**A syllabus of a course of chemical lectures read at Guy's Hospital / by William Babington, Alexander Marcet, and William Allen.**

**Contributors**

Babington, William, 1756-1833.
Allen, William, 1770-1843.
Marcet, Alexander, 1770-1822.
Guy's Hospital.

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Js Bryant 1814
father of Thomas Bryant
both past Presidents
of the Medical Society
of London

A

# SYLLABUS

OF

# A COURSE OF
# CHEMICAL LECTURES

READ AT

GUY's HOSPITAL.

BY

WILLIAM BABINGTON, M.D. F.R.S.
ALEXANDER MARCET, M.D. F.R.S.
PHYSICIANS TO THE HOSPITAL,

AND

WILLIAM ALLEN, F.R.S. & F.L.S.

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# PREFACE.

In every Science taught by Lectures, a Syllabus of the Course has been found of advantage to the Student. At the same time that it lays before him a comprehensive outline of the subject, and points out the several divisions and their arrangement with respect to each other, it defines the meaning and extent of scientific terms better than more verbal statements would do, and affords a convenient epitome of the rudiments of the science.

As the objects of Chemistry are various, and its views extensive, so likewise is the connection of its principles subtle, and their investigation complicated and minute: hence the aid of such a synopsis is perhaps even more requisite in this than in any other branch of Natural Philosophy. In proportion too as modern improvements have enlarged the scope, they have increased the utility of a Prospectus to explain it; if, for instance, we take a retrospective view of the state of Chemical Science eight or ten years ago, it will appear that a number of discoveries have been made since that period, which have opened new fields of investigation, and have in some instances pointed out the imperfection of our former systems.

On these grounds it has been thought right to draw up a Syllabus of the Lectures delivered at this Hospital, and to renew it from time to time, as the progress of the Science may appear to require.

As the Course is necessarily designed for Medical Students, particular attention has been bestowed on those parts which relate to their profession. It is not, however, confined to this object alone. Chemistry is now so intimately connected with various departments of Science, and with most of the Arts and Manufactures whether useful or ornamental, that an acquaintance with it has become in some degree necessary in the general system of education; and however different the views with which the Gentleman, the Artist, and the Manufacturer may enter upon its study, each will obtain information adapted to the particular line of his pursuit, that will amply reward him for the time he may spend in acquiring a competent knowledge of its principles.

Agreeably to this view of the matter, an endeavour has been made to point out the application of these principles, not only to the purposes of Medicine, but to most others to which Chemistry is in any way allied; and it is hoped that, independently of advantage during the period of teaching, this Syllabus may be useful to Students when they have ceased to attend;—that by future perusals they may not only recal such information as length of time or diversity of employment had erased from their memories—but that it may also serve as a general outline of the science, to be filled up at their leisure—as a systematic arrangement to which they may refer whatever knowledge they shall hereafter obtain.

In preparing this Course of Lectures, considerable attention has been paid to the order and distribution of the different parts of the subject. But as Chemical Science, though making daily progress, is not yet sufficiently advanced to admit of a perfect arrangement of its parts, and as the new Nomenclature, though admirably contrived, appears from Professor Davy's late brilliant discoveries, to have in some instances been at variance with facts, it has been deemed desirable in this Course of Lectures to guard against too strict an observance or hasty adoption of systematic views of arrangement. For this reason, the Synoptic Tables of Nomenclature, which appeared in the former Syllabus, are now suppressed; and a list of the Simple Bodies, that is, of those which, in the present state of our chemical knowledge, we are unable to decompose, has been substituted in their place.

It may be proper to mention, that although all subjects strictly belonging to Natural Philosophy are referred to the Lectures delivered at Guy's Hospital on that department of Science, yet the Chemical Lectures are occasionally illustrated by such parts of Experimental Philosophy as the subject may immediately require. By the free access, likewise, to an extensive Laboratory, the Student has an opportunity of seeing the various chemical processes conducted upon a scale corresponding with the expenditure of a large Hospital, and thereby of becoming familiarly acquainted with every step necessary in the management of such operations ;—without which the demonstrations of a Lecture-room will seldom make that impression which is necessary to fix them in his memory, and enable him to apply them with readiness and effect upon any future and distant occasion.

A Lecture on the Chemical Agencies of Electricity, and another upon Mineral Waters, are occasionally delivered during each Session. The examination of the several varieties of Urinary Calculi is also sometimes introduced. But these objects have not been treated of in the Syllabus, as they do not essentially belong to this Course of Lectures, and as their introduction is to be considered as optional.

# A
# SYLLABUS
# OF
# CHEMICAL LECTURES.

## INTRODUCTION.

GENERAL division of the study of Nature, under the heads of *Natural History, Physics,* and *Chemistry.* Objects of these various branches of natural science generally stated. CHEMISTRY defined.

## OF THE ATTRACTION OF GRAVITATION.

General view of the subject. Cause of *Attraction* not understood. Different species or modifications of attraction. *Gravitation.*—This force is exerted between masses of matter, and often at an immense distance. Distinction between the *specific* and *absolute weight* of bodies. *Areometers.* Experimental illustrations on the subject of specific gravity.

## OF THE ATTRACTION OF COHESION OR AGGREGATION.

This attraction is exerted between the *homogeneous* particles of bodies, that is, particles of the *same kind,* and acts only in contact, or at imperceptible distances.—Its influence on the different forms of matter.—Differs from *Chemical* attraction. Distinction between the *Integrant* and *Elementary* or *Constituent* particles of bodies. Caloric acts in opposition to the attraction of aggregation.

*Crystallization.*—Is an effect of the attraction of aggregation. Term *Solution* explained. The formation of crystals, influenced by concentration, refrigeration, rest, atmospheric pressure, &c. and attended with various circumstances, such as change of temperature, of volume, &c. Explanation of the terms *Efflorescence* and *Deliquescence.* — Different susceptibility of crystallization in different salts—how applied to chemical analysis.

Cohesion or aggregation only among Homogeneous par
If you dissolve Soda Sulphas in hot water on cooling
it will again resume its former character in different
with respect to figure &c. we only by this Solution
effect a Separation of its own particular
particles & Aggregation some force to break down
these particles which particles are called
Integrant particles (this is analogous to ⅔ specimen of air)
Elementary, or Constituent these bodies that cannot be any further
simplified.

No Agent so remarkably effects the particles of bodies
as Caloric or heat, examine different bodies & remark
the different State of consistence we find them
as in instance we have Air Bees wax which
is softer in summer than Winter, there is
not only difference in different bodies but at
different periods in one & the same body as wat
in the State of Vapour by applying heat & by
abstracting heat Ice becomes formed at 212 wa
goes off in State of water under 32 Ice becomes for
which is a beautiful example of Chrystallization
In Chrystallization a peculiar form is form
adhered too in diff. Substances. The Saline bo
posess the power of Chrystalls most remarkably
as Soda Sulphas Pot. Tartras &c., when Chrystalliz
is understood the Substance therein you may
be known by the figure of it alone as well as alm
by its taste it is done by measurement

For good Chrystals we must have time & quietude
if disturbed they will not be good.

The knowledge of Chrystallyzation is very important. The Saline Bod. Ch. is very remarkable But there are others as earthy bodies as Rock Chrystall Hexadron Prism — The action of nature may be so interrupted as we shall have the Prisms larger in one Specimen than there & the Prism more correct; but still the general form will be exactly like Native Carbonate of Lime or Calcareous Spar as it is called.

Amongst the Metallic Bod: Ore of Lead Chryst: Cubical

In the essential Oils as Camphire which will chrystallyze beautifully

When they are at liberty to follow their own peculiar nature they will be uniform in their shape, they may be interrupted by various causes as extraneous bodies for instance

When Chrystallyzation is going on there is an evident alteration of Temperature

Sometimes there is enlargement taking place during chrystallyzation which occasionally burst the pipes conveying the water

In the act of C the concrete shall keep to itself a certain quantity of water which is called the water of chrystallyzation. The Soda Sulphas contain more than ½ its weight of water

The air of atmosphere contains a great deal of water. if you make it the subject of exp$^{t}$ of Hygrometer it will not be found to remain the same a long time

When Salts as the Potash Alone, and Muriate of Lime are abounding with a propensity of absorption for moisture, it is called a ~~[illegible]~~ deliquescent salt; the Soda Sulphas on the contrary when exposed to the atmosphere becomes mealy therefore called efflorescent, being subject to allow this alteration as we are enabled by heat to employ the necessary water.

Different Salts require diff$^{t}$ proportions of water to dissolve them

The formation of Chrystalls by Romé de Lisle which was that all Chrys. were derived from certain Primitive or Simple forms

When you remove the 12 edges of a Cube you make a Chrystall with as many faces as the Number of edges are removed. If we had removed the solid angles or Corners by which we should have added 8 faces to the Chrystall

There are diff arrangement in order of Chrystals according to the form of them as viz

Imadron Pyramid
Hexaedral Chrystals
Rhomboidal Octohedron
Roctendron Rhokedihedron
Tetrahedron

Many Salts disposed to exhibit itself in the Cubic form

If the deficiency takes place either at the Solid edges or Sides then the deficiences will cause variety in the form of the chrystals, The Rhomboid, the characteristic of the native Carbonate of Lime if you break it down by mechanical power the fragments will be found in complete rhomboid. Hexadral pyramids terminated by

In the                    we have Rhotadodra Chrystals —

If for instance you meet with native carb of Lime & find the nucleus a complete Rhomboid it may be called the Primitive form of it. The particles added will follow certain laws but we shall have variety to a certain degree When the axes are left unaltered Hauy speaks of Apiceax

Wollaston invented an [illegible]
[illegible] Chrystals in place of the Goniometer
far superior to the Goniometer

Alum naturally Chrystallizing is Octohedrons

Concise history of *Crystallography.* Sketches of *Romé de L'isle,* and *L'Abbé Haüy's* theories of the formation of crystals. *Primitive* and *secondary* forms of crystals. General idea of *truncations, decrements,* &c. and of the mode in which they give rise to all the varieties of form in crystallized bodies. The form of crystals, and the instrument called *Goniometer,* by means of which these forms are accurately ascertained, are important auxiliaries in mineralogical chemistry.

Octohedron
Cube formed by
2 Tetrahedron
Combined together
Rhomb to make
with Both [illegible]
[illegible]

Tetrahedron with 3 base

Dr W thinks the first Particles are all more or less Spherical

## ON CHEMICAL ATTRACTION.

*Chemical attraction* or *Affinity,* like the attraction of cohesion, takes place in contact or at insensible distances, but differs from the latter in acting between *dissimilar* or *heterogeneous* particles. The result of its action is the formation of a *compound,* with properties differing from those of its constituent parts. Chemical *Analysis* consists in resolving a compound into its constituent or elementary parts. The attraction of cohesion, and chemical attraction may be generally considered as acting in opposition to each other. Process of *Solution* examined.

Generally the Shape of them when Large is very different
in Shape

Calcarious Spar the Primitive Shape is always
Prism Fluor Spar octohedron

The Galina a Cube

In most instances it is necessary, in order that chemical attraction may take place, that one of the constituents should be in the fluid state. Chemical combination produces remarkable changes in the form, colour, density, &c. of the bodies combined, and is generally attended with a change of temperature.

Bodies have amongst themselves different degrees of chemical attraction, and it is on the estimation of these different attractive forces that the Science of Chemistry rests.—Methods employed to form such estimates.

Definition of the terms *Simple* and *Double elective attraction.*—Experimental illustrations.—*Precipitation.—Saturation.*

Berthollet's opinions on the doctrine of attraction generally stated. The quantities or masses of matter—the force of attraction of aggregation—the degree of temperature—considered as causes by which the phenomena of attraction are often modified.

Of the *limits* of chemical attraction.—Whether bodies can combine together in any proportion ; or whether they will unite only in certain determinate proportions?—Concise view of Mr. Dalton's and Dr. Wollaston's theories on the subject.

Chemical attraction

Produces different bod from their combination thus if Acid Muriat & Soda be brought together the result will be Soda muriat & it will be in vain to try to separate them by mechanical means of pounding the smallest particle will be a compd of Soda & muriatic acid. They are called Compounds the subst of which its composed is called its component arts

attraction of cohesion & Chemical attraction act opposite each other

of all the means of weakening attraction of Cohesion is Solution in water is the best when the Substance is soluble, but its something more than mere mechanical division

Water diss diff Salts with diff facility

There is a law that one of the bodies should be in a state of Solution but to this there are exceptions as for instance when we powder potash & Acid together it will not act but when the Acid. Cit. is dissolved an effervescence will take place. Take Tinfoil on which Nitrate of Copper may remain on it without any action but if a little water is added it will in a few minutes act violently produ smoke & sometimes a flame

Another Law of chemical attraction is that the nature of one of the articles is completely altered as for examp Sulphuric Acid & Copper form Sulphate of Copper, & Oil & an alkali will cause by its mixture a Soap different in every respect from the 2 ingredients employed

Among the alterations of chemical attraction there is sometimes a complete change of form By Muriate of Lime & Sulphuric Acid adding a little of this to the Muriate of Lime the whole will be converted into a Solid forming Sulphate of Lime or Plaster of Paris.

The reverse of this is also sometimes the case thus by mixing Acetas Plumbi & Alum are rubbed together will produce a fluid the water of chrystallization of these two salts is sufficient to dissolve them both

By the Combination of Carbonic Acid Gas & Ammoniacal Gas we produce Carbonate of Ammonia thus making two Gas forming a Solid

Muriatic & Ammoniacal Gas will produce Muriate of Ammonia

Chemical Comb. is always attended with a change of Density

By this Mixture altho the tube is quite full there is a diminution of bulk, that is the Sulphuric Acid is a distinct condensation.

The same happens when Spirit of wine & water are mixed also heat given out

In all cases of chemical Comb. there is a change of temperature. Sometimes a prodigious degree of heat evolved. The Comb. of Ol Terebinth & Acid: Nitrous be mixd & it will ignite most violently — Acid Nit.  Ol Tereb

Black Manganese from which Oxygen is obtained it is very disposed to absorb oxygen but emits it a

Lime absorbs Carbonic Acid very readily but easily emits it again

If you add Acid Sulph. to Nitrate of Lime which has a greater attraction for the lime than the Nitric Acid, it will precipitate the lime to the Bottom of the vessel forming Gypsum or Sulphate of Lime, it is an example of simple Elective attraction —

There is a Scale which is very useful for acquiring a knowledge of the quantity of Acid in Muriate of Soda for example

Piece of iron when red hot expands very much Hot water will increase in size a bar of iron. a Thermom is raised ~~as~~ by the expansive power of heat if you put a Thermometer into hot water, the water gives heat to the fluid in the Thermometer and makes it expand Sanctorius was the first inventor of Thermometers the only objection to the Thermometer it being air that expanded

## CLASSIFICATION.

The principles of classification of the older chemists shown to be inconsistent with modern discoveries.—What is to be understood by the term *Element*, or *Elementary Substance*.

General view of the *simple* or *elementary bodies*. Of the principles of arrangement adopted in most modern treatises of Chemistry. Unavoidable difficulties in a systematic classification of chemical knowledge. Statement of the arrangement adopted in this course—reasons which appear to render it most eligible.

## OF CALORIC.

Explanation of the terms *Heat* and *Caloric*. Various opinions on the nature of Caloric examined.—Its phenomena may be considered under two general heads, *viz.*

### I.—FREE CALORIC, OR HEAT OF TEMPERATURE.

Caloric, in this state, *expands* bodies, and affects the thermometer.—*Equilibrium* of heat.—*Thermometer*.—Principle and construction of that instrument. Description of the various thermometrical scales. Nature and limits of the information derived from these instruments.—Wedgwood's *Pyrometer*.—Peculiarity respecting the expansion of elastic fluids by heat.—Exceptions to the law of expansion by heat.*—Expansive force of freezing water.—Contraction of Argil by heat.—*Fusion* and *Vaporization* of bodies.—*Evaporation*, distinguished from *vaporization*.—Influence of the atmospheric pressure on vaporization.

Theory of the *Propagation* and *Equilibrium* of free caloric.—*Conducting powers* of bodies.—* Fluids are very slow conductors when at rest.

*Radiation* of heat.—Professor Prevost's theory of universal radiation.—*Reflexion* of heat.—Professor Pictet's apparent reflexion of cold.—Leslie's *differential thermometer*.—Bodies differ in their *reflecting*, *radiating*, and *absorbing* powers.—Explanations and experimental illustrations.—Practical applications of these principles.—*Ignition* is the ultimate effect of accumulated caloric in its free state.—Takes place in all bodies nearly at the same temperature.

## II.—COMBINED CALORIC.

Caloric, when combined with bodies, may be considered in two points of view:

1st. As *Specific or Comparative heat*.—Meaning of these terms defined and illustrated by

Farenheit's Scale is divided into 212 degrees, Zero is placed at a temperature which can be made by mixing salt and snow 212 degrees is ye boiling point. Mercury freezes 5-0 deg below zero in Farenheit's Thermometer, Mercurial Thermometer are ye best, it has an advantage because it is more visible, over a Thermometer graduated by spirit.

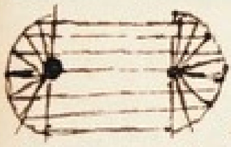
* If a quantity of water be gradually cooled down to a certain Temperature, and if that is carried still farther it will expand & if ye vessel is closed it will often burst it, the force of water when it is freezing is extreme, it often splits off pieces of rocks and slate, Trees &c — Clay cracks when heat is applied to this is owing to ye moisture of it being taken away.

It may be said generally that all bodies, excepting vegetable produc are fusible. When a body is rendered fluid.

the point of boiling water is 212, Æther 104 Hydrarg: 170 by Farenheit's Thermometer. When water approaches ye boiling point a noise is heard this is owing to ye agitation of ye water; then steam arises thro' ye mass of water, which comes out of ye vessel in a visible state, Water in high situations, as on the top a Mountain &c, will boil at an inferi temperature when it is deprived of Atmospheric pressure. If you cork up a flask of water, when the water is boiling, you take away ye Atmospherical pressure, then by immersing the flask of water after it has stopt boiling, into a vessel of Cold water ebullition will again commence, Glass is ye best Conductor of heat Copper Next. Silver is ye best Conduc of heat Gold &c &c Bodies differ very much in absorbin heat. thus some things feel Cold, others warm. they are bad & good Conductors. On the reappearance of frost, that when it thaws we feel it much colder this is owing to ye wet air being a good Conductor of heat &c

Fluids are very slow conductors of heat when at rest, this was supposed by Humphrey. they have, it is now known a very slight conducting power. this is easily seen by placing a Thermometer in a vessel of water, & pouring ether on its surface & igniting it & you will not find this water become of a higher temperature & raise ye Thermometer.

According to Dr Prevost's Caloric consists of various particles. That Caloric radiates in right lines and observes of ye same laws as light. The rays of Caloric can be brought into a focus When a hot body is placed in the Centre of a Concave body the rays are diverging towards that Concave body. By ye same law the rays are directed in a parallel direction,



By placing a bottle of hot water in this way we can raise ye Column of the Thermometer very much: but by placing a body of greater heat (as a red hot bullet) we can ignite Gunpowder. after the Gunpowder has exploded you will find by applying your hand to the surface of ye opposite mirror it will be very hot indeed. Cold is capable of being reflected by a like experiment but in this the Thermometer is becoming ye hot body Various Bodies have diff: powers in radiating & reflecting the rays of heat. if a body was blackened it would radiate more, but reflect less. Bright & Mettallic surfaces reflects most, but radiates less. a Paper Surface The reason why Metallic pots makes better tea than an earthen one, is because it radiates less. Polished Metallic Substances.

Combined Caloric) 1st Different bodies
have a different Capacity for Caloric –
a diminished Capacity of heat in Conseque
of Condensation will ignite tinder

If Ice be melted & a thermometer be placed in it, you will find the Thermometer remain in the same State, this is owing to the heat being entirely employed in changing the Ice to a fluid State. but directly it is all melted of course ye Thermometer will rise; The diff. of latent & Specific Caloric is that ye latter is

Latent heat requires a change of State; it undergoes a change: hence it is called heat of fluidity or evaporization, the Phenomena of latent heat was found by Dr Black*, he found it by filling a Vial with Water, corked; boiled it, which soon ceased boiling from ye pressure of the air in ye Vial, the Consequence was that ye vapor could not be carried off, it was raised above the boiling point, then cork was suddenly withdrawn, instead of the water rushing out: it fell back to ye boiling point by the steam escaping.

1 ʒi of water in ye form of Steam contains more heat than fʒi of water at the boiling point (212 deg:).

Alcohol of Sulphur is better than Æther for producing evaporation, but evaporation will go on without the aid of these evaporating fluids. Water will actually freeze by its own Evaporation & much sooner in a potters Vessel that being porous.

If we take a tube, with a bulb at each extremity & let that tube be exhausted of all the air then wrap round one of the bulbs with Lint soaked with Æther or Alcohol of Sulphur, the water which is in the bulb will freeze experiments.—*Capacity* of bodies for caloric.—Changes of temperature produced by the condensation or rarefaction of elastic fluids.—Bodies ignited by the mere condensation of air.

2dly. In the state of *Latent heat*, also called *Heat of fluidity*.—Is that which is absorbed by bodies during their fusion or volatilization.—Account of some of Dr. Black's original experiments on the subject.—Experimental illustrations.—Cold produced by evaporation.—Cold produced by the solution of salts.—Heat evolved during the crystallization of salts.—Lavoisier's *Calorimeter*.—Application of the doctrine of latent heat to a variety of natural phenomena and artificial processes.

Of *Steam* in particular.—Distinction between *Vapour* and *Gas*.—Estimate of the elastic force of vapour.—Temperature of steam raised by increase of pressure.—*Eolipile*.—Papin's digester.—Application of steam to mechanical purposes.—Chemical history of the *Steam-Engine*.

Processes of *Distillation—Sublimation—Evaporation—Spontaneous evaporation—Hygrometer*.

Whether heat may be considered as existing in bodies in a state of *Chemical combination*, forming a third modification of combined caloric ?

The extrication of heat by *friction* and *percussion,* not distinctly referable to any of the other modifications of caloric.

## OF LIGHT.

Connexion between caloric and *Light.*—Nature of light.—Its *reflexion* and *refraction.*—Its *decomposition* into seven coloured rays.—These rays differ in their power of producing light.—They differ also in their power of producing heat.

Property of certain bodies to absorb light.—*Phosphorescence.*—Bolognian stone.—Canton's phosphorus.—Animal phosphorescent substances.—Luminous fish.—Glow-worm.—Lantern fly.—Rotten wood.

Connexion of *Light* with *Oxygen.*—*De-oxydating* effects of light.—Its effects on nitrat and muriat of silver.—Mr. Wedgwood's contrivance for copying paintings on glass.—Effects of light on the animal and vegetable economy.—Rays of light, which, though not discernible, produce chemical effects.

General considerations on the effects of HEAT and LIGHT in nature.

Mercury does not freeze until it reaches 39 degrees below Zero of Farenheit's Thermometer.

Soda Sulphas: 8 parts Nitr, 5 P. Ammoniac Sal 5 parts this produces an intense Cold this produces a temperature of Zero, Nitrate of Ammonia produces a great deg: of Cold when dissolved in water the Acids Diluted mixt with Snow produce a gr degree of Cold a temperature of 15 below Zero. If you fi a Phial with a solution of Soda Sulphas & exclude ye air from it by corking it closely, when you take out the Cork & expose ye Surface to ye atmosphere you will see it will suddenly Chrystallize.

# OF AERIFORM SUBSTANCES OR GASSES.

These consist of a solid ponderable substance or *Base* combined in a peculiar manner with *Caloric*.

The property of the resulting gas depends upon the nature of its *Base*.

Those not condensable at common temperatures, distinguished by the name of *Permanently elastic Fluids*.

Method of ascertaining the *absolute* and *specific Gravity* of gasses, and computing their volume under different circumstances of *Pressure* and *Rarefaction*.

*Elasticity* of the air.—Theory of the *Air-Pump*.

## *Of Oxygen Gas.*

Called formerly *Dephlogisticated, Pure, Empyreal,* or *Vital Air*.

Somewhat heavier than *Common Air*.—100 cubical inches at the temp. of 60 *Farenh.* and at 30 inches *Bar. press.* weigh about 33,8 grains.

Forms a constituent part of the *Atmosphere*—Serves the purposes of *Respiration* and *Combustion* in an eminent degree—Has a powerful affinity with a great variety of substances, particularly inflammable bodies, and when the new compounds are rapidly formed, *Caloric* and *Light* are frequently elicited.

Theory of *Combustion*—*Pyrophorus.*

To *Sulphur, Phosphorus,* and *Charcoal,* in the act of burning, it communicates *acid* properties; which are more or less distinct, as the combustion or decomposition of the Gas has been more or less complete.

The basis, therefore, of this fluid was formerly considered as the universally *Acidifying Principle,* and hence denominated *Oxygen*:—hence also the terms *Oxyd, Oxydation, Oxygenation,* &c.

The base of *Oxygen Gas* has a strong attraction for *Caloric,* but this is overcome or modified by the attraction of the particles of some solid substances.

It destroys the splendour and tenacity of the *Metallic Bodies* when they are exposed to it at a high temperature, and gives them an increase of weight proportioned to its own consumption: hence the modern theory of *Calcination.*

Take Alum Honey or Sugar treat it in Stone
mixing the day it first thin into a Phial
ut it in Sand & heat in the ordinary — putting
cork lightly in it taking care to cork it with
s little atmospheric air as possible

xygen combines in diff$^t$ proportions

ome Metals attract more Oxygen than others.
f Tin is Melted it attracts Oxygen most readily
when Lead is Melted its Surface becomes tarnished this
a process of oxydation
Platina Gold Silver have a feeble attraction for oxygen –
ence they retain their lustre a long time tho' exposed to y
ir –
f the Oxydes of Metals are heated with Charcoal we
then regain the Metal –

If Hyd. Calcinatum is heated in a retort, common air
ir first comes over. then Oxygen and if you
ontinue it afterwards you will obtain Quicksilver

he process of respiration important to y welfare of our Bodies
ayo the 1$^{st}$ who discovered the effect it produced on
tmospheric air – he thought that some actual Principle w
ken in in respiration. – Priestly worked on this & made
any experiments he found that an animal could only live
certain time in a certain quantity of air – we Shod
ou allow men to work in wells &c which have been
ut up for a long time without first sending down
Candle when if that burns the workmen may descend
ith Safety – Carbonic Acid Gas is given off from
ungs. Shewn by making Aq. Calcis cloudy. Oxygen
one will not Support life, its functions would go on too
apidly. Dr Priestly Shewed that the difference of Color in
rterial & venous blood is owing to the action of the Oxygen
hen venous blood is exposed to the Atmosphere the
xygen renders it in brighter red. When blood is shut up
n a bladder the Oxygen will act on it nevertheless

The frequency of inspiration is twenty

For every cubic inch of Oxygen given

When examining the air found they had lost so many cubic Inches of Carbonic Acid

Then absorbed all the Oxygen set that down
Set down also the quantity of Azote remaining

every cubic inch of Oxygen lost in respiration is replaced with as many cubic Inches of Carbonic Acid

Performed the same experiment on a Guinea Pig in a Mixture of Hydrogen & Oxygen it made the animal in half an hour Sleepy

During Sleep Mr Allen thinks the absorption of Carbonic Acid is less than it is when we are awake.

Mr Allen thinks a great deal of Oxygen is taken into the blood with a great deal of its Latent heat

Animal heat very much influenced

Cold blooded Animals decompose but little Oxygen Gas their circulation less rapid

The decomposition of Oxygen is greater in cold than in hot Climates

The 1st thing you do with a drowned person is to renew the circulation of the blood

The quantity of Carbon given off in 24 hours

All warm blooded animals require a greater atmosphere than the lower orders: thus frogs can breath under water but will die if kept long under

*Protoxyd*—the first degree of *Oxygenation.*

*Peroxyd*—the highest degree.

Importance of *Oxygen Gas* in the process of *Respiration*—Analogy between this process and *Combustion.*—*Carbonic Acid* the result;—for every cubic inch of *Carbonic Acid* formed, there is a loss of a cubic inch of *Oxygen* in the air respired.—Produces a remarkable change in *Blood:* hence the supposed function of the *Lungs,* and origin of *Animal Heat.*

Its purity best ascertained by exposure to a solution of *green Sulphate* or *Muriate of Iron* saturated with *Nitrous Gas,* or by mixture with the Gas itself: *Eudiometer.*

Obtained most readily from *Metallic Oxyds,* and compounds of the *Nitric* and other acids by the application of heat, and in a state of great purity from *Oxymuriate of Potash.*

## *Of Azote or Nitrogen Gas.*

Called formerly *Phlogisticated Air,* and *Mofete.*

Remains after the abstraction of *Oxygen Gas* from *Atmospherical Air,* by exposure of the latter to *Sulphuret of Potash,* to a mixture of *Iron Filings* and *Sulphur,* &c.

Obtained also by mixing *Oxymuriatic Acid* with *Ammoniacal Gas.*

When pure has a faint smell, but no taste, and is rather lighter than *Atmospherical Air.*

100 cubical inches, *Therm.* 60° *Bar.* 30° weigh about 30, 4 grs.

If inspired is instantaneously destructive of *Animal Life,* and extinguishes *Flame* ; but does not impede *Vegetation.*

Differs from most other *Gases* in being but in a small degree capable of absorption by *Water,* or by the liquid forms either of *Acids* or *Alkalies.*

Evolved in the decomposition of *Animal* and *Vegetable Substances,* of which it forms a constituent part.

When mixed in a certain proportion with *Oxygen Gas* and exposed to the *Electrical Spark,* it produces *Nitric Acid* ; and by union with *Hydrogen Gas* it forms *Ammonia*—from the former of these properties it takes the name of *Nitrogen.*

Of the means thought to be employed by nature to maintain a due proportion between this and *Oxygen Gas* in the composition of the *Atmosphere.*

Wallen tried by experiment how much he could diminish
Oxygen, when he had done this as far as was safe
er was found 7/10th of Oxygen

sh Can't live without Oxygen if you take the Oxygen
Same water by Distilling it and Covering its
surface with oil a fish in this water will not
live long.

hic Carbonic Acid Gas is always formed in respirat
getables are Constantly decomposing Carbonic Acid
pecially if they are exposed to light

c Conferva which covers Ponds &c if examined
th Microscope is a most beautiful object

To Obtain Oxygen

e Cheapest the Bk Oxyd of Manganese coarsely powdered
a little dilute Acid: Sulph: and apply gentle heat
Oz will yield 6 Gallons of Gas –
By dissolving Mercury in Nitric Acid – making
itrate of Mercury –
e Nitrate of Potash will yield it. Wedgwoods
tort is the best next to Glass –
e purest Oxygen Gas is got from Black Oxyd of
Manganese or Oxymuriate of Potash
rs of Oxymu: of Potash will yield a Cubic Inch of
re Oxygen – When getting it for delicate exp-
eriments it over Mercury – The process of getting
it Shd be conducted Slowly

By Oxygen Gas we Cannot melt Metals which
can't be readily melted in a Common furnace w
n may be readily melted by it. The end of the
blowpipe Shd be tipped with Pl

at 212 Water is attracted by heat & takes the form of Steam

Water can only be got pure by distilling it in a glass retort & then very slowly almost be able to tell the drops in

Water contains diff^t substances

Water in a slight degree compressible

ts component gass if made into a State of Vapo

and applied to it

Hydrogen has a strong attraction for Lime & [illegible] at some of [illegible] by throwing [illegible] Lime

## *Of Hydrogen Gas, or Inflammable Air.*

Found in a disengaged and impure state in *Coal Mines,* on the surface of *Stagnant Waters,* and rising through the waters of certain *Springs.*

Obtained also artificially from *animal, vegetable,* and *bituminous* matter by distillation; from *Essential Oils, Alcohol, Æthers,* &c. by the application of heat; and from *Ammoniacal Gas* by means of the *Electric Spark.*

But purest from the decomposition of *Water* by *Metals,* as above stated; or during their solution in *diluted Acids.*

When pure, between 11 and 12 times lighter than *Atmospherical Air:* hence the construction of *Aërostatic Machines.*

Smell adventitious.

100 cubical inches at a Temp: 60 *Farenht.* and 30 inches *Bar. press.* weigh 2. 8 grs.

Combined with *Oxygen* in the proportion of about 15 *Hydrogen* to 85 *Oxygen* by weight, it forms water, from the decomposition of which these fluids may be both obtained in a gaseous state, and therefore considered as its elements.

Hence the effects of *Water* in promoting *Combustion,* and in the *Oxydation* of *Metals,* &c. &c.

In the combustion of *Hydrogen* with *Oxygen Gas,* the purity of the resulting water depends on the slowness or rapidity with which the process is conducted.

On inspiration proves noxious to *Animal life,* apparently by the exclusion of the *respirable* part of the *Atmosphere.*

In its nascent state it is found to be capable of combining both with *Oxygen* and *Azote,* with the one producing *Water* as in the case of combustion, and with the other *Ammonia.*

*Carburetted Hydrogen Gas*—formerly called, *Heavy Inflammable Air*—procured by passing *Hydrogen Gas* over red hot *Charcoal*—afforded by subjecting *vegetables* and *Inflammable Substances* to a strong heat—different kinds of *Carburetted Hydrogen—Olefiant Gas—Gas Lights.*

*Sulphuretted Hydrogen Gas*—Methods of procuring—Combines with *Alkaline Bases*—Is absorbed by water—The solution precipitates some metals and not others.

*Phosphuretted Hydrogen Gas*—One of the most combustible substances known—Absorbable by water—Methods of procuring.

*Hydrogen Gas* is capable of holding *Arsenic* in solution.

ater may be decomposed by a Common Electrical
achine Take a Tube filled with water Cork it at
th ends & put a small gold wire thro' it letting the
communicate with an Electrical machine
ow employ a Zinc wire from its strong attraction
oxygen the water will become muddy.—
ter may be completely decomposed by making
Steam pass thro' a red hot Tube . . in which
ere there is piece of iron wire which attracts
Oxygen & the Hydrogen passes over & may be
lamed.

The inconvenience arising from Gas lights in a room
for it is not only unpleasant but unwholesome—

Hydrogen will take up Sulphur forming Sulphu
retted Hydrogen gas To procure this pour a small
uantity of Diluted Muriatic Acid on a small
ortion of Sulphurated Potash it is Sulphurat
Hydrogen which is so offensive in Common Sewers
itches &c it is very Volatile . The bad smell of Sewers
&c Mr Allen says may be abated by Quick Lime
Phosphorus Combined with Hyd: forming Phosphu
-retted Hydrogen Gas it is made by putting a
piece of Phosphorus in Hydrogen gas directly
the Gas is exposed to Oxygen it becomes
a Compound of Phosphuret of Lime when put
in the Water it will take fire

Hydrogen can hold a portion of Arsenic in
it, it is produced by pouring
on Zinc

Nitrous Oxyd Gas can't be respired longer than four Minutes without losing entirely voluntary Motion. Some persons after taking it are remarkably grave & sullen. Some are very lively and in fact almost deranged

Inflammable Substances require a higher temperature to burn in this Gas than in Hydrogen a Piece of Sulphur must be heated some time before it will burn in the Nitrous Oxyd Gas.

To procure this Gas take Nitrate of Ammonia which consists of Ammonia (Compound of Hydrogen and Azote) Nitric Acid (Compound of Azote & Oxygen) the result will be by distilling this Salt we shall have ..

Phosphorus will readily decompose this Gas and burn most splendidly.

## *Of Nitrous Oxyd Gas.*

Procured from the decomposition of *Nitrate of Ammonia* with a gentle heat. Consists of *Oxygen* and *Azote* in intimate union. In some of its properties resembles *Acids*.

100 cubical inches at a middle temperature and pressure, weigh about 50 grains—Is decomposed by combustible substances at a very high temperature—Soluble in double its volume of *Water*, to which it communicates a sweetish taste.

Most inflammable substances require a high temperature to burn in it—Is not acted upon by *Nitrous Gas*.

Remarkable for the intoxicating effects which it produces in respiration.

❋

## OF SALTS.

These characterized by being *sapid* or of a *saline taste* and readily *soluble* in water; further remarkable for their disposition to act on, or to be acted upon by most other substances, as also for the regularity of the forms which they are in most instances found capable of assuming—*Crystallization.*

Their solution in water for the most part accompanied by a diminution of temperature; hence the usual means of producing *artificial Cold.*

On exposure to air generally either receive or impart moisture: hence said to be *deliquescent* or *efflorescent.*

When heated, the greater number undergo either *watery* or *igneous Fusion*—some are volatalized, and many more or less completely decomposed.

They are divided into *simple* and *compounded* —the more simple are *Alkalies* and *Acids*—the compounded, such as result from the union of these with each other, *Neutral Salts,*—or of the acids with earths and metallic oxyds, ***Earthy*** and *Metallic Salts.*

In Some Salts there is a great portion of Water In Alum there is a very large portion of Water In Sal Rochelle there is also a large portion f water

The particles of a Saline body having a dispo-tion to attract each other they enable us to urify the Salt

If we have a Solution of a Saline substance all e have to do is to apply heat to evaporate the water hen on suffering it to cool Chrystals will form f you evaporate to much of the water the Chrysta ill be irregular the appearance of a Pellicle is sign that Chrystalls will form. when the tempe-rature of the Solution, is down to the Tempera-ture of the laboratory you will know that the roceſs of Chrystallization is finished - In he Veſsel it is situated place pieces of Sticks croſs the Veſsels for the Chrystalls to form i. — If the Chrystalls are Colored you have ly to diſsolve these Chrystalls again in Water nd evaporate it again when you will obtain lear Chrystalls. — Chrystallization also affords s an opportunity of Separating different Salts hich are not readily soluble in Water, by Evapo-ating it cautiously you will easily Separate hem. — The Most soluble will Chrystallize first

We can make Salts Chrystallize directly on applying some Substance which has - Strong Attraction for Water. Take a Solution of Sulphate of Potash & pour a little Alcohol into it when a precipitation of Chrystals will take place

Some Salts some Salts will alter the Chrystallized form, by being exposed to the Air The Sulphate of Potash will effloresce. Caustic Potash will Liquefy.

Some Salts may be Sublimed. Some Salts are decomposed by heat: Saline Substances form 2 grand Division: Simple & Compound

We have          earthy Salts, & Metallic Salts.

To know an Alkaline Solution take a piece of Paper which has been dipt in Turmeric . it will Change its Color  Syrup of Violets will change it green –  The different Alkalies have no action on each other . They have a Strong attraction for Moisture . A good test for Alkalies is a bit of Litmus paper reddened by Vinegar if it be dipt in that State into an Alkaline Solution it will recover its blue Color

Alkalies in their pure State Combine with Oils & forming Soap

The Alkalies have a Peculiar effect on Animal Matter therefore they are Called Caustics When Combined with Acids this power is destroyed . The term till lately was confined to these 3 Substances Potash, Soda & ammonia but it is now found to be in many other Substances,

## OF ALKALIES.

Distinguished by a pungent, and lixivial or urinous *Taste,* and by changing most vegetable *blue* colours to *green,* and many of the vegetable *yellow* colours to *brown.*

Have a strong attraction for *moisture.*

Produce no alteration on each other, but manifest an extensive disposition to unite with other bodies. With *Acids* they constitute *Neutral Salts.*

They precipitate from their solutions most of the *Earths,* and all the *Metallic Oxyds,* several of which they are capable of re-dissolving.

With *unctuous substances* they form *Soaps;* with *Silex* and *Alumine* various kinds of *Glass* and *Porcelain;* with *Sulphur, Alkaline Hepars* or *Sulphurets.*

The substances most perfectly *Alkaline* are *Potash, Soda,* and *Ammonia.*

The two former, till lately considered as simple bodies, but discovered by Professor Davy to consist of peculiar *Metallic Bases* combined with *Oxygen.*

*Ammonia* remarkable for its volatility in a moderate temperature—a compound of *Hydrogen* and *Azote.*

Many of the *Earths* also have distinct alkaline properties, more especially *Barytes, Strontian* and *Lime*.

## *Of Potash.*

Form, *concrete*.. Taste, *extremely pungent, Caustic*. Colour, *white*. When perfectly dry, is a non-conductor of *Electricity*. In this state consists, according to the experiments of Professor Davy, of a peculiar metal *Potassium*—combined with *Oxygen* and a portion of *Water* intimately combined.

*Potassium* is considerably lighter than *Water*—rapidly absorbs *Oxygen*—is capable of two states of oxidation, *Protoxyd* and *Peroxyd*—exists in the latter state in *Potash*—is soluble in *Hydrogen Gas*—combines with inflammable substances—and forms alloys with metals.

*Potash* appears to be a constituent part of most *vegetable* substances; it is also found to enter into the composition of several *minerals*. Usually obtained from the ashes of the former in the state of *common Potash*, by elixation in water and evaporation to dryness; or in that of *pure Potash* by subsequent treatment with *Lime*.

Potash is a part of most vegetable & mostly
mineral bodies it acts in its pure
state as a caustic on the addition of
moisture to it heat is evolved: it turns
vegetable blues to green.

xposed to a strong heat it melts & may
be poured into moulds. Its powers on
Substances depends

It is procured from all vegetables by combustion
& putrefaction. In very woody Countries
rees are cut down to make potash
the wood is burnt. the Ashes of it con-
tain potash by pouring water on the
[illegible] produces a strong Solution of
Potash this is evaporated & which
forms Potash. In the boughs of the
tree & small Succulent twigs there
is the greatest Share of Potash.
Many of the weeds in England have Potash
in it. Common Fern: Fumitory &c

will yeild Potash by burning. Wormwood will also yeild Potash by the Same Process Pearl Ash is the common Potash purifyed by breaking it into Small pieces exposed to heat & the Salt is made red hot .. The Oxygen of the Air takes away the Carbon Hydrogen .. and the Substance becomes white forms the Pearl Ash.

In order to Obtain Potash pure Take Pearl Ash lb 3 & 4 lbs of Quick lime add to them 3 or 4 times their weight of water Chalk would be formed

we should have a Solution of Caustic Potash this Solution being evaporated in a Clean iron vessel will form the common caustic Potash -- It is purified by adding Alkohol which has only the property of destroying the Caustic Potash.

The Oxides of Some Metals are Soulable in Potash the Oxide of tin is Souluble Oxide of Iron is not.

It has the Power of acting on flint &c it will render them Soluble in Water.-

Until Potash was thought an elementary
ubstance, not being able to decompose
t. But Mr Davy decomposed it by the
Voltaic Battery — Potassium is a Metal
t will amalgamate with other Metals
alloy it will when put into water decom-
pose it and render it Alkaline which may
e known by dipping a piece of Turmeric
aper into it

00 of Dried Potash contain

Hydrogen Gas may be produced by putting a piece
f Potassium into it — it is Capable of 3 States of
ydation The sub oxydate which is made by
utting a small piece of Potassium & expose to the
ir from which 1st it will absorb oxygen. 2nd form
Duoxyde. — 3 Peroxyde which is yellow
Potassium has a very powerful attraction for Oxygen
Put a small bit of Potassium into a retort
exhaust by the Air Pump successively and put
nto the retort some Oxygen which is heated by a
amp of Spirit, by this means you will obtain
e Peroxyde of Potassium from which comes
Contact with Potassium will become an alloy &
l look like Tin

Potassium has no action on Muriate of Potash

Potassium will decompose Glass
When heated in Hydrog: it forms an Hydrouret

Has a strong attraction for *moisture.*

On solution in *Water* produces an increase of temperature *(Liquor Potassæ* P.L.*)*

Combines with all the *Acids,* and in most instances with a force of attraction superior to that of any other substance.

Fusible in a moderate, and volatile in an intense heat. Is decomposed in a high temperature by *Iron.*

Promotes the fusion of *earthy Bodies* and of *metallic Oxyds*; hence the preparation of different kinds of *Glass.* Unites with *Sulphur,* and renders it soluble in water *(Potassæ Sulphuratum* P. L.)

Dissolves several of the *Metallic Oxyds.* The comparative forces of attraction under all circumstances by no means exactly ascertained.

The order of the attraction of this alkali, in the moist way, *Sulphuric, Nitric, Muriatic, Phosphoric, Fluoric, Oxalic, Tartaric, Arsenic, Succinic, Citric, Lactic, Benzoic, Acetic, Boracic, Sulphureous, Carbonic and Prussic Acid; Water, Unctuous Oils, Sulphur, Metallic Oxyds*; in the dry way, *Phosphoric, Boracic; Arsenic, Sulphuric, Nitric, Muriatic, Fluoric, Succinic, Formic, Lactic, Benzoic,* and *Acetic Acid, Baryt, Lime, Magnesia, Alumine, Silica, Sulphur.*

Sometimes prescribed internally in solution; in the concrete form frequently employed as a *Caustic.*

## *Of Soda.*

Its *Form, Colour, Taste, Causticity,* &c. nearly the same with those of the former *Alkali.*

Consists, according to Professor Davy, of a peculiar *metallic Base* called *Sodium,* combined with *Oxygen.*

*Sodium* lighter than water, but heavier than *Potassium.* Other particulars in which these two metals differ.

Found in great abundance in the mineral kingdom, particularly in combination with *Muriatic Acid.*—Obtained, in a pure or caustic form, from *Carbonate* of *Soda,* by means of *Lime,* as pure or caustic *Potash* is from *Carbonate of Potash.*

*Soda* has an equally extensive disposition to combine with *Acids* as *Potash.*

Acts powerfully on the *Earths,* and *metallic Oxyds*; also unites readily with *unctuous substances*; hence the preparations of *common Soaps.*

Order of attraction of this Alkali, the same as that of *Potash.*

It is impossible to distinguish this from the
ast Alkali from its external appearance
t will turn vegetable blues green.
t can only be d          from Potash by its
hemical Combinations. It has a stronger
ttraction for Acids than ~~Sod~~ Potassium
he Oxymuriate of Platina does not occasion
precipitation in a Solution of Soda but
does in a Solution of Potass.. Soda like
otass appears to Solidify a portion of water
raises the thermometer Soda has been
lled fossil or mineral Alkali it is diff.
find an animal or veget: Substance without a
rtion of Soda. It is procured by Burning
arine Plants. which is annual it grows in
Mediterranean. It is melted into a sort of
rge Masses which is called Barilla then
Soda Subcarb: in this last Substance
t which comes from Spain is best
p is obtained by burning Marine plants
generally has but a small portion of
kali. 101 Grains of Acid will Saturate 50
ins of Barilla As used in Manufacture
t it does not Contain much
Soda

but combined with Carbon A
Soda is never found pure; It is found in
Egypt. & on the Shore of Persian & other
hot Countries

Various Processes have been made to obtain it from Common Salt. To obtain it take Sod: Subcarb: ℔ 4 add ℔ 2 of Quick lime 2 Gallons of Water Lime takes the Carb: Acid. we have a Solution of Caustic Soda which being boiled down when it is evaporated in the same manner as you would other Saline Substances It may be purifyed by Alcohol —

It decomposes Water & gives off Hydrogen Gas exactly as Potassium does.

Its Chemical Properties are much the same as those of the Potassium, last mentioned

It is capable of 3 States Suboxyde. 2d Deutoxyde 3rd State the peroxyde. —

25 Oxyg 75 Sodium in 100 Parts of Sod

apable of 2 States of Oxydation

uboxyde & Peroxyde

o know the quantity of real alkal

n a quantity

eight 100 Grains Lye water

t with water & wash it

ver until you have diſsolved

e the alkali, Then take Nitri

id and keep dropping it in

efully until you have brought

to the neutral point

x 2 Pounds of Lime 4 Pounds

Barilla Pour on 2 Gallons of

oiling water, when you will

ave a strong Solution of Potash

hen you evaporate & pour it

to Moulds

Dr Priestly obtained it first in a Gaseous
State

Ammonia exists only in the Gaseous form
Consisting of Hyd & Azote Specific Gr.
less than that of Common Air 100
Cubic Inches weighs not quite 18.

Ice is quickly Melted by Ammoniacal Gas on account
of its affinity for Water Ammoniacal Gas is
2 Parts 1 Part
procured by a Mixture of lime & Muriate of Ammon
and put it over a Spirit Lamp. the lime
combines with the Muriatic Acid & forms Muriat of
A taper will not burn in Ammoniacal Gas
but sometimes there is a yellow flame
Ammoniacal Gas may be decomposed by passing
Electric Sparks thro it — When you wish to
have it very dry Put into it a
Small piece of Caustic Potash

It will combine with all the Acid Gases passing
from the Aeriform to the Solid State &
fill a Phial with Muriatic Acid Gas and afterwards you can put a Similar quantity of Ammoniacal Gas without increasing its volume
forming Muriate of Ammonia or Sal Ammoniac.
The Ammoniacal Gas has a Caustic taste & pungent
& is destructive to Animals made to Respire it
Spirit of Wine Absorbs this Gas as well as Water
The Liquor Ammonia should be Stopt Closely —
it is Simply Water which has Combined
with a Large quantity of Ammonia &c.

hlt Chlorine or Oxymuriatic Gas
ny Strong action takes place
mixed with the Ammoniacal
s — it causes a flash of Light

## Of Ammonia.

Form *gaseous*.—Smell extremely *pungent*.—*Caustic*.—*Azotic*.—Lighter than *Atmospheric Air*—100 cubic inches weigh 18,67 grains—Experiment of Professor Berselius, shewing its metallic basis.

Is absorbed both by *Water* and *Alcohol*; by the former with great rapidity, producing an increase of temperature and bulk *(Liquor Ammoniæ* P. L.*)* On the contrary, *Ice* dissolved in this fluid, produces cold.

Is in a slight degree *inflammable*.

Obtained from the distillation of *bones* and other kinds of *animal Matter*, but purest from the decomposition of *Muriate of Ammonia*, by *Potash*, *Soda*, or *Lime*.

May be decomposed in various ways; as by exposure to *Heat*, by the *Electric Spark*, in the reduction of *Metallic Oxyds*, by the distillation of *Nitrate* of *Ammonia*, &c. yielding in some cases *Hydrogen*, in others *Azotic Gas*: which gasses by particular modes of combination have been found to reproduce it, and are therefore considered as its elements.

Agrees nearly with the other *Alkalies* in the order of its attraction, both in the humid and dry way.

l Animals is always formed when
imal Substances are distilled

## OF ACIDS.

Appear in general to consist of *Combustible Substances* in union with the base of *Oxygen Gas,* the proportion of which in most cases determines the degree of *Acidity.*—Several of them the immediate result of *Combustion.*

Distinguished by being *sour* to the taste, changing vegetable *blue* colours to *red,* and by their extensive power of combining with other substances.

The properties of the individual *Acids* dependent on the nature of their respective *Bases:* the stronger the attraction of their Bases for *Oxygen,* the less intense in most instances their *Acidity.*

All unite readily with water. *Diluted Acids.*

In combination with *Alkalies* form for the most part what are called *Neutral Salts;* with *Earths* and *Metallic Oxyds, Earthy* and *Metallic Salts.*

Most of the acids *antiseptic.* Some powerfully *corrosive.*

Admit of different distinctions—from their form, into *solid, liquid,* and *gaseous;* from their

The peculiar Smell of Harts horn arises from a
ortion of Empyreumatic Oil. this makes it diff
from Liquor Ammonia; Ammonia is contain
n various Vegetables in the Class Tetradynamia as
abbage &c  Ammoniacal Gas may be obtained from
ommon Soot &c  To procure it from Animal
ubstances a large iron Vessel is used by the Manu
factories of it when the bones by burning have
become quite white they look as if they contained
othing but bony Substance. The first thing
he Manufacturer does is to break down the bones
nd boiled, put into the iron vessels from which
pes are going to three Cysterns and these again
with Casks which receive the Ammoniacal
Gas

Tin Filings which has a powerful attraction for Oxyg
Moisten it with a little Nitrate of Copper: The Zinc in
the Tin Filings Combines with the Nitric Acid.

y throwing in a little quick lime you decompose

he Test for Ammonia is to Moisten a bit of Glass with
uriatic Acid & it will produce white fumes.

portion of Ammonia is evolved when urine rests
n the Open air   Ammonia Combines with
il & animal & Vegetable Mucilage forming
n imperfect Soap  Eau de luce is made of Oil of
iquor Amm: Tc Mast: ʒij Ol: Lavend: Mxxxx Spt vin

Pure Ammonia acts only the Metals when they are in a State of Oxyde (that is without you admit Oxygen) Copper put into Liq: Ammonia and expos'd to the Air it attracts Oxygen, and changes its color;: but if it is excluded from the Air it is not acted upon

Sebeck of Jena in 1808 discovered that Mercury was acted upon in a curious manner by Subjecting it to Galvanic Influence in a piece of Carb: or Muriat of Ammonia, an amalgam is formed the Mercury extending itself & combining with $\frac{2}{7}$ ~~Hydrogen~~ Ammonium

more usual and abundant sources, into *mineral, vegetable,* and *animal;* into such as have *simple,* and such as have *compounded* bases.

The more important of the *Acids* are, the *Sulphuric, Nitric, Muriatic, Carbonic, Fluoric, Boracic, Acetous, Tartareous, Oxalic, Gallic, Phosphoric* and *Prussic.*

## *Of Sulphuric Acid.*

Formerly called *Acid, Oil,* and *Spirit of Vitriol.*

Long considered as the *Universal Acid.*

Seldom found uncombined.

Obtained artificially from the rapid combustion of *Sulphur,* or of a mixture of *Sulphur* with *Nitre,* or from the distillation of *Sulphate* of *Iron.*

Concentrated afterwards by *boiling.*

When pure, *limpid, ponderous, unctuous, inodorous,* and intensely *sour.*

Specific gravity nearly double that of *Water.*

Has a powerful attraction for *Moisture,* and on mixture with *Water,* occasions a remarkable increase of temperature.

When volatilized by the higher degrees of heat, it assumes the form of a dense white vapour, the first portions of which sometimes congeal if exposed to a moderate cold. *(Glacial Oil or Acid of Vitriol.)*

By treatment with *Combustible Substances* is generally more or less discoloured, and may be either deprived of a portion of its *Oxygen,* and thereby made to assume the form of *Gas,* or totally decomposed and reduced to its original basis, *Sulphur.*

The properties of *Sulphureous Acid Gas,* which may be also prepared by the *slow* combustion of *Sulphur,* in many respects different from those of the *common Acid*; its compounds therefore differently denominated. *Sulphite of Potash,* &c.

The *Sulphuric* superior to most *Acids* in its *Power* of *Attraction* for other bodies.

Independently of its *Water,* supposed to consist of 42,3 parts of *Sulphur* and 57,7 of *Oxygen.*

The order of its attraction *Barytes, Strontian, Potash, Soda, Lime, Magnesia, Ammonia, Alumine, Metallic Oxyds, Water, Alcohol.*

Combined with *Alkalies* it forms:

1st, *Sulphate of Potash* (*Potassæ Sulphas* **P. L.**) usually prepared from the saline mass which remains after the distillation of *Nitric Acid.*—Form, hexangular prisms with hexahedral pyramids—prism frequently wanting.—Taste, *saltish*

*bitter.*—Difficultly soluble in water; also very difficult of fusion—May be decomposed either in the *moist* way by *Barytes,* or in the *dry* way by calcination with *Charcoal.*—100 parts consist of 42,2 of *Sulphuric Acid,* 50,1 of *Potash,* and 7,7 of *Water* —Application chiefly *medical.*

*Super Sulphate of Potash*—crystallizes in slender needles or hexangular prisms—soluble in five parts of water, contains twice as much acid as the sulphate. (*Potassæ super Sulphas* P. L.

2d. *Sulphate of Soda* (*Sodæ Sulphas* P. L.) obtained by solution and crystallization from the matter left behind in the preparation of *Muriatic Acid, Muriate of Ammonia,* or *Muriate of Quicksilver.* Is also found native in many mineral springs. Form of its crystals, *hexangular prisms with dihedral summits.*—Taste, *bitter.*—Effloresces on exposure to *Air.*—Readily soluble in *Water.*—When exposed to *Heat,* undergoes watery fusion. May be decomposed in the same way as *Sulphate* of *Potash.*—100 parts consist of 23,52 *Acid,* 18,48 *Soda,* 58 *Water.*—Used only in *Medicine.*

3d. *Sulphate of Ammonia* , obtained by the union of *Sulphuric Acid* with *Ammonia,* on the addition of diluted *Sulphuric Acid* to liquid *Carbonate of Ammonia.*—Form, *crystalline.*—Taste, *bitter, pungent.*—Easily soluble in *Water*. *Fusible*. *Volatile.*— Employed principally in the manufacture of *Muriate* of *Ammonia*.

*Sulphuric Acid* forms also with the *Earths* and *Metallic Oxyds*, particular compounds, to be hereafter spoken of under their respective heads.

Employed principally in *Dying*, *Bleaching*, *Tanning*, *purification of Oils*, and *in Medicine*.

## *Of Nitric Acid.*

The basis of this *Acid* is *Azote*—consists of *Nitrous Gas* or *Nitric Oxyd*, and *Oxygen*.

100 parts of *Nitrous Gas* consist of 43 *Azote*, 57 *Oxygen*.—100 cub. inches weigh 33,92 grains. Partly absorbed by *Water*—effects on animals—and on combustible substances—decomposed by the *Electric Spark*—also by *Sulphurets* and some of the *Metals*—means of procuring—test of its purity—reproduces *Nitric Acid* by the addition, and furnishes pure *Azote* by the subtraction of *Oxygen*.—100 parts of dry *Nitric Acid* said to consist of 68,06 *Nitrous Gas* and 31,94 *Oxygen*—or about 29,5 *Azote* and 70,5 *Oxygen*.—*Nitric Acid Gas* rapidly combines with *Water* and

# Nitric Acid

In the Nitrous Oxyde the Oxygen is in a State of Condensation. It consists of 1 Measure of xygen and half a Measure of Azote

zote can exist in a diff state that is it can take more xygen Gas.

ual Measures of Oxygen & Azote form Nitrous Gas

2 Vol: 100

itrous Gas when in Contact with Oxygen absorbs it apidly and forms Nitric Acid: Nitrous Gas is sily made by Pouring on Quicksilver Nitric Acid.

Phosphorus will burn Splendidly in ~~Nitric Acid~~ Nitrous Gas

There has been much diff: of Opinion concerning th
quantities of Nitrous Gas & Oxygen to form Ni
Acid: Mr Allen thinks it as above Mentioned
If you put a large quantity Oxygen the Acid i
Blu
n diff$^t$

Nitrous Acid Gas diff$^t$ to procure as we know
known a Substance to Confine The only wa
to get is to take a Glass that has a ground g
Stopper exhaust it  it has a very Strong
Attraction for water vap
It is heavier than N. A. Gas 100 Cubic Inches weig
75 Grains. - It is procured from 1 Part
of Acid Sulph: Potass: Nitras 2 Parts
The Lute employed on these occasions sho
be the fat Lute

Nitric Acid is readily procured by 60 Parts of Pot: Nitra 29 Parts of Concentrated Sulphuric Acid: Lute Wolfe Apparatus together: In the Process of Distillation the heat Should be very moderate otherwise when the Salt becomes fluid it will be thrown out of the retort and perhaps break the receivers: you Get more Nitric Acid by a Slow Process. — if you wish to get every portion of Acid you must use a larger portion of Sulphuric Acid: to the same portion of Potass: Nitras. In large Manufactories they use Iron Vessels for the Preparation of Nitric Acid: this process will procure it suff: pure for the Dyer &c but for Nice Chemical Experiments it is not fit for it contains a portion of Acid: Muriat: which by pouring into it a Solution of Nitrate of Silver when there will be a Cloud: if there is Sulphuric Acid: the Nitrate Baryt will discover it by a Cloud being formed: The Residuum in all these Cases will be Potass: Sulphas

If Acid: Nitr: is exposed to the air & light it will be deprived of part of its Oxygen therefore reduced to Nitrous Gas. it becomes Colored: but it may be restored by Distillation but this will decompose it and lessen the quantity Nitric Acid will boil when diluted at 219 or 220 but when Concentrated it will not boil till the thermometer rises to 240.

0 - Temper of 248 to Boil
Parts of it containing 150 Parts of real Acid &
Parts of Water

forms *liquid Nitric Acid.*—100 parts spec. grav. 1,5 consist of 91,55 *Acid* and 8,45 *Water.*

Obtained from the decomposition of *Nitrate of Potash* by *Sulphuric Acid,* or by *Sulphate of Iron.*

Purified by re-distilling it from a fresh portion of *Nitre,* or by the addition of *Nitrate of Silver* and of *Baryt.*

In its common form, of a *yellowish* or *orange* colour: when pure, altogether *colourless.*

More *volatile* and less *ponderous* than *Sulphuric Acid*—its *Acidity* equally intense—attracts *Moisture* also from the atmosphere. (*Acidum Nitrosum dilutum* P. L.) *Aqua-fortis.*

Destructive, more immediately than the *Sulphuric Acid,* of the life and texture of bodies to which it is applied.

On mixture with *that Acid* communicates to it the property of dissolving silver: *Aqua Reginæ.*

Experiments of Cavendish and Milner on *Nitric Acid*—its spontaneous production by processes of nature.

Nitric Acid dissolves all the *Earthy Bodies* except *Silica.*

In its action on the *Metallic Bodies,* it is decomposed to a greater or less degree according

ces containing
s Sulphur
ent part
an acid
of Silver
st acid of
the other
a stronger
Acid when
many
dissolved
ly by
ng it

to their capability of uniting with a larger or smaller proportion of its *Oxygen.*

Similar effects produced on it by *Charcoal, Phosphorus, Sulphur,* and most other combustible substances; as also by exposure either to *Light* or *Heat.*

Hence the difference, if any, between *Nitrous* and *Nitric Acid,* and the formation of *Nitrous Gas,* and *Gaseous Oxyd* of *Azote.*

In some instances, the reciprocal action such as to occasion immediate inflammation, as on mixture with *Essential Oils.*

Combined with *Alkalies* it forms,

1st. *Nitrate of Potash (Potassæ Nitras* P.L.) Obtained in the East Indies and other countries, by the elixation of certain soils, in which it is either spontaneously and repeatedly produced by their exposure to Air and Light, or formed upon the addition of *Potash.*—Those soils more especially productive which abound in vegetable and animal matter that has run into a state of putrefaction.—Freed from extraneous saline matter by repeated crystallization.—Form of its crystals *prismatic.*—Taste, *cold, saline, penetrating.*—Much more soluble in hot than in cold water.—In a moderate heat it undergoes watery

Davy is of opinion when Nitric Acid is combined
with a base the proportion of Oxygen one
nd a half.

Nitric Acid is more immediately active on
bodies than Sulphuric Acid. & when mixt
with the Sulphuric Acid gives the power
of dissolving Silver. Nitric Acid Stains
the Cuticle when applied to it and destroys
it — Cavendish mix'd 5 Part of ~~Azote~~ Oxygen
in a Tube
to 4 parts of Atmospheric Air. When he
& Caustic Soda
introduced a portion of Soap leys
& taking thro' it Sparks of electricity
& dipping paper into the Solution which
Soap leys he found is much altered.

Milner procured Nitric Acid from the black
oxyde of Manganese & ammonia. The
Powdered put into a Porcelain Tube

Nitric Acid may be decomposed by making a
with Iron Turnings
Tube in the middle red hot which has a
strong attraction for Oxygen and this Tube
communicating with a retort in which
there is Nitric Acid. when heat is applied to
the retort, Nitrous ~~Acid~~ Gas will be procured.—
As heated if done slowly another portion of Oxygen
is taken & you in the Nitrous Oxyde & if done
suddenly you procure nothing but Azote
Nitric Acid may be existing in old rubbish but it may
be decomposed. it yields no inconsiderable
ntity of Nitric Acid. The Soil on which sheep
have folded will yield no inconsiderable quan

Charcoal powder when dropt into very
very good
Strong Nitric Acid will produce Sparks of
Nitrous
fire. Nitric Acid. should be never kept in
large quantities for it is a Dangerous material.
it is so very Combustible; its capable of Setting
to Straw & the mixing of it is that its impossible
to procure Nitrous or Nitric acid Gas therefore
[illegible] go to Rest the fumes arise
Essential Oils will be immediately decomposed
by Nitric Acid: as Ol: Terebinth: — the Essen
Oils consist of Carbon & Hydr: principally
The Salts formed by Nitric Acid are Nitra

Nitric Acid will dissolve all the earths except
Silex

you may always know a Nitrate by heating
it it will yield Oxygen .--

Nitrate of Potash when ignited is a go
test for Carbon its always occa
a detonation

The Goodness of Gunpowder is very dependa
on the Charcoal to make which the Alder
Willow &c are preferred.

In Purifying Nitrate of Potash you must take
are not to apply the heat too long but pour it
ult in thin Pans it ans[illegible] & it never Chrys
llize

Melted Nitrate of Potash is an excellent test
for Carbonaceous Matter. Take a little of it
nd pour it on Charcoal when it will exhibit
pleasing Phenomenon arising from its
trong attraction for Oxygen. By a combi-
nation of these two Substances Gunpowder
Made The parts 75 Salt Petre 15 Charcoal: Sulphur
Parts. Salt Petre is fused: Charcoal should be very good
is best made in Iron Cylinders not in ye Common Method
itrate of Potash may be decomposed by Sulphur
d Metals as well as by Charcoal.

having provided pure Ingredients. The Salt Petre
Charcoal & Sulphur: is all ground to a fine
owder (but separately) they are all mixt
a Vertical Stone working on an horizon
l one – If by accident it explodes at ye
ginning of the Process it will not explode
ry violently, but more so when the pro
ss in nearly finished: When thus
prepared it is pressed into a cake by
Pressure, it is then broke into small
ces – and Sifted into pieces of the Size
ye Common grains of Gunpowder: These grains
re Dried afterwards: it is now
ometimes dried by Steam. As Sulphur

When Gunpowder is good it will explode from off paper without making any Mark on the paper. —

12 Grains of Gunpowder in exploding will lift a very Considerable weight 8000 Pounds ex
Grains exploded in a proper apparatus
In detonation evolution of Carb Hyd - Az
be very little water formed on the exp
of Gunpowder

Nitric Acid: Combined with Soda forms Nitrate of Soda it resembles very much Nitrate of Potash it Chrystallizes in Cubes

Nitric Acid Combined with Ammonia forms Nitrate of Ammonia:

when Chrystallized it is a six sided Prism

Soluble in twice its weight of Cold water & half its weight in boiling water

Nitrate of Ammonia: should never be kept in Metallic Vessels: 1 part of the Salt and 2 parts of Nitric Acid: will form a fluid Capable of dissolving Gold.

ating Potash tends to form Prussiate of
Iodin

fusion (*Salprunellæ*).—An increase of the heat produces a decomposition of its *Acid*, the *Alkali* remaining unchanged.—May be more rapidly decomposed by the addition of *Charcoal*; hence the preparation of *Gun-powder*.—When decomposed in the moist way, by treatment with the *Sulphuric*, furnishes *Nitric Acid*.—100 parts dried at 70 *Farenh.* consist of 44 of *Nitric Acid*, 51.8 of *Potash*, and 4.2 of *Water*.—Used extensively in *Glass-making*, *Metallurgy*, preparation of *Gun-powder*, and for *dietetic* and *medical* purposes.

2d. *Nitrate of Soda*, called formerly *cubical* or *quadrangular Nitre*. In most of its properties resembles the former.

3d. *Nitrate of Ammonia*; obtained by slow evaporation, from the combination of *Nitric Acid* and *Ammonia*.—Form, *crystalline*.—Taste, *cool, bitter, urinous*.—*Deliquescent*.—Easily *fusible*.—Under cautious distillation, yields *Gaseous Oxyd of Azote*, *Nitrous Gas*, and *Water*; but detonates when suddenly heated.

The *Order* of *Attraction* of this acid, the same as that of the *Sulphuric*.

Chief uses, in *Dying*, *Etching*, and *Assaying*; and sometimes employed in *Medicine*.

## *Of Muriatic Acid.*

Obtained by decomposing *Muriate* of *Soda,* by means similar to those employed in the preparation of the *Nitric Acid.*

Its purest form *Gaseous.*

In this state heavier than *Atmospherical Air* ; 100 cubic inches at mean pressure and temperature, weighing 39 grains ; of a pungent *odour* ; *irrespirable* ; destructive to *Flame,* imparting to it under extinction a bright green colour ; inflames the skin without discolouring or corroding it.

Formerly supposed to consist of an unknown radical intimately combined with *Oxygen.* Late researches of Professor Davy, by which this doctrine is controverted.

When dry has no action on the *Metals,* nor on any other of the *Combustible Substances.*

Exposed to a moist atmosphere it becomes *cloudy*—Is readily absorbed both by *Water* and *Ice,* the latter of which it liquefies : in either case it occasions an increase of *Temperature* and augmentation of *Bulk,* communicating to the water the general properties of an *Acid* (*Acidum Muriaticum* P. L.)

# Muriatic Acid

is one of the Component parts of Muriate
Soda —

many attempts have been made to decompose
t. It is obtaind from Salt by Sulphuric
id, in order to procure eight rip
Pounds of Common Salt put it into
retort Connected with Woolfs
lp: then Put in Pounds of Water
Pound of Concentrated Sulphuric
id: which is put into the Retort
th the Muriate of Soda. —

this way you may procure it tolerably
ure: The Muriatic Acid in large Manu
actoris is Made in large iron vessels
it will answer very well for their
urposes but it is not good enough
r Chemical purposes: The Muria
tic Acid Contains Iron it is usually
a brown Colour

ater can take up: as much as 400 volumes
bulk of Muriatic Acid: Gas

The Muriatic Acid in its purest form is in yᵉ State of Gas:

This gas extinguishes a taper & unfit for respiration You procure this Gas by taking 2 parts of Com: Salt heat it you then put this Salt into a retort & then pouring on it a little Sulphuric Acid: and apply a Gentle heat when you May by means of a bladder Collect this Gas: –

This Gas when applied to Combustible Substances does not have a very Considerable effect.

The liquid Muriatic Acid will readily dissolve most of the Metals especially if it is exposed to the Air, it readily Melts Zinc and Iron but it has not any action on Gold Platina the Liquid Muriatic Acid Combines readily with yᵉ Alkalies and most of yᵉ Earths

A Solution of Nitrate of Silver is a good test for this Acid, by Making a White precipitate

When Muriatic Acid is Mixed with Muriate of Potash it forms the Salt of Silvius matic Acid don't act on Gold Platina Molibden

mmuriates are decomposed by Nitric & Sulph: A

arthy Muriates are particularly deliquescent,
bsorb so much Moisture from the air.

rgent: N: A: is a very delicate test of the presence
d: Muriat: it discovers it by causing a
white Cloud — & it also enables us to
exactly how much Acid there is. Nitrate
ash is formed on the one hand & Muriate
ver on the other or Luna Cornea by the old
ists which contains 19 Parts of Acid
oxyde of Silver

mon Salt soluble in 3 times its weight of Water
very little more if heated. Alcohol don't
lve Common Salt, if Pure (Spirits) It
d be the Sp Gravit 815 or 820 Water
1000 The Muriate of Soda is very
ure its Chrystalles are Cubical various,
rapped don't deliquesce when Pure or
ean, but it usually containing various
ts which causes it to deliquesce generally
ains Sulph: of Magnes. & Lime this causes
aste of Sea Water than Salts form
nsiderable portion Diff proportions
ff parts At the Baltic. Its estimated at

Common Salt generally has in it
Sulphate of Magnesia & Sulphate of lime

It constitutes the Saltness of the Sea Water
it may be procured by evaporation
muriate of Soda found in immense quantitie
in diff parts of the World as Cordova in S
Russia in some places so abundant & c
that they build huts with its. In this Co
ns Cheshire it's found generally coloured
brown by a mixture of argil &c
for preparing it a certain place is chosen
by the Side of the Sea a Pond is made
and by the Side of this pond there is anothe
beyond this a third more inland
these ponds are exposed to the heat of
the Sun which of course is carried off
partly by evaporation: it is then let
into the 2nd Pond: & then into the third
which is nearest the boiling house
where it is let in and boiled and evapor
ated & Crystallization soon commences. it is
then put into baskets thus called basket Salt
and another form of it is the Bay Salt

Muriatic Acid dissolves also some of the *Metals,* as *Zinc* and *Iron,* with the production of *Hydrogen Gas ;* and shews a superiority of attraction for most of the *Metallic Oxyds.*

In its liquid and more common form it readily dissolves and unites with all the *Alkalies* and most of the *Earths.*—Its combinations with the former are,

1st. *Muriate of Potash,* formerly called *Salt* of *Silvius ;* a salt but little used.

2d. *Muriate of Soda (Common Salt)*; obtained by evaporation from *Sea Water,* or the water of *salt Springs,* or the solution of *Rock Salt,* which is found in several parts of the world in immense quantities.—Form of its crystals *cubical.*—Taste, agreeably *saline.*—Equally soluble in cold *Water* as in hot ; soluble also in *Alcohol.*—Crystals burst or decrepitate on sudden exposure to *Heat.* Melt in a red heat without decomposition. May be converted into vapour by being intensely heated.—Promote the fusion of many of the *earthy* and *metallic* bodies.—May be decomposed in the moist way by *Sulphuric* and *Nitric Acids ;* and in the dry way, by the *Phosphoric, Boracic,* and *Arsenic.* May also be decomposed by *Oxyd* of *Lead ;* hence the preparation of *Turner's Patent Yellow.*—100 parts *Mur.* of *Soda* dried at a red heat, consist of 46 *Mur. Acid,* and 54 *Soda.* New views of Professor Davy on the constitution of this *Salt*—Other methods of procuring *Soda* from it—Of extensive application in *Agriculture, Glass-making, Glazing, Metallurgy, Soap-making, Diet, Pharmaceutic Chemistry,* &c.

3d. *Muriate of Ammonia,* (*Ammoniæ Murias.* P. L.); found native in the neighbourhood of *Volcanos;* prepared also, in large quantities, in the dry way, by double chemical affinity from a mixture of *Sulphate of Ammonia* and *Muriate of Soda.*—Form, *concrete.*—Taste, *penetrating, acrid, urinous.*—Soluble both in *Water* and *Alcohol.*—Crystallizes under evaporation into small quadrangular *Prisms.*—Yields its basis readily to both the fixed alkalies, and to lime:—is also partially decomposed by sublimation with oxyd of iron. (*Ferrum Ammoniatum* P. L.)—Of extensive application in *Dying, Tinning, Soldering,* &c. Used also frequently in *Medicine.*

The chemical affinity of the common form of the *Muriatic Acid* in most instances weaker than that of either the *Sulphuric* or *Nitric*; but the order of its attraction the same.

On mixture, either in the liquid or gaseous state, with *Nitric Acid,* occasions in it a partial

Scotch Salt is not so Pure

he Sulphate of Lime in Sea Water embarraſs
he Makers of Muriate of Soda extremely

he Method of Decomposing Common Salt is
ffected by diff: Methods.

ime has ye property of decomposing Common
alt by Mixing it into a paste and putting
air bodies
nto a damp Cellar – Litharge which is an
yde of Lead will also decompose it 4 Parts & 1 Part of C Salt forming
Color Called Turner's yellow – we may likewise
ecompose it by Barytes: but we must
ecollect that this the Barytes is poisonous
uriate of Ammonia is found in Volcanos
the Mountains..

so in Animal fluids usually met with.
n Concrete form or taking the ~~cup~~ shape of ye
ol. The Taste Venomous, Acrid: Much used
soldering and dying. in soldering two piece
Metal it is necessary that both surfaces
ould be very bright that is free
om Oxyde

Them who Salt provisions prefer the Bay
Salt which is formed by long exposure to
the air & Sun & Chrystallizing slowly in
the Ponds. It is thought to contain no
superiority over the other. if its better
practical superiority depends on the largeness
the grains which dissolves less rapidly
they pervade the meat more completely

What they call in Cheshire the Stove Salt
is made by evaporating the water ar
hastily the resulting Salt is called by the
Stove Salt.

For the purposes of the large grain fi
Salt they only raise the temp to 100
degrees & let it continue a long ti
During the evaporation of the Salt the
will be a pellicle formed which
viewed will be found cubical. It
gather together & ultimately ~~falls~~ to
bottom

Exp of Mr Allen

Liverpool Salt is made by dissolving
n Salt in Sea Water & formed

i contains 99 Pts of Pure Muriate of Soda

mington Salt contains in 100
ut ~~contains~~ 96 parts of Muriat
da

n the Mother liquor they make
lphate of Magnesia

Soda is so very useful it has been
objects to obtain it from Common
S

Duty on Common Salt is enormous. but
vernments take off this Duty when
de use off to make Soda.

urate of Soda is useful in fluxing
tals.-
urate of Potash but little used.
ore Soluble in hot than Cold water
Muriate of Ammonia consists of Acid:
m. & Ammonia: is nearly neutral
ble in Concrete form very
ble in water & if carefully
porated may be made to Crys-
tallize regularly Soluble in
irit

The Oxymuriatic Gas was first found by Shield
When you present a Subst: containing Oxygen to Muri-a
& apply heat you obtain a peculiar Gas. Chlorine
Was considered as a simple substance, 1774 Davy made the dis
containing it
Take 3 parts of liquid Muriatic Acid, and put
into a retort, with black Oxyde of Manganese 1
Water capable of dissolving twice its volume of the
Gas then form what has been called liquid oxy Muri
acid Gas

~~Liquid~~ Oxymuriatic Acid Air will become decompo-
-sed by light, but not by the air or heat
The liquid Oxymuriatic Acid is sometimes given in Medicine

it is very much used in Bleaching. ~~but~~ It speedily de
the Green color of vegetables in fact all colours except the
yellows
Muriatic Acid will weaken vegetable fibres
exceedingly if the Solution is too strong. The Manu
make use of Lime with it, then called Oxymuriate of Lim
The smell of Oxymuriated Muriatic Gas is pungent
not respirable, 100 Cubic Inches of it weighs 76 3 &

it may be procured from oxymuriate of Potash
and strong Muriatic Acid. a very gentle
heat must be used in obtaining this Gas by these
means
This Gas has an extreme effect on vegetable Colors

it acts powerfully on Putrid Infection, but from
the Suffocating Nature of it, care must not suffer much
to be evolved. Take Care to remove every portion
of Iron from the room for it will spoil it
Muriate of Soda Manganese & Dilute
Sulphuric Acid in a Saucer will give it
act — it can't be brought out in bulk & ove
Putrescent is

y considered Chlorine which he named as
the Muriatic Acid gas
n known 100 Cubic Inches weight 76 Grs
Burns in it with a very diminished flame
adopt Davy's Theory we then suppose that

this was Chlorine

decomposition, and acquires new properties: *Aqua Regia.*

An analogous change found to be produced on it by distillation from certain of the *Metallic Oxyds,* more especially from that of *Manganese:* hence the preparation of *Oxy-muriatic,* or as it was at first called, *Dephlogisticated Marine Acid.*

New views of Professor Davy on the nature of this *Gas*—Experiments tending to prove that it is a simple substance—and if so, the present name improper.

The sensible properties of this *Gas* distinguishable from those of all the other *Elastic Fluids*—Remarkable for its effects both on *Animal* and *Vegetable Colours*—Thought to possess the important property of destroying *putrid* and *contagious Effluvia*—Not so readily absorbed by *Water* as *common Muriatic Acid Gas*—Is materially affected by exposure to *Light,* is readily acted upon by most of the *Metallic Bodies,* and, in several instances, produces appearances like actual *Inflammation.*

Much heavier than *Atmospheric Air.*—100 cub. inches weighing 74,5 grs.

When equal parts of Chlorine & Hydrogen are mixt over Hyd: Pn: it is forming when the Electric Spark is applied to it Muriatic Acid is formed

Tin Put into Chlorine makes Liquor
ing liquor : Calomel: & Oxymuriate of
Mercury ~~are~~ Compound of Mercury
lorine If a little Sulphuret of Antimony
put into Chlorine in 7 Dark Spark
be given off Phosphorus

ake fire in this Gas without having been
reviously heated Davy says Phosphor
in combine with Chlorine in 2 diffr p
portions forming 2 diffr Substances th
Phosphorane & Phosphorana the last is a fluid

Ideas of Scheele on the constitution of this singular substance—Of Berthollet and the French Chemists—Of Dr. Henry—Important discoveries of Professor Davy; reasons which induced him to doubt the existence of *Oxygen* in it—Curious effects on *Phosphorus*—Highly negative with respect to *Electrical energy*—Means of procuring.—Singular compound of this *Gas* and *Oxygen*.

Its combinations with salifiable bases (hitherto called *Oxy-muriates)* afford *Oxygen Gas* when heated; triturated with combustible substances, they inflame and frequently detonate. The most important of these is, *Oxy-muriate of Potash,* obtained by cautiously evaporating and cooling a solution of *Potash,* saturated with *Oxy-muriatic Acid.* It crystallizes into flat hexhedral prisms or plates, of a pearly *lustre: Taste* faintly saline: moderately soluble in *Water:* on exposure to *heat* readily undergoes watery fusion, and, like *Nitrate* of *Potash,* yields great abundance of *Oxygen Gas,* but of more than ordinary purity.—Much more remarkable than *Nitrate* of *Potash,* for its power of detonating on mixture with several of the combustible bodies, as *Charcoal, Sulphur,* and *Phosphorus*; more especially the latter.

Nitrate of Potash & sulph: Acid is good & for
Nitrous Gas it acts in preventing Contag

e Oxymuriatic Acid Gas acts powerfully on
e Surface of Mercury

f you take pure Muriatic Acid Gas, heat
otassium in it, it will take fire after
ing well heated, you put the Potassium
to a retort & exhaust it by Means of the
i Pump you then fill it with Muriatic
d Gas, when by applying a lamp to the
tort you will find the Potassium burn
illiantly  The Action of Oxy Muriatic Acid Gas
Chlorine on the Metals is very obvious
has highly negative properties  When Mixt
th Hydrogen Gas a remarkable change takes
ce. Take equal portions of Hydrogen &
lorine it will be found when these are
ixt common Muriatic ~~Gas~~ Acid, this change
d readily brought about by exposing a Mixture
these 2 Gases to the light of y Sun it will
onate. Phosphorus will combine with
orine or Hydrogen. when you introduce
orine on Phosphorus it will take fire
i done in a retort.

It will act very Powerfully on Sulphur also

When Mixt with Carbonic Acid Gas forms a peculiar Compound, it forms a gas heavier than any other Gas.

In this Composition the Oxygen is Certainly Condensed

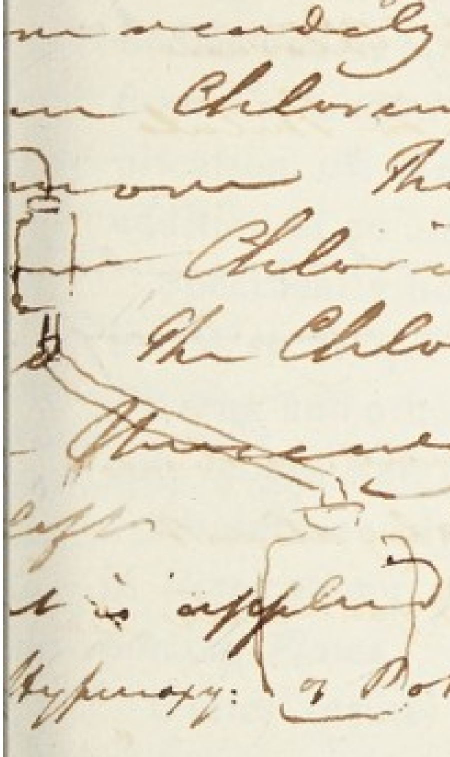
The Smell of this is different to Chlorine it does not act so powerfully on Metals as the Chlorine.

The Bleaching properties of Chlorine, is obvious it will Change a piece of Parsley almost white. (Chlorine is also Called Oxymuriatic Acid Gas)

Flowers of Sulphur is exposed to Chlorine

the Tin is Melted in it about for the
l: of Gas ever disappears & what is
t is hydrogen

a small quant of Hyperoxygenated
Pot: & Dilute Muriatic Gas & apply
Gentle heat you get ~~Hl~~ Chlorine
is readily absorbed by water
an Chlorine 8 times its Bulk
over This Gas is easily separated
Chlorine by mercury
The Chlorine passes itself on
Mercury & the ~~Hl~~ Chlorine
self This Gas Detonates when
t is applied
Hyperoxy: of Potash is made as "



requires 16 or 18 times its weight of Water
solve it

alt produces violent effect on being rubbed
Sulphur If this salt is mixt up with Sugar Honey
may set them on fire by Sulphuric Acid The
tantaneous Fire boxes are made in this way

Experiments on the constitution of this *Acid.*—100 parts by weight consist of 28,60 *Carbon,* 71,40 *Oxygen.*

*Charcoal,* not an *Oxyd of Diamond* as erroneously supposed.—*Carbon* can exist in two distinct states of *Oxydation.*—*Gaseous Oxyd of Carbon.*

Procured by exposing the *Oxyds* of *Metals* and *Charcoal,* or a mixture of powdered *Marble* and filings of *Zinc* to a red heat.

Formerly considered as *Hydrogen Gas* holding *Carbon* in solution, and called by *Priestly Heavy Inflammable Air,* but proved by *Cruickshank* to be a distinct species, having *Carbon* for its basis combined with a limited proportion of *Oxygen,* inferior to that which constitutes *Carbonic Acid.*—100 cubical inches, middle temperature and pressure, weigh about 20 grs.—It is inflammable, and burns with a lambent blue flame, but does not explode with common air. And by combustion is converted into *Carbonic Acid.*

This acid, like others, is disposed to combine with salifiable bases. With *Alkalies* it forms,

1st. *Carbonate of Potash (Potassæ sub-carbonas* P. L.) usually obtained from the ashes of vegetables, by lixiviating them in water, decanting

da Water you take a Solution of
bicarbonate of Soda

bonic Acid Gas is made by pouring
te Sulph or Muriat. on Chalk lime
Marble employing leaden vessels
the Gas sent into the vessel. it is drawn up
a Syringe & by a Piston it is forced into
trong Tube & by this means the Water is
rongly impregnated

he temperature (Water) 150 it will absorb
Carbonic Acid Gas Spirit takes up
n than water.

bines in 2 proportions with Potash
ming the Subcarbon of Potash

we meet with Carbonate of Potash in
o States. 1st as a Subcarbonate or Salt
Tartar. Pearl ash is like the Subcarbona
Potash,. It may be easily procured from
b-Carbonate of Potash.

Carbonic Acid Deminishes the fetor of foul edu
very much

1/5 of Carb Acid gas with /5 of Atmospheric air it may respi

Take Powdered Zinc, marble Powder & a dri
before mixt put into a Glass retort &
apply a moderate heat . when the Pur
Gaseous Oxyde of Carbon will come

If 2 Vol: of this Gas (Gaseous Oxyde of Carb) & a
volume of Oxygen be mix'd & the Electr
pass thro' it you will deminish it to 2 parts - whi
parts will be Carbonic Acid known by rendering Ag. Calc
100 Parts the Gas (Gas: Oxyde of Carb) consist
49 Carbon & 51 Oxygen

at a Temperature high perhaps Carbon Acid G
may be decomposed by any subst
having a strong attraction for Oxyg

Lime Water is a Good Test for Carb
acid Gas

Spring Water contains Carbonic Acid

Carbonate of Soda is found at Teneriffe
nd on the Land in Egypt and elsewhere
t generally procured in the Country
boiling the Ashes of Barilla. It is
y soluble effervesces on exposure
a dry atmosphere more particularly

Potash is saturated with Carbonic Acid
may give a much larger dose of it

Mollet. Take Subcarb of Potash 3 Pounds
und of Carbonate of Ammon. the
f of Carbonic Acid will be given over
the Carbon of Ammon.

Carbonate of Soda may be charged with a Co
of quantity of Carbon: Acid

Take Sal Amm: 1 Pound 2 Pounds
Common Chalk

Carbonate of Ammonia is procured
from Ammonia. Soluble in 2 Weights of
ct mean 100 pts Consist of 55 Carb Ac
18 Ammon. 2 + Water Carbonate of Ammonia
& this is the cause of the Pungency

In order to fill Smelling Bottles Take 1 Part of
mmon Chalk 2 Parts put into a retort & apply heat The
Acid goes over the Lime & forms muriate of Lime & the Carb
acid & Ammonia will be combined

It is Soluble in Water in hence the
preparation of Aq. Ammoniæ it
is not soluble in Spirit

Carbonic Acid is a powerful
Antiseptic :. It is employed to foul
Ulcers as it is when Charcoal is applied

and evaporating to dryness.—Form, *powdery.*—Taste, *urinous.*—Colour, *pearly-white.*—*Deliquescent* in a moist atmosphere (*Liquor Potassæ sub-carbonatis* P. L.) May then be crystallized after cautious evaporation—May be decomposed in the moist way by most of the other *Acids,* or by *Lime* ; and in the dry way, by the simple application of *Heat.*—Uses various, as in *Glass-making, Bleaching, Metallurgy, Medicine, &c.*

2d. *Carbonate of Soda, (Sodæ sub-carbonas* P. L.*)* found native in *Egypt,* the island of *Teneriffe,* and elsewhere ; obtained also from the ashes of certain marine plants, by elixation, evaporation, and crystallization.—Form of its crystals, *octahedral.*—Effloresces on exposure to *Air.*—Its other properties and uses nearly similar to those of *Carbonate of Potash.*

3d. *Carbonate of Ammonia (Ammoniæ Carbonas* P. L.); obtained by distillation from most animal, and some vegetable and mineral substances: or from the decomposition of *Muriate of Ammonia* by *Carbonate of Potash,* or by *Lime.*—Form, *concrete.*—Smell, *pungent.*—Taste, *urinous.*—Very soluble in *Water* (*Liquor Ammoniæ Carbonatis* P. L.) Soluble also in *Spirit (Spiritus Ammoniæ* P. L.) With unctuous substances forms an imperfect *Soap (Linimentum Ammo-*

*niæ* P. L.). Like all the foregoing compounds, may be decomposed by *Potash, Soda, Barytes,* or *Lime.*

*Carbonic Acid* now universally considered as consisting of *Carbon* rendered acid by *Oxygen;* for which it has a stronger affinity than any other acidifiable base.

Inferior to most of the *Acids* in its *Attraction* for other bodies.

Order of attraction, *Barytes, Strontian, Lime, Potash, Soda, Magnesia, Ammonia, Alumine, Metallic Oxyds, Water, Alcohol.* Uses chiefly *medical.*

## *Of Fluoric Acid.*

Obtained by decomposing *Fluate* of *Lime* by means of the *Sulphuric Acid.*

Form *gaseous.*

*Heavier* than atmospherical air, *Caustic.*—Kills animals immersed in it.

Unites readily with *Water,* and renders it intensely sour.

In union with the *Alkalies,* forms compounds of a gelatinous consistence.

Possesses the remarkable property of dissolving and volatilizing *Silica.*

n with Lime called fluor Spar, it is also
d in many Pure Stone

## Fluoric Acid

ed by Scheele as a distinct Substance never exists uncombined ,

The Radical for this Acid is not known

n obtain$^{d}$ by taking 1 Part of Fluate of Lime
d 2 parts of Concentrated Sulphuric Acid

t when we want it in a very Concen-
trated form we use a different Method
e put no water in the Second Vessel

s Acid Corrodes Animal Substances very
ickly therefore we should be very careful
m from y$^{e}$ Gas arising from the Concentra
Fluoric Acid.

ombined with Soda it forms Fluate of
da which neither deliquesces or effloresces
en exposed to y$^{e}$ air

ffects Glass very readily

This Acid does not act on Lead Silver &c

but when in the ſtate of Oxyde it will

act on them very ſensibly – It readily & form Fluates. –

This Acid effects Glaſs very ſensibly

Coat y^e Glaſs with Wax and then with a engraving

tool engrave what you Want? – useful in Label

Bottles &c — Graduating Eudiometers also useful

It is used very much in etching of Glaſs

Water absorbs a Large Quantity of the Silicated

Fluoric Acid Gas free 200 times its bulk

You can get the Silicated Fluoric Acid Gas by mixing a

owdered Glaſs with the Acid: & fluate of Lime

On burning Potaſsium in Fluoric Acid Gas

a great portion of Hydrogen is formed.

The Fluate of Lead is decomposed

h Fluoric Acid is Capable of combining with Sod-
s not so readily as with Potash

mmonia has a disposition to form a
ble Compound with Silex & fluoric Acid.

en 1 Part of Vitrious Borac Acid
Parts of fluor Spar mix them & Pour on
m 12 times their weight of Acid Sulph:
rms a curious Gas, of which 100 Cubic
he weighs ~~45~~ 73 Grains ~~[illegible]~~ this is the Gas which is
loyed to ascertain the ~~Degree of dryness~~ gases
~~ich are not acted on by Fluoric Acid but Dec~~
~~ts Oxydes~~

ated Fluoric Acid has not been affected by passing
hro' red hot Tubes

# Boracic Acid

Comes to us from the East

This was formerly called the Sedative
from some supposed qualities of that kind
Salt. it presents itself in a Solid
form and it feels like Cetaceum

Burning vitrified
Davy found the Mixing of Potassium &c & Boracic Acid
in a Copper or Iron Tube & exhaust it, after this apply h
That he got a Chocolate Colored Mass×
heated
and which being ~~burned~~ in Oxygen Ga
he obtained again Boracic Acid It will take
you put into a retort & exhaust it

You procure Boracic Acid by taking (Str
in water 8 parts
a Solution of Borax, and Dropping into
it a little Sulphuric Acid or Muriatic
until you have saturated it completely
Acid.× When it cools it will deposit Chrystals of Boracic
The Boracic Acid requires a great portion
of water to Dissolve it, perhaps 40 or 50 times
its weight it is more Soluble in Alcohol wh
green
will afterwards burn with a ~~yellow~~ fla
reddens vegetable blues, not changed by
exposure to air the least action an
[illegible] [illegible] of the Acids

which is not soluble in water Æther & Oils

Dissolves *Zinc, Iron,* and *Copper;* the other metals not acted on, unless in the state of *Oxyds.*

Decomposed by Professor Davy by means of *Potassium.*

Order of attraction, *Lime, Barytes, Strontian, Magnesia, Potash, Soda, Ammonia, Alumine, Metallic Oxyds, Water, Alcohol.*

Use—*Etching on Glass.*

Boracic Acid is Dug by Natives at Borax many called it has a rancid [illegible] supposed to arise from mixture of grease. Sent to us whitish in masses the East Indies. from this we obtain the [illegible] Acid which feels like Spermaceti

## Of Boracic Acid.

Davy Says that Borac[illegible] and contains 2/3rd Oxygen

Called formerly *Sedative Salt.*

Form, *concrete, scaly.—Semi-transparent* and of a *pearly lustre,* and *saline acid taste.*

Sparingly soluble in *Water;* more so in *Alcohol,* to the flame of which it communicates a greenish tinge.

When united with *Water* easily sublimed.

Fusible without addition into a transparent *Glass.*

Decomposed by *voltaic Electricity,* but more completely by *Potassium*—Experiments of Davy on this subject—Conjectures that the basis is *metallic.*

compound

entirely by

Glass

may

compose

as

X

By combination with *Soda,* produces *Borate of Soda* (*Sodæ Boras.* P. L.); obtained, in an impure form, from the spontaneous evaporation of the water of certain lakes in the kingdom of *Thibet*; said also to be found in those of *South America.*—Purified by subsequent solution, boiling, and crystallization.—Form of its crystals, *prismatic.*—100 parts consist of about 34 *Acid,* 19 *Soda,* 47 *Water.*—Taste, *styptic.*—Readily soluble in *hot Water.*—Changes vegetable *blue* colours to *green.*—When heated, parts with its water of crystallization, and melts into a transparent *Glass,* which effloresces on exposure, and may be again dissolved in water.—Serves as a flux for all the *Earths* and most of the *Metallic Oxyds.*—May be decomposed in the moist way, by the *Sulphuric,* and several other acids; in the dry way, by the *Phosphoric* only.—Employed chiefly in *Metallurgy,* and *Glass-making.*

This *Acid* is found in solution in the water of certain lakes in *Tuscany*; or obtained artificially by decomposing *Borate* of *Soda* by *Sulphuric, Nitric,* or *Muriatic Acid*; or by subliming it with *Sulphate* of *Iron.*

Order of attraction, *Lime, Barytes, Strontian, Magnesia, Potash, Soda, Ammonia, Alumine, Metallic Oxyds, Water, Alcohol.*

Solution of Boracic Acid in Spirit
Wine gives a green flame when
ut on Paper — this flame is
asioned by the blue flame which the
rit gives, and the other colored flame
hich the Borax gives.

he Boracic Acid is strongly heated
becomes vitrified

on is a Chrystale called the Boracite
hich contains a large quantity of the
racic Acid

obtain Borax heat the Tincal to redness
d form a Solution & evaporate it
s you will obtain large bold
ystals

The Method of Purifying Borax. –

Boracic Acid is Capable of decomposing most of th
other acids at a red heat & decomposes them a

Boracic Acid is useful on account of its acti
on Silex & argil & in making Glass

Common Borax being heated to drive off t
water of Chrystallization forms Glass of Bo

Boracic acid is found contained abundantly
in Diff^t Minerals
The Datolite in Norway contains 30 p^r Cen
of Boracic acid

## Acetic Acid

egetable Acid have generally Compd Radicals
egar is Carbon & Hydrogen

kinds of Wine Cyder Wine & fermented
uors may be all converted into Acetic Acid

egar

he process of changing them appears to be a diff
angement of particles & an addition of Oxygen
en expose the Liquor to the air when
king vinegar. When Vinegar has been
some time Decomposes Putrefies
der to keep vinegar is to put it into Green
tles & Boil them in Water & Cork it up
egar is liable to contain a great deal of Mucilage
Acid as Oxalic Acid Tartarous Acid
this Mucilage which Gives common vinegar
ant Color  For internal purposes carry on the
eration in Glass vessels

Specific Gravity of destilled vinegar is very
that of Water

ery cold Climates as Petersburgh vinegar is
readily concentrated ,

his Climate we concentrate in by evaporating
ortion of the Acetiferable Base. If you pour
nate of Potash into weak Acetic Acid you will obser
escence & Acetate of Potash will be formed

In the Same Manner Acetic Acid Combines with Oxydes of Metals – as Silver Copper with the Case forms verdigris Distilled Verd: is nothing more than Common Verd: boiled down & Evaporated you obtain a beautiful Colored serie.

Vinegar may be prevented from undergoing a change to Putrefaction, by having the Vinegar in Bottles, and place these Bottles in boiling Water and then Cork it, and it will keep for a long time ..

For the Purification of Vinegar for internal purposes, we must not use Metallic Vessels We Must use Glass for this purpose.

Common Vinegar is very Much Diluted so that we can take it in our food by a Common Spoon

We can procure strong Acetic Acid by adding to the Vinegar Potash an effervescence takes place, when the Particles of Potash Combine with the particles of Strong Acetic Acid, the result of this process is the Acetate of Potash, by evaporation you obtain this salt - if too great a heat is employed it will be brown and will not be Soluble in Alcohol or Water entirely

## *Of Acetic Acid.*

Procured from a number of substances capable of undergoing the vinous fermentation—Is largely diluted with *Water* in common *Vinegar*, and may be obtained from it by cautious distillation—Procured also by distilling *Wood*—When pure, without colour, and in taste moderately acid—May be concentrated by freezing—But most perfectly by combining it with a *salifiable base* and subjecting the compound to distillation —As *Verdigris*, or *Acetate of Potash* and *Sulphuric Acid*—Other methods—Sometimes called *Radical Vinegar*—Very *acrid*—Inflames the skin —Slightly inflammable—Thought to consist of 50 *Oxygen*, 14 *Hydrogen*, 36 *Carbon*—*Aromatic Essence of Vinegar* combined with *Potash* produces *Acetate of Potash* (*Potassæ Acetas* P. L.); prepared by saturating *Potash* with *distilled Vinegar*, evaporating to dryness, melting the remaining mass, dissolving it in water, filtering and evaporating a second time.—Form, *flakey*.—Colour, *white*.—Taste, *pungent*.—*Deliquescent*.—Easily soluble both in *Water* and *Alcohol*.—Its acid decomposed in distillation.—Yields *Acetic Acid* on the addition of the *Sulphuric*.—Used in medicine as a *Diuretic*.

Mr Allen prefers having an excess of

It ought to be perfectