamenting rooms in stucco, in taking impressions of medals, in casting statues, busts, vases, time-piece stands, candelabras, obelisks, and for many other purposes.

The common Plaster of Paris is ground after being calcined; and in this condition it has the property of forming a pliable mass with water, which soon hardens, and assumes the consistency of stone.

L. AMBER.

This gem was known to the inhabitants of remote ages; the Phenecians sailed to the Baltic, (the Glessany islands,) for the sole purpose of obtaining Amber, which they wrought into chains and other ornaments, that were sold to the Greeks, who called the same Electrum. In the Trojan war, as Homer reports, the women wore necklaces of Amber. Its electric properties were likewise known, for Thales was so much surprised at that phenomenon, that he attributed it to a soul in the Amber; and Pliny says that Amber is revived by heat, the nature of electricity not being understood. It was also worn as an amulet, and used for medicine. The ancients could not agree as to its origin; Philemon, according to Pliny, classed it as a fossil; Tacitus, however, judging from the insects held in it, concluded it must be a vegetable juice, whence its name in Latin, succinum, or juice. Many naturalists have, until lately, considered Amber as a mineral; but it has been satisfactorily proved by Schweigger and Brewster, from its chemical characters, and polarising light, to be a gum-resin, and that it is the juice of a tree, called the Amber-tree, now extinct.

Amber occurs in nodules or roundish masses, from the size of grains to that of a man's head; and sometimes in specks; it has a conchoidal fracture; is transparent and translucent; possesses a

single refraction of light; a resinous lustre in a high degree: its colours are wine and wax-yellow, greenish or yellowish white, or reddish-brown; sometimes the colours vary in layers. It scratches gypsum, but is attacked by carbonate of lime; its streak-powder is yellowish-white; it has a specific gravity of 1.08 to 1.10; it becomes electric by rubbing. Before the blow-pipe it burns with a yellowish and bluish-green flame, emitting at the same time a dense and agreeable smoke, and leaving a carbonaceus residuum; heated oil softens and makes it pliable; it does not melt as easily as other resins, requiring 517° Farenheit; it yields by dry distillation an acid which is called succinic acid, also an essential oil, known by the name of oil of amber, and in the retort remains a brown mass, called the resin of amber, which is used in the arts as amber-varnish; any essential oil, or spirits of turpentine may be used for procuring the resin; fat oils dissolve the Amber perfectly; its elementary constituents are carbon, hydrogen, and oxygen, with some lime, alumina, and silex.

Amber is found either thrown up by the sea, or in the small rivers near it; sometimes in alluvial deposits of sand or gravel in the vicinity of the sea or in bituminous formations, such as lignite, bituminous wood, or jet, where crystallized minerals are at the same time found, such as iron pyrites, &c.

Its geological distribution is in the green sand formation, or according to De la Beche, the stratified rocks, between the third and fourth large group. It is found all over the world, but the principal localities are the shores of the Baltic, in Prussia, from Memel to Dantzic, where it is collected by the inhabitants in various modes. One of the largest specimens ever met with on the Baltic was found in 1811, measuring fourteen inches in length by nine inches in breadth, and weighing twenty one pounds.

I had in my own collection, in the year 1831, a splendid wax-yellow Amber, from the Baltic, which measured about sixty cubic inches, and weighed nearly two pounds. It is also found on the Danish coast, and in Greenland, Sicily, Monrovia, Poland, France, and the West Indies. A sailor is said to have found a remarkable specimen, eighteen inches in length, in a singular manner; the discoverer accidentally seated himself on it, when he became so attracted to the Amber, excited by his natural heat, that it was with some difficulty he could detach himself from it.

In the United States we find Amber at Cape Sable, in Maryland, in a bed of lignite, in masses of four and five inches diameter; also, near Trenton, and at Camden, New-Jersey, where a transparent specimen, several inches in diameter, was found. According to Professor Hitchcock, it is found at Martha's Vineyard, Gay-head, and at Nantucket. At the latter place, a light coloured specimen was found, of three or four inches diameter, which is in the collection of T. A. Green, Esq., of New-Bedford.

The production of Amber depends upon the position of the respective localities; whether it is found among sand and gravel, in mines called Amber mines, or in the sea, on the shore, or in smaller rivers near the sea coast; and the modes of collecting are three-fold:

1. The Amber mines, which are numerous in Prussia, are wrought like other mines, and explored to a depth of more than one hundred feet. Shafts are constructed for raising the product from the interior of the mines; the miners dig until they reach the Amber vein, which is generally found after passing a stratum of sand and a bed of clay of twenty feet thickness, and another stratum of decomposing trees or lignite, which may be fifty feet through; they come then to the pits, which the characteristic colour of the soil is the best indication to search for.

2. The second mode of collecting Amber, is practiced generally after a storm, by the fishermen, who either wade into the water, provided with leather dresses, to their necks, or use small boats, and find at the depth of three fathoms the floating Amber.

3. It is mostly, however, collected in large quantities on the shore, after having been thrown up by severe storms.

The Amber fishermen are, by practice, pretty well skilled in finding out the spots where the largest quantities may be obtained.

Amber from the mines does not essentially differ from that of the sea, excepting that the former is rather more brittle, and is often covered with an earthy crust.

The Amber is assorted before it comes into the hands of the lapidary or merchant, and according to size and clearness of colour, it receives different technical names; thus there are—

1. The *exquisite* specimens, which are perfectly pure, transparent and compact, weighing from five to six ounces or more; these are employed in larger ornaments and specimens of the arts, and fetch the highest price.

2. The *ton* stones, which weigh from a quarter of an ounce to four ounces; the largest or purest pieces of which are used for jewellery, and the impure for incense or medicine.

3. The *nodules* are still smaller.

4. The *varnish* stones are still smaller than the former, but are very pure and hard, so as to be easily pulverized, and are used for varnishes, sealing-wax, &c.

5. The *sandstones* are very small, opaque, and perforated pieces.

6. The *lumps* are large but impure specimens, unfit for a lapidary's use; they are sold as specimens, or employed as incense or for the manufacture of succinic acid.

7. *Refuse* are those pieces which fall off at the lapidary's bench.

The pure Amber receives from the lapidary distinct names, according to the shades of colour it possesses, such as egg, pale and light-yellow, and so into its brownish shades. The assorted Amber is treated according to the various purposes it is intended for, and receives its requisite form by cleaving with an appropriate instrument, by which, also, the external crust is removed. It is generally believed that the worse the crust is in appearance, the more beautiful is the interior of the Amber.

Amber, taking a very high polish, is employed for a great many purposes of jewellery, and for various ornaments, such as beads, necklaces, bracelets, ear-rings, buttons, rosaries, mouth-pieces for pipes, cane-heads, snuff-boxes, work-boxes, &c. It is generally wrought on the turner's lathe, by steel instruments, and is easily bored; it is polished on a leaden wheel, with pumice-stone, then with linen or a hat-body and rotten-stone, and lastly by rubbing it with the hand. Common specimens are polished with a linen rag, chalk and water. Beads of Amber must be drilled before receiving the facets. In cutting and working Amber, care must be taken not to overheat it by friction, as it will then be liable to crack. Amber has occasionally been cut into cameos, busts, images, &c.

Impure Amber pieces may be much improved by wrapping them in paper and allowing them to digest for forty hours in hot ashes, in a pot filled with sand; or by boiling them with gradually increased heat in linseed oil. Amber may also be coloured red, blue and violet, and dissolved in absolute alcohol; it may be cast into different ornaments. Broken Amber may be mended by a cement of

linseed oil, gum mastic, and litharge; or by moistening the ends of both pieces with potash, warming the same, and pressing the parts together.

The price of Amber was in former times much higher than at present, but size, colour and transparency always govern the same. A pure exquisite specimen of one pound is sold for forty dollars; but most good specimens are sent to Armenia, the East, and Turkey, to which places manufactured Amber goods to the amount of fifty to sixty thousand dollars are annually exported from one manufactory at Stolpe, in East Prussia.

Amber is often adulterated in various ways, and more especially with gum copal, which is palmed upon the ignorant for Amber, and which does actually resemble it in many respects: for both are of the same colour; both become negatively electric by friction; both have nearly the same specific gravity; and both give a pleasant odour in burning; hence when wrought as jewellery or ornaments, it is not easy to distinguish the one from the other. One mode of detection was pointed out by the Abbé Haüy: "If," says he, "a fragment of Amber be attached to the point of a knife, and inflamed, it will burn with some noise, and a kind of ebullition, but without liquifying so as to flow: and if it should fall on any flat surface it rebounds a little; whereas the copal, under similar circumstances, melts and falls in drops, which become flattened." My own experience has taught me the following distinguishing characteristics: first, the electro-metre, a small instrument composed of a brass needle, suspended on a pin, is the most essential distinguishing guide; for Amber, on being rubbed, will excite the instrument about ten degrees more than copal; secondly, Amber on being brought before the fire, requires pretty high temperature for melting it, and exhibits no kind of ebullition; whereas copal easily liquifies, burns with much smoke, and decrepitates more than Amber.

Amber is likewise adulterated by gum Arabic, gum thus, shellac, and glass pastes. The last can easily be distinguished by their hardness, and the others by their solubility in hot water.

Amber very frequently has inclosed within it insects, such as flies, beetles, &c. in a state of complete preservation. Such specimens are much sought for, and command a very high price; and on that account the adulterations are mostly practised, and in the following manner: either by boring a hole in the Amber and

introducing the beetle and filling it up with pulverized gum mastic, and then letting it melt over a charcoal fire; or by melting the Amber, throwing in the insects and letting it cool. The former adulteration may easily be detected, since the mastic will never be able to combine closely with the Amber, and shows more or less cracks and fissures; but the latter is scarcely to be detected, without a scientific investigation of the inclosed insects, which in the natural specimens do not exist in the present world, being called antediluvian, or extinct species of animals.

The most extraordinary collection of specimens of Amber may be seen in the cabinet at Dantzic. A specimen of Amber of fifteen pounds weight is preserved in the cabinet at Berlin. The inhabitants of Colberg, in 1576, presented to the Emperor Rudolph II. a specimen weighing eleven pounds.

LI. JET.

This mineral occurs massive; has a conchoidal fracture; is opaque; has a shining lustre; and is of a jet, velvet, or pitch black colour. It is pretty soft, and yields to the knife; has a specific gravity of 1.29 to 1.35; it burns with a greenish flame, and emits a strong bituminous smell. In trade it is also called Black Amber or Pitch Coal. It is found in the brown coal formation, of the plastic clay, and the lias, with lignite and amber, in England, France, Silesia, Hessia, Italy, Spain and Prussia.

Jet bears a high polish, and is wrought into necklaces, ear-rings, crosses, rosaries, snuff-boxes, buttons, bracelets, and particularly mourning jewellery. It is at first generally assorted to select the best pieces, most suitable for working; such as are free from iron pyrites, lignite, and have no cracks nor fissures. It is then turned on a lathe and likewise on horizontal sand stone wheels, which run unequally on their perüphery, by which the various specimens may be cut and polished at the same time. During the operation the Jet must be moistened with water, else it may crack from being overheated. It is polished with rotten-stone or crocus martis and oil, on linen, or buckskin; and lastly by the palm of the hand.

The manufacturing of Jet ornaments was formerly a considerable branch of industry in France, where, in 1786, the department de l'Aube occupied 1200 workmen; but at the present time it is no more worn, and the black enamel is substituted for it.

LII. CANNEL AND ANTHRACITE COAL.

Both the above species of coal are employed, like the Jet, for ornaments; the former is manufactured in England into various ornaments, and the latter in the United States. At a late fair of the American Institute, at New-York, large candlesticks and various ornaments, made of anthracite, were exhibited, from a manufactory at Philadelphia; they were beautiful specimens.

LIII. LAVA.

This mineral is a compound of several minerals, and is a volcanic production. It occurs massive, with vesicular or porus marks; has a splintery and conchoidal fracture; a lustre dull or glistening; is opaque, and of gray, brown, red, yellow, black, green and white colours, of all their shades. It often contains crystals of Felspar, Leucite, Hornblende, &c. In the arts for ornamental purposes the compact varieties, only, are cut and polished. In Naples, jewellery and ornaments in great quantities are manufactured and exported; such as pins, ear-rings, intaglios, snuff-boxes, vases, candelabras, &c. The different Lavas are cut with sand and emery, and polished with pumice-stone. Lava is found in all volcanic countries, and particularly at Ætna, Vesuvius, Hecla, in Mexico, the Lapari Islands, &c. Lava is often used as the base for Mosaic works. The blue Lava of Mount Vesuvius has the appearance of artificial blue enamel, and is in much demand for jewellery and ornaments. I have inspected fine specimens of polished slabs at the rooms of the Boston Society of Natural History.

LIV. JADE.

This mineral is called in Mineoralogical works Nephrite, Hatchet-Stone, Punamu. It occurs massive; has a splintery fracture; a greasy lustre when polished; it is translucent; scratches glass, and is attacked by Felspar; it is of mountain-grass and sea-green colours; is fusible into a greenish glass; it consists of silex, lime, alumina, magnesia, and iron. It was originally found in China; it occurs in Egypt, on the Amazon river, in an island in New-Zealand, called Pavia Punamu, and in the United States, (Smithfield, R. I. and Newbury, Mass.)

It is used for snuff-boxes, cups, &c; and in Turkey they use it for handles to sabres, daggers, and hatchets. Deities formed of it

have frequently been excavated from ancient ruins. Such I saw a few years ago in a collection of Indian curiosities brought from Mexico.

LV. SERPENTINE.

This mineral derives its name from its variegated colour, which resembles the skin of a serpent. It is generally divided into two varieties, the Common or Opaque Serpentine, and the Precious, Noble or translucent Serpentine.

Serpentine occurs massive; the common is occasionally crystallized in rhomboidal crystals, in Norway, New-Jersey, and Pennsylvania; it has a splintery, uneven and conchoidal fracture; is unctuous to the touch; yields to the knife; its colours are green in all its shades, but also reddish and grayish; it has a specific gravity of 2.5; is infusible before the blow-pipe, but with borax dissolves into a transparent glass. It does not belong to the stratified rocks, but to the ophiolithes of Brogniart, and is mostly associated with granite, gneiss, micaceous, chlorite, argillaceous shistes and limestone; and therefore belongs to the primitime formation.

Serpentine, for richness and variety of colours, exceeds all other rocks; and it abounds all over the globe, in large consolidated masses. Its localities are too numerous to be specified. In the Alps, we find the Serpentine nine thousand feet high; in France, the mountains of Limousin; in Spain, Norway, Sweden, Scotland, the Shetland Isles, England, Italy, Bohemia, Saxony, Bavaria, and Switzerland; in the United States we find it all along the Alantic coast, where the primary rocks are found, as at Hoboken, (New-Jersey,) opposite to New-York city, Warwick, (New-Jersey,) as far as Maryland, at Bare Hills, through Pennsylvania, Rhode Island, Connecticut, Massachusetts, Vermont, &c. The Serpentine beds of Massacusetts are inexhaustible. In Middlefield, Massachusetts, the bed is one quarter of a mile in breadth and six miles in length, which alone would be sufficient to supply the whole world with a valuable material for ornamental and architectural purposes. There are beds at Westfield, Blanford, Pelham, Zoar, Windsor, Marlborough, Cavendish, and other towns in Vermont. Most beautiful specimens are found in Newbury, near Newburyport; and latterly a new locality was discovered by Dr. Jackson, in Lynnfield, Mass.

Serpentine incloses the chromate of iron in the Shetland islands, Maryland, &c.; and is on that account of the highest importance to the artist.

It is easily wrought on lathes into various articles; such as snuff-boxes, vases, ink-stands, &c; In a small place at Zoblitz, in Saxony, several hundred persons are constantly employed in the manufacture of boxes, trinkets, and chimney-pieces. The locality at Grenada, in Spain, has supplied many churches and palaces of Madrid with large columns, and other ornaments. It is really surprising that the inhabitants of those districts where the Precious Serpentine is found, have not yet employed it as an article of trade, as the quality of the American Serpentine is, if not superior to the English and Spanish, certainly not inferior to any hitherto found: and I trust that the day is not far distant when our parlours will be embellished with mantle-pieces, tables, and mantle ornaments, made of it. Candlesticks, mugs, pitchers, knife-handles, firearm-stands, jamb-hooks, and many other domestic articles, instead of silver-plated, steel, and cast-iron ware, might be formed of it and used.

Serpentine is often associated with a number of other minerals, thus: *a*, Serpentine with Talc; *b*, Serpentine with Diallage or Schiller-spar; *c*, Serpentine with Amianthus; *d*, Serpentine with Asbestos; *e*, Serpentine with Garnets; *f*, Serpentine with Actinolite, &c. That variety which contains the Amianthus in a layer, is sometimes exceedingly beautiful; and when polished has the appearance of Satin-spar.

LVI. MARBLE.

This is the name of a very extensive family; and although in the form of limestone it is used as a building material, it would not receive a place in these pages, but that a number of species or varieties are, for their beauty, structure and rarity, used in jewellery as ornaments. I will, therefore, out of the large class embracing Marble, limestone, and calcareous Spar, enumerate those varieties which legitimately belong to our subject.

LVII. STALACTITE AND STALAGMITE.

It occurs in large tuberous, undulated masses, botryoidal, mammillary or concretional, either in icicles or circles; has a fibrous

fracture; is translucent; of a pearly lustre; colour generally yellowish-white and white; its composition is calcareous spar; it originates in caverns, through which water, holding this in solution, filters, and on its ultimate evaporation leaves the carbonate of lime in various forms, which sometimes resemble altars, pillars, animals, &c.

Those pillars or icicles which are pendant from the roof, and those rising from the base, are sometimes divided into Stalactite for the former, and Stalagmite for the latter. But the cause of their existence is the same, and there ought not to be any distinction in their name.

Ornaments of Stalactite in the shape of vases, &c. are often seen in fancy stores. The greatest localities of this mineral are, the Grotto of Antiparos, and Bauman's Cave, in the Hartz, which I visited in 1827, and which displays gigantic Stalactites; also at Derbyshire. In the United States, are very celebrated caves, which yield this article.

These have lately been described by my friend Charles Cramer, Esq. Russian Vice Consul at New York, an enthusiastic and useful mineralogist, of St. Petersburg, in a pamphlet published by the Imperial Mineralogical Society of St. Petersburg, in the German language; and as this interesting little work is not accessible to all, I will here translate the list of all the caves enumerated by him as North American. We would observe that these are not all situated in limestone regions, neither do they all furnish Stalactites.

Canada—Grotto in the Niagara,
A cave in Lanark, Upper Canada,
A smaller cave at the same place.
New Hampshire—The Devil's Cave.
Vermont—The caves in Bennington,
" " Dorset.
Massachusetts—The Natural bridge and cave at Nahant,
" " over the Hudson brook,
The cave near Sunderland,
" in Berkshire,
Two caves near New Marlborough,
The cave near West Stockbridge,
" in Lanesboro',

The cave in Adams,
The Purgatories, near Sutton.
Connecticut—The West Rock cave, New Haven.
Rhode Island—The Purgatory, near Newport,
The Spouting cave, near ditto.
New York—Cave near Watertown,
" at the Niagara,
Ball's Cave,
Knox's Cave,
The Monito, at Wigwam, or Devil's Abode,
Esopus Cave.
Pennsylvania—The Devil's Hole, in Bucks county,
The cave on the Swatera river.
Maryland—Hughes' Cave,
The cave at Harwell.
Virginia—Weyer's Cave,
Wreast's Cave,
Madison's Cave,
Zane's Cave,
Blowing Cave, near the Panther Dale,
Greenbriar's Cave,
Cave on the Kanhawa River,
Chapin's Cave,
Johnson's Cave,
Allen's Cave,
Ruffner's Cave,
Roger's Cave,
Reid's Cave,
Natural Tunnel in Scott County,
Natural Bridge in Rockbridge County.
Ohio—Mason's Cave,
Nature's Building, or Cave in the Rock.
Indiana—Epsom Salt Cave,
Cave near Corydon.
Kentucky—Boone's Cave,
Russel's Cave,
White Cave,
Mammoth's Cave,
Cave on the Crooked Creek.

Tennesee—Big-bone Cave,
Arched Cave.
South Carolina—Great Flat Rock Cave,
Lover's Leap.
Georgia—Nicojack Cave.
Missouri—Ashley's Cave.
Mississippi—The Abode of the Great Spirit on the North West Coast,
Cave on the Copper River.
Mexico—The Dantoe Cave,
Chamacasapa Cave,
San Fillipe Cave.
Cuba—The Cave near Matanzas.
Hayti—The Cave near St. Domingo.
Peru—The Cave in the Andes.
New Andalusia—The Canipe Cave.

Mr. Cramer mentions the size of the Stalagmites in the ante-chamber of Weyer's Cave, as being twelve feet high; those in Solomon's Temple, of the same, twenty-five feet high, which are nearly transparent; and its Hermit Chandelier, four feet high, and twelve feet in circumference; the colossal Stalagmite in Washington Hall, which is said to represent the father of his country wrapped in his cloak; Pompey's column, thirty feet high; also Babylon's Tower, thirty feet in circumference.

LVIII. EGYPTIAN MARBLE.

This is generally milk-white, or grayish-white and bluish, and also black and red, which is called the Rosso Antico; it is of a close granular structure, and was a great favourite with the ancient architects.

LIX. ITALIAN MARBLES.

With these may be counted the Parian marble; the Pentelian marble; the Venitian or Lombardy marble, which is quite translucent; the Luni and Carara marble; and the Laconian marble, or Verde Antico. They have all yielded materials for the most ancient Greek and Italian sculptors. The Venus de Medici, the Diana hunting, and Venus leaving the bath, are of Parian marble: a Bacchus in repose, a Jason, a Paris, and many Grecian monu-

ments, are from the Pentalian marble, which comes from the vicinity of Athens.

LX. AMERICAN MARBLE.

The varieties of marble, which substance is inexhaustible in the United States, are very numerous; and I am proud to assert, that for architectural and ornamental purposes, they will successfully compete with those of any foreign country. The colours are various, from the snow-white to the black with gold and grass-green veins. A small district in New England, of about fifty miles in extent, concentrates, I may say, the marbles which may be collected in Europe through a space of two thousand square miles; for we find in the county of Berkshire, and that of New Haven, the representatives of marbles from Italy and Ireland; and the discoveries which are constantly making of additional marble localities are a source of great satisfaction. Thirty years ago, the City Hall, of New York city, was built of marble from West Stockbridge, Massachusetts, which was transported at great expense, a distance of over four hundred miles; whereas, afterwards, the same quality of marble was discovered on New York island, but a few miles distant. According to Professor Dewey, the county of Berkshire alone turned out forty thousand dollars worth of marble several years ago. I will here enumerate a few of the most interesting marbles, such as—

a, The Philadelphia marble, which is snow or grayish white, and sometimes variegated with blue veins, which takes a very high polish.

b, The Potomac marble, which is properly called a breccia, being composed of rounded and angular fragments from the size of a pea to that of an ostrich's egg. Its colours are red, white, gray, and blackish-brown, intermixed; it takes a very fine polish, and forms a most beautiful ornamental stone. It comes from the banks of the Potomac, in Maryland. As specimens of this, we would refer to the columns in the House of Representatives at Washington, which are twenty feet high, and two feet in diameter.

c, The Verde Antico, of New Haven, Connecticut. This marble is intermixed with serpentine veins, and makes a most beautiful appearance. There are inexhaustible quarries of it at New Haven and Milford; it bids fair to rival every other ornamental stone in

the world. Four chimney-pieces of this mineral were purchased for the Capitol at Washington; and I lately examined a splendid centre table, wholly cut from this marble, that was exhibited at the tenth annual fair of the American Institute. It is to be hoped that some company may undertake to introduce this marble more extensively into notice, for it does not yet appear to be sufficiently known among our wealthy citizens, and the enterprise would be well rewarded. Large slabs may be seen at the New York Lyceum of Natural History, and in the cabinet of Yale College, New-Haven; I possess a very fine, large slab, polished. Portsmouth, Vt. likewise furnishes splendid Verde Antico, specimens of which may be seen at the American Institute, in New York.

d, Berkshire county, in Massachusetts, may justly be called the marble pillar of the United States; and, as Professor Hitchcock remarks, the inhabitants of that county cannot but regard their inexhaustible deposits of marble as a rich treasure to themselves, and an invaluable legacy to their posterity. The towns, West Stockbridge, Lanesborough, New Ashford, Sheffield, New Marlborough, and Adams, in that county, keep thousands of hands constantly working in their quarries. In 1827, two thousand seven hundred tons of marble were exported from that town; and in 1828, a block of from fifty to sixty feet square, and eight thick, was raised by one charge of gunpowder.

e, White, fine, granular marble, bearing the closest resemblance to the celebrated Carara marble, is obtained from Smithfield, R. I. and Stoneham, Massachusetts.

LXI. SHELL MARBLE.

This mineral is a secondary marble, and is called also conchitic marble, on account of its containing petrified shells, which, when polished, communicate to their matrix, the marble, a most beautifully variegated appearance.

a, The Lumachelle marble is a kind which is very scarce; it has a gray or brown ground, interspersed with shells of a circular form and golden colour, and when held towards the reflection of light, displays red, blue and green tints, like those of the precious Opal or iridescent Labrador.

It is sometimes seen in the form of pins and other jewellery; but stands, on account of its scarcity, very high in price; the only

locality is in Corinthia; one formerly in Devonshire, England, being exhausted. Some splendid specimens from Corinthia, are in the collection of the Baron de Lederer, Austrian consul of this city; and a very fine specimen of the Lumachelle, at the Boston Society of Natural History, was marked with the locality of Neufchatel.

b, The Panno di Morto, or funeral pall, is a deep black marble, with white shells, like snails, which is only seen at Rome, and is very scarce.

c, The Bristol marble, from England, is a black marble, interspersed with white shells.

d, The Italian shell marbles from Florence, Lucca, and Pisa, are red, containing white shells (ammonites).

e, The French shell marbles are very numerous; those from Narbonne are black with white belemnites; that from Caen is a brown marble with madreporites; and those from Languedoc are of a fiery red colour, mixed with white and gray univalve shells; of this Napoleon's eight columns for his triumphal arch in the Carousel, at Paris, were cut.

f, The United States have a good many shell marble quarries; but they are all black and gray. Those of Trenton Falls, and Little Falls near Seneca lake, Northumberland co. Pennsylvania, Bernardston, Mass., and Hudson, N. Y., contain either trilobites or encrinites; some take a very fine polish.

LXII. PISOLITE AND OOLITE.

These minerals are likewise composed of carbonate of lime; they occur massive, and in distinct concretional layers, either in the form of peas or other round grains or pebbles, and are of a white, yellowish-white, brownish or reddish colour; when cut and polished, they make a fine ornamental stone, and present a very effective appearance. The former is found in alluvial deposites of the hot water mineral springs of Carlsbad, in Bohemia, and the baths of St. Philip, in Tuscany; the latter forms large beds in England and France. The city of Bath, in England, is mostly built of this limestone.

LXIII. THE ROCK OF GIBRALTAR.

This is likewise a carbonate of lime; occurs massive, mostly striped; is yellowish-white, yellow, and brownish; is only found

in that rock fromw hence it takes its name, and has been heretofore a great favourite for jewellery and other ornaments. At this day we see in the shops and private houses, pins, brooches, ear-rings, seals, cane-handles, snuff-boxes, letter-holders, vases, urns, candleabras, obelisks, &c., formed of it. It takes a high polish.

LXIV. APATITE.

This mineral has its name from its colour, meaning deceptive, as it resembles the colour of some more precious gems; it occurs in six-sided prisms, has a conchoidal fracture, a vitreous lustre, is translucent, and yields to the knife; its colours are white, yellowish-white, greenish-yellow, blue, bluish-green, grass-green and reddish. It resembles the beryl and emerald, but is distinguishable by colour and hardness; it is found in primitive rocks; its localities are met with all over the world, but most abundantly in the United States. Specimens of three or four inch crystals from Etonville, N. Y., have a spendid appearance, and if cut and polished, would make fine pins, ear-rings, and other ornaments and jewellery.

LXV. LEPIDOLITE.

This mineral derives its name from the Greek language, from its scaly structure; it occurs massive, presenting an aggregate of minute shining, flexible scales or hexagonal plates; it has a splintery fracture; a glistening and pearly lustre; is translucent on the edges; its colours are lilac and rose-red, and pearl-gray, greenish-yellow-and blue; it is scratched by glass, and yields to the knife; has a specific gravity of 2.81; is fusible with ease into a transparent globule. It is found in granite and primitive lime, in Monrovia, France, Island of Elba, Corsica, Sweden, and in the United States, in Maine, New-Hampshire, Vermont and Massachusetts. It is cut in Europe for various ornaments, such as plates, vases, snuff-boxes, &c., and will, I trust, at some future day, be more extensively used in jewellery; for there are some variegated specimens of a peach-blossom colour, and very fine granular structure, which are extremely beautiful.

LXVI. MICA.

This mineral occurs crystallized, in six-sided tables and oblique rhombic prisms, and massive; also, disseminated; it has a perfectly

foliated structure; a glittering and metallic lustre; is transparent and translucent; very fusible and elastic: its colours are, white, green, black, brown, peach-red, yellowish and bluish; it has a specific gravity of 2.7. It is found in primitive rocks, and forms an ingredient in granite, gneiss, mica slate, and other rocks, where it more or less predominates; its localities are, therefore, universal, but in Siberia it forms large beds, and is quarried for special purposes, such as a subtitute for glass windows; and although the United States afford ample localities of the same, yet a few years ago quantities were imported here for the doors of Nott's stoves.

The *Plumose Mica* is a beautiful variety, and derives its name from its resemblance to a quill or plume, the lamellar or fine delicate crystals diverging in such a manner as to present this appearance. It is of a pearl-gray colour. It is found in the United States, at Williamsbury, Mass., Hartford, Conn., and many other places. The *green Mica* is of a beautiful grass-green colour, and is found in Brunswick, Maine. The *rose-red* Mica is a very beautiful mineral, and is found in numerous places, in this country; principally at Goshen, Chesterfield, Mass.; Acworth, N. H.; Bellows Falls, Vt., &c. The Mica may, when of good colours, be used for jewellery and other ornaments, as well as the Lepidolite.

LXVII. PYRITES.

This mineral is called Sulphuret of Iron, Iron Pyrites, and Markasite. It occurs crystallized in many forms; such as the cube, octahedron, and dodecahedron; also massive, disseminated, capillary and cellular; it has a conchoidal fracture; a brilliant metallic lustre; its colours are bronze, yellow, brass-yellow and steel-gray. This mineral takes a very high polish, and from its fine lustre looks extremely well when cut in the form of a brilliant or rose. It was formerly much used in jewellery for ear-rings, rings, pins, and necklaces. It was, in former times, considered a great preservative of health. It is now but seldom seen, except in mineralogical cabinets.

LXVIII. ROSE MANGANESE.

This mineral is called in mineralogical works the Siliceous Oxide of Manganese, and also the Carbonate of Manganese. It

occurs massive; has a foliated structure; a conchoidal fracture; a shining lustre; it scratches glass; its colours are rose-red, reddish, and yellowish.

It is found in Siberia, Sweden, Hungary, England; and in the United States, at Middlebury, Vt., and at Cummington and Plainfield, Mass., where, according to Professor Hitchcock, the siliceous oxide, or according to Dr. Thompson, the bisilicate of Manganese is found in great abundance. Since it takes a very high polish, and is much wrought at Catharineburg, in Siberia, into many ornaments, it is confidently to be hoped that it may also find its amateurs in this country, as it is very easy to cut and polish, and the material is so plenty.

LXIX. PORPHYRY.

This mineral form rocks in a geological sense, but is properly a compact Felspar. It has various colours and shades, contains imbedded crystals of Felspar and Quartz, or either of them, and is, as may be supposed, a very hard stone. It is much used in Europe for ornamental and architectural purposes; also for slabs, mortars and other articles.

In the United States, Porphyry has never been used for any purpose; but Professor Hitchcock remarks, in his Geological Report of the state of Massachusetts, that it would be strange if an increase of wealth and refinement should not create some demand for so elegant and enduring a rock as Porphyry. In the same excellent work the author divides Porphyry into four varieties, as occurring in Massachusetts, in the neighbourhood of Boston:

1st. Compact Felspar, with several predominating colours; the one with yellow, resembling the Turkey Stone; one with red, from brownish to blood-red, closely resembling Jasper; one with a rose-red colour, resembling the Rose Petrosilex of Europe.

2d. Antique Porphyry; closely resembling that European Porphyry which was employed by the ancients in monuments and ornamental furniture and forms, and is when polished a beautiful ornament. It presents numerous varieties and shades of colour: one of the most elegant is the light green; then a deep green; red of various shades; reddish-brown; black, or nearly so; gray and purple; and the imbedded crystals are usually of a light colour, sometimes white, brown, and greenish.

3d. Porphyry with two or more minerals imbedded, and having a base of common Felspar. This mineral is between Sienite and Porphyry, resembling the Trachytic Porphyry, and is generally unfit for ornamental purpose; the Quartz which it contains is hyaline and smoky.

4th. The Brecciated Porphyry, which is composed of angular fragments of Porphyry and compact Felspar, reunited by a paste of the same material; the fragments are also of various colours, usually, however, gray and red; the rock is very hard, and when polished, furnishes specimens of great delicacy for ornamental purposes.

LXX. SIENITE.

This rock is compossed essentially of Felspar and Hornblende, and sometimes contains Quartz or Mica, or both. When polished it forms the most splendid ornamental stone of all other rocks; it is very hard; and its colour and the mode of distribution of the various ingredients, make it very agreeable to the eye. It much resembles Granite, and is often almost identical with it: but by close inspection it may be distinguished from the want or addition of the component ingredients.

Professor Hitchcook describes six varieties of the Sienite:

1st. That Sienite which is composed of Felspar and Hornblende, when the first is white, greenish, and yellowish, and the latter invariably black.

2d. Felspar, Quartz and Hornblende; the first is foliated, and commonly of grayish, bluish or yellowish colour; the second from quite light to dark colour and hyaline; and the latter is black. Under this variety the quarries at Quincy and Cape Ann have been arranged by the author, (which are generally called Granite,) on account of the absence of Mica. The Quincy Granite, or rather Sienite, is that celebrated architectural material used in the cities of Boston and New York, for those huge and magnificent edifices, public as well as private, erected within the last six years; and it may be supposed that two thousand buildings in the city of New York have been constructed with this splendid article.

3d. Felspar, Hornblende, Quartz and Mica. This rock, likewise, has a beautiful appearance, but is, as yet, less wrought than the

other varieties. The Felspar and Hornblende are predominant. The Quartz is in small grains, and the Mica is black.

4th. The Porphyritic Sienite; its base is Quartz and Felspar, and the Hornblende is almost entirely absent; it has a porphyritic aspect; the Felspar predominates. It is the most ornamental stone when polished.

5th. Conglomerated Sienite; it is a quarternary compound of Felspar, Hornblende, Quartz and Mica, but all in rounded or conglomerated masses, having the aspect of a pudding-stone; the nodules are from half an inch to six inches in size, and may be easily broken out of the mass, and the Hornblende predominates mostly in them. It is unfit for architectural purposes.

6th. The Augite Sienete; in this rock the Hornblende is present and Mica absent. It is composed of black Hornblende, greenish Augite, and yellowish Felspar; all, except the Felspar, presenting a crystalline structure; it is also composed only of Augite and Felspar.

The name of the rock Sienite was originally derived from Sienna, in Upper Egypt, from whence the first specimen was procured; it was examined and identified by Werner; many of the Egyptian monuments, such as Cleopatra's Needle, and Pompey's Pillar, were obtained from there.

LXXI. GRANITE.

This rock is composed of Quartz, Felspar and Mica, and forms the crust of our globe. It occurs over the whole earth, and the eastern part of the United States is abundantly furnished with this valuable mineral. As a building material it has been most extensively used for the last ten years; but the great fire in New York, which consumed, in December, 1835, seven hundred buildings, among which about two hundred were erected of Granite, has given a sufficient proof that Granite is, in this changeable climate, unfit for a building material, but that it may be usefully employed for ornamental and architectural purposes, where it is not constantly exposed to the atmosphere and weather, which make it so liable to decomposition.

Nevertheless, Granite continues to be generally employed in the erection of public buildings, warehouses, bridges, &c., and begins to form an important pecuniary object to the merchant and

mechanic; and on this account I cannot forbear to treat more fully on its general characters, and I must confess that the rich granite treasures of Connecticut, Rhode Island, and Massachusetts, which I had occasion to examine a few weeks ago, on my journey into those regions, deserve fully all the enconiums bestowed upon them in Hitchcock's Report on the Geology of Massachusetts, and in Shepherd's Report on the Geological Survey of Connecticut. So abundant and large are the Granite rocks in the eastern part of the United States,* that some single localities are sufficient to supply many countries with this lucrative article. Professor Hitchcock divides the Granite of Massachusetts in four varieties, viz:

1, The Common Granite, which, according to him, embraces nine-tenths of the Granite, in Massachusetts, and the ingredients are a distinct crystalline structure, mixed and discriminating colours.

2, The pseudomorphous Granite is that variety in which the mica separates distinctly the other ingredients, which are closely mixed.

3, Porphyritic Granite: it contains besides the usual composition, of Quartz, Felspar and Mica, distinct imbedded crystals of Felspar.

4, Graphic Granite: this variety consists of Quartz and Felspar only, the cross fracture presents the appearance of written characters.

Professor Shepherd divides the ornamental Granite of the State of Connecticut into eight different types, viz:

1, Gray Granite.

2, White Granite. This variety I have examined myself a week ago, in Plymouth, (Ct.) and so beautiful was its colour, and close granular texture, that I took it at a distance for a sand-stone or white marble.

3, Flesh-coloured Granite.

4, Red Granite.

5, Epidotic Granite.

6, Porphyritic Granite.

7, Chloritic Granite.

8, Sienitic Granite.

In Rhode Island, a fine white Granite has, according to Dr.

* Professor Hitchcock remarks that there is not a town in Massachusetts in which more or less of Granite does not occur, either as situ or as boulders.

Webb, of Providence, been employed for the erection of the arcade of that city, from a quary in Johnstone, five miles from Providence.

The manner in which the Granite is usually split out at the quarries is this: a number of holes, of a quadrangular form, a little more than an inch wide and two or three inches deep, are drilled into the rock at intervals of a few inches, in the direction in which it is wished to separate the mass. Iron wedges, having cases of sheet iron, are then driven at the same time and with equal force, into those cavities; and so prodigious is the power thus exerted, that masses of ten, twenty, thirty, and even fifty and sixty feet long, and sometimes half as many wide, are separated. These may be subdivided in any direction desired; and it is common to see masses thus split till their sides are less than a foot wide and their length from ten to twenty feet.

The price of the Granite from these quarries, according to Professor Hitchcock, is from forty to forty-five cents per superficial foot, and for hammering and fine dressing it, about thirty cents the superficial foot, such as in the style of the Tremont House in Boston; common work from twenty to thirty-five cents; posts for stone fronts cost thirty-four cents per foot. The enterprising citizens of the city of New York have erected gigantic monuments of Granite for future generations to admire.

APPENDIX.

LXXII. PEARLS.

Pearls are concretions, consisting of carbonate of lime, having a roundish, tubercular, or angular form; a white, gray, blue or green colour; a shining lustre, and the hardness of lime. They are found in several bivalve shells, particularly however in the Mother of Pearl, (*ovicula marga vitifera*); also in the oyster, and several unios. The origin of the Pearl is by some considered to be unfructified eggs; by others, a morbid concretion or calculus, produced by the endeavour of the animal in the shell to fill up holes therein; by others again, as mere concretions of the juice of which the shell has been formed, and with which the animal annually augments it. It is very plausible, however, that the animal of the shell is attacked often by enemies, such as the boring shells, (turritella,) &c.; that grains of sand, or any other pointed sub tance, which, on such occasions, come within the shell, stick fast and augment with the growth of the shell; it is also known that the Pearls may be produced artificially, by pressing a sharp body on, or by boring a hole in, the shell. The Chinese are in the habit of laying a string with five or six small pearls separated by knots, inside of the shells, when the fish are exposing themselves to the sun, and taking them out after some years, whereby they obtain very fine and large pearls, and but a little open on the side where they were adherent to the shell. The pearl fishers say that when the shell is smooth and perfect, they never expect to find any Pearls, but always do so, when it has begun to be deformed and distorted. It was therefore concluded, that as the fish grew old, the vessels containing the juice for forming the shell and keeping it in vigour, became weak and ruptured, and from this juice accumulating in the fish, the Pearl was formed, and the shell brought to decay, as supposed by M. Reaumur. It would be, according to this idea, a sure guide to know from the form of the shell, whether the Pearl is large or small; and thus by the smaller ones being thrown back into the sea, a constant crop of large Pearls might be obtained. The mother of Pearl fish is found in the East and West Indies, and other seas

in warm latitudes, and in the rivers of north and middle Europe. In some parts of the globe, they are found in clusters, containing a great number; the places where found are called pearl banks. The most famous are near the coast of Ceylon, that of Japan, and in the Persian Gulf, near the island of Bahreim; also near the coast of Java, Sumatra, &c. The finest and most costly Pearls are called the Oriental; and are from the above places; they are all white or yellowish; those from the Perisian Gulf, on account of their perfect whiteness, are preferred to those from Ceylon. Pearls are collected in rivers with the hand, but in seas it is the business of divers, brought up to this most dangerous occupation from early youth. In the East Indies there are two seasons for pearl fishing; the first in March and April, the second in August and September; and the more rain, the more plentiful are the pearl fisheries. In the beginning of the season there are sometimes two hundred and fifty barks on the banks; the larger barks have two divers, the smaller, one. The divers descend from their barks with a rope round their body, and a stone of twenty or thirty pounds attached to one of their feet, so that they may sink speedily from eight to twelve fathoms, where they meet the shells fastened to the rocks: the nostrils and ears are stuffed up with cotton, and to the arm a sponge dipped in oil is fastened, which the diver now and then brings to his mouth, in order to draw breath without swallowing water. He also carries down with him a large net, tied to his neck by a long cord, the other end of which is fastened to the side of the vessel, to hold the shells, and the cord is to draw him up when the net is full, or when he wants air; he has likewise a knife or an iron rake, for detaching the shells from the rocks. Thus equipped, he precipitates himself to the desired depth, where he can very distinctly see all that is passing around, yet cannot escape in time the sudden approach of sharks, to whom he too often becomes a prey. When the diver has been in the water some minutes, and has his net filled, or is unable to stay any longer, he loosens quickly the stone at his foot, shakes the line, and he is drawn up by his companions. The diving-bell is now frequently used; more so than in former years.

In the Persian Gulf the divers rub their bodies with oil, and fasten a stone of about fifty pounds to their feet.

The shells obtained are piled up in heaps, and left exposed to the

rain and sun until the body of the animal putrifies, and they open of themselves. Those containing any Pearls have from eight to twelve. After being picked out, washed and dried, they are passed through nine seives of different sizes.

At the Pearl islands, near the Isthmus of Panama and Colombia, the pearl fisheries have, within a few years past, become lucrative to some of the inhabitants. The divers use more simple methods than those we have mentioned, for collecting the pearl oysters: they traverse the bay in canoes that hold eight men, all of whom dive naked into the water, from eight to ten fathoms deep, where they remain about two minutes, during which time they collect all they can with their hands, and dexterously rise to deposite them in their canoe, repeating the operation for several hours.

In Sweden, they catch the pearl oyster with a pair of long tongs. The fishermen are in small boats, painted white on the bottom, which reflects the light to a great depth, and as soon as they perceive them passing underneath they seize the oyster.

Pearls are esteemed according to their size, form, colour and lustre; the largest, of the size of a small walnut, are called paragons, which are very rare; those the size of a cherry, are found more frequently, but still are rare; they are the diadem or head pearls. They receive names, also, according to their form, whether quite round, semi-circular and drum-form, or that of an ear-drop, pear, onion, or as they are otherwise irregularly shaped. The small pearls are called ounce pearls, on account of being sold by weight, and the very smallest, seed pearls. Those of a brilliant white colour, or white water, are most sought for in Europe; those of a yellowish colour in some parts of Asia; and some of a lead colour, or those of a jet black, are preferred among some nations. They all turn more or less yellow with age, and to restore the white colour, they are either baked in bread, rubbed with boiled salted rice, or kept for a short time in the gastric juice of fresh-killed chickens.

Pearls are sold by weight, the Troy or gold weight; but the dwt. of twenty-four grains is counted as thirty; so that an ounce has six hundred grains, pearl weight, and four Troy grains are equal to five pearl grains. The price has, within the last forty years, much diminished, for two reasons:

1st. Diamonds, and particularly brilliants, became more plenty,

and have since been worn, not by the higher classes alone, but also by the middling.

2d. Within the last twenty years, artificial pearls have been manufactured in high perfection, and are worn to a great extent.

It is my opinion, however, that the price of pearls will take a fresh rise among the nobility and richer classes, the Diamond being now so generally worn; as persons, thinking to invest safely, without any future loss, their surplus capital, purchase brilliants that formerly were possessed exclusively by the rich.

Pearl fisheries were first carried on in remote times in the Persian Gulf, and the most celebrated, formerly, were near the island Bahreim. Five hundred thousand ducats was then the yearly produce. About one million dollars worth, at the present time, are exported. The island Kharack now produces the most considerable quantity. The principal market is at Maskate; from thence they are brought to Surat. The mode of procuring them pursued in those countries, is in canoes, holding fifteen men, six of whom are divers: the shells caught during the day are delivered to a surveyor, when they are opened on a white cloth, and whoever finds one of some value, puts it in his mouth, to give it, as they say, a "better water." The greatest harvests are generally after many rains, and the largest Pearls are mostly found in the deepest water. At Ceylon the pearl fisheries are now considerable, particularly in the bay of Condeatchy. The shells are there left to reach the age of seven or eight years, and in the fourth year they have small Pearls, sometimes a hundred and fifty. They fish yearly, in the month of May, during four weeks. In the year 1804, eight hundred canoes, each with two divers, were engaged. Before the year 1800, the pearl banks were leased, to an Indian merchant, for three hundred thousand pagods; and before the arrival of the Europeans in India, the same bank was used every twenty or twenty-four years; when under the Portuguese, every ten, and under the Dutch, every six years. In 1800, the produce was from one hundred to one hundred and fifty thousand pounds sterling.

Japan has some pearl banks, which are, however, not much sought, just like the Nipthoa lake, in Chinese Tartary. America did send, in the sixteenth century, Pearls to the amount of eight hundred thousand dollars, to Europe. The shells were mostly

collected from Cape Paria to Cape Velo; round the islands Margarita, Cubagna, Cocher Punta, Aragy, and at the mouth of Rio la Hacha, from which latter locality, and the Bay of Panama, Europe is now mostly supplied; the former localities having long since been relinquished, on account of their small produce; too many shells having been removed at one time, thereby retarding the growth of Pearls. Panama has sent, within a few years past, about one hundred thousand dollars worth of fine pearls to Europe, the trade being carried on by Messrs. Plisé, of Panama. The coast of Florida is said to have been very lucrative to the Indians, in a pearl fishery, which, however, does not prove so now, since the settlement of civilized people.

England used to be supplied from the river Conway, in Wales; and Scotland supplied the London market, between the years 1761 and 1764, to the amount of ten thousand pounds sterling; but the supply has failed. Pearls are found in the Elster river, in the kingdom of Saxony, from its source at the borders of Bohemia to Elsterberg, where the fishery has been carried on since 1621, with some advantage to the sovereign; some Pearls found there were valued at fifty Prussian dollars each. In the river Watawa, in Bohemia, and in the Moldau river, from Kruman to Frauenburg, Pearls are found of great beauty; so much so as to equal in price the Oriental Pearls. Also, at Rosenberg, Pearls are sometimes found superior to the Oriental in lustre; and at Oelsnitz, a considerable pearl fishery is carried on. Most of the rivers in Sweden, Lapland, Finland, Poland, Norway, Jutland, Silesia, and other places, contain Pearls, but they are not collected.

The price of Pearls used formerly to be determined like that of the Diamond, from one carat upwards, viz; if the carat is fixed at five dollars, and a pearl weighs four carats, take the square, or sixteen multiplied by five, which is equal to eighty; so that a Pearl of four carats was estimated at eighty dollars.

I am informed by Mr. Plisé, who has very recently brought a considerable quantity of Pearls from Panama, that he receives four dollars per grain in England, for those of good size and quality. A Pearl which Pliny valued at three hundred and seventy-five thousand dollars of our money, Cleopatra is said to have dissolved at a banquet, and drank off to Mark Antony's health. The Peregrine, which was found in 1574, near Margarita, and given to Philip

II. of Spain, was of pear-form, the size of a pigeon's egg, weighed twenty-five carats, and was valued at fifteen thousand ducats.

Pope Leo bought a Pearl for eighty thousand crowns. Tavernier describes one belonging to the King of Persia, which is said to have cost one million six hundred thousand livres. Portugal has a Pearl in its treasury of the size of a pear. Julius Cæsar bought a Pearl from Servilia, the mother of Brutus, for one hundred and fifty thousand crowns. Two Greeks, residing in Moscow, are in possession of a Pearl weighing twenty-seven seven-eighth carats.

For restoring Oriental Pearls to their original lustre, which they lose in course of time, the following process is resorted to in Ceylon: the Pearls are allowed to be swallowed by chickens, which are then killed, and the Pearls are an hour afterwards taken out of the stomach, when they are as white and lustry as if just taken from the shell.

ARTIFICIAL PEARLS.

Artificial pearls or beads are of various kinds; most generally they consist of solid masses of glass, with a hole drilled in them; or they are blown hollow, and then filled out with metallic lustry grains, wax, or with the fine scales of the bleak fish, which have a silvery and pearly lustre. The same scales are likewise used to coat beads of gypsum, or alabaster, which are soaked in oil and then covered with wax to give them a pearly appearance. The Roman beads are made in this manner; the scales are dissolved either in liquid ammonia, or vinegar, and the solution or liquid is used for covering those artificial beads. The Turkish rose beads are made of an odoriferous paste, and are turned afterwards like those of coral, amber, agate, or other hard substances. The knitting beads are sold in meshes of one hundred and fifty, or twenty strings, of fifty beads each, of various colours; and the large glass-beads in meshes of twelve strings. There are numerous manufactories in Germany and Italy of the various kinds of beads, which are used to a very great extent both in Africa and North and South America. Germany exports yearly from its different manufacturing places, such as Heidelberg, Nuremberg, Sonnenberg, Meistersdorf, in Bohemia, and Mayence, more than a million dollars worth. In Venice are large establishments for the finest cut beads.

Nuremberg manufactures, besides the glass beads, considerable quantities of amber beads. In Gablontz, in Bohemia, more than six thousand persons are engaged in the manufacture of beads, that are made of pure glass or of a composition. From the glass-houses, which are very numerous in Bohemia, the rods of different sizes are delivered to the glass mills for cutting, which is performed by water power or by hand. In 1828 there were in that neighbourhood one hundred and fifty-two mills in operation; a number of glast blowers were likewise engaged, who possess great dexterity in blowing the small beads with the assistance of a small blow-table. In the manufactory of George Benedict Barbaria, at Venice, six hundred varieties of beads are constantly making; and that of Messrs. Gaspari and Moravia, manufactures, besides the beads, every article of jewellery from the same material.

The rose beads of Steffansky and Tansig, are made of bread crumbs, which are beaten up with rose water in a wooden mortar, until they become a uniform mass, to which is added some otto of roses and drop-lake, when it is made into beads with dissolved gum tragacanth; for the black rose beads, Frankford black is substituted in the place of the drop-lake.

Lamaire, of France, manufactures beads equal in lustre and beauty to the real Pearls. He adds to

1000 ounces of glass beads,
3 " fish scales,
½ " fine parchment glue,
1 " white wax,
1 " pulverized alabaster,

with which he gives them an external coating.

Rouyer manufactures his beads, also in France, from opal, which he covers with four or five layers of dissolved isinglass, and then with a mixture of a fat oil, spirits of turpentine, and copal, so as to prevent their becoming moist. In order to render them of the peculiar lustre of the oriental Pearls, they are covered with a coloured enamel. The opal is fused into rods by a lamp, over which is laid a brass wire to support it; the wire is held in one hand and the opal in the other, and the wire is then kept turning until the bead has the desired size and roundness; if a coloured enamel is to be applied, the beads are made but half the required size, which being done, it is once more covered with the opal, then

the solution of isinglass is used, and lastly the varnish. Beads made in this manner are with difficulty distinguished from the oriental Pearls.

The best method of making artificial Pearls, is certainly by means of pulverized real Pearls. Either the smallest, or the deformed large specimens, may be reduced to a fine powder, and then soaked in vinegar or lemon-juice, and the paste made up with gum tragacanth, may be cut out with a pill machine, or a silver mould of any desired size, and when a little dry, be enclosed in a loaf and baked in an oven; by tin amalgam, or by the silver of the scales of young fish, the proper lustre may be given.

LXXIII. CORALS.

Corals are zoophytes, whose calcarous habitations resemble vegetable branches. They live in the sea, adhering to rocks, stones, or vegetables, and shoot to the surface of the water in tubiform stems with branches, generally coated with a gelatinous or leathery skin that incloses a cartilaginous marrow, composed of many cells, inhabited by the animals, who propogate in sprouts from eggs so fast, that small reef-rocks are formed, which in the course of time grow to islands.

The Red Coral or Precious Coral, (*Iris nobilis*), belongs to that family of zoophytes which live mostly in the cavities of rocks in the sea; the stem is always of a beautiful red colour, rarely white; quite compact, striated on the outside, of entire calcareous composition; it grows one foot high, and an inch thick. The stem is covered with a leathery crust, containing open warts of eight teeth, in which the animals, or polypi, with their eight arms, are situated; the arms are whimpered, and the animal grows very slowly.

The Red Coral is fished up with nets of strong ropes, fastened on large wooden cross beams, which are thrown down on the places where the Corals are known to be fastened, and an expert diver contrives to entangle the nets in the reefs, which are then drawn up by force. The Corals so brought up are cleaned, assorted, and sold to the manufacturers.

The Red Corals are distinguished by the names of the countries where found.

1. The Barbarian, which are the thickest and purest.

2. The Corsican, which are the darkest, but not so thick, and less pure.
3. The Neapolitan, and those from Ponza, which are clear and pretty thick.
4. The Sardinian, which are thick and clear.
5. The Catalonian, which are nearly as dark as the Corsican, but mostly thin.
6. The Trapanian Corals, from Trapani, in Sicily, which are somewhat preferred at Leghorn.

The darkest Corals are most liable to be worm-eaten.

The polished Corals are generally sold in bundles, which consist of a certain quantity of strings, of a certain weight. They are strung in Leghorn, either of various or equal thicknesses, which latter are then of various sizes, and the bundles receive their names accordingly; Grossezze, Mezzanie, Filotti, Capiresti, &c. The thickest Corals are put up in one string, resembling a tail, and are called Codini; the smallest are called Smezzati.

At Genoa, the various large Corals are called Mèzzanie; the uniform large, Filze; and the uniform small, Migliari.

According to colour they are distinguished at Leghorn; the darkest red are called Arcispiuma, which are the dearest; and then Primo, Secundo, Terzo, Quarto, Coloro or Sangue, Chiari, Moro, Nero, &c.

According to form they are called round (*tondi*), and cylindrical round (*boticelli*). The former form are sent to all parts of the world, whereas the latter are only sent to Poland. The large Boticelli are put up in meshes of twelve pounds, containing 36 strings; and the middling size of the Boticelli are in meshes of six pounds, containing sixty strings; those Boticelli which are still larger, are called Olivatti, and are only sent to Africa; those which are globular, and not drilled, are called Pallini altorno, and are sent principally to China, where the favourite colour is the rose-red, and the most perfect kind.

The sound Corals are called Netti, and the worm-eaten, Camolatti, which latter are mostly sent to the East Indies.

The tops of the branches are called dog-teeth, or dent's cane, and the thick ends of the branches are called maometti; both kinds are perforated lengthways, and are used in Barbary as ornaments for horses. The fine large Coral stems which form suitable

specimens for cabinets of Natural History, are called in Marseilles, Chouettes.

There are one hundred varieties of shades of Red Coral distinguished at Marseilles.

The Corals are principally used for ornaments, and although not highly esteemed in Europe or this country, are very much so in the East Indies, China and Africa, where they are preferred to the Diamond. Almost every East India lady wears a bracelet or necklace of Corals.

The White Coral has its origin from the eight-star Coral (*madrepora occulta*;) and the Black Coral from the black-horned Coral (*gorgonia antipothes.*) The Medusa head (*caput meduse,*) called the Sea Polen, belongs likewise to the Coral family, and consists of sixty-two thousand six hundred and sixty-six articulated members.

The Corals are fished for on the coast of Barbary, between Tunis and Algiers; in the latter state is Bona, the principal station, and the French have it also at Basteon de France.

The monopoly was purchased by France, in the 17th century, at eighteen thousand dollars annually, and by England since 1806, for fifty thousand dollars.

There is at Bona a summer fishery, from the first of April to the first of October, which occupied, in 1821, thirty French, seventy Sardinian, thirty-nine Tuscanian, eighty-three Neapolitan, nineteen Sicilian barks; and, altogether, two hundred barks of two thousand and twenty-three tons capacity, with two thousand two hundred and seventy-four men, and they fished up forty-four thousand two hundred pounds of Coral, valued at two million four hundred thousand francs. The winter fishery of the same year occupied three French barks, each with nine men, and they obtained six hundred and eighty pounds of Coral.

The principal manufactories of Corals are now at Leghorn, where this branch of business has been carried on for two hundred years past, by the Jews. There were formerly twenty establishments, but the number has lately been much diminished.

They are sent principally to China, the East Indies, and Arabia, partly by the way of London, and partly by Moscow, Aleppo, and Alexandria; many Corals are likewise sent to Poland.

Genoa has a few manufactories, in which the Sardinian Corals

are mostly wrought. At Marseilles there has been a large manufactory ever since 1780, and at present it is the only establishment of the kind in France.

The East Indies consume, according to the statement of Le Goux de Haix, nearly four million francs worth.

Corals are worn in the East as ornaments in the turbans, and the Arabs bury the Coral with their dead.

A large Coral, from the manufactory at Marseilles, was sold in China, to a Mandarin, for twenty thousand dollars.

The price of Coral has, within some years, much depreciated.

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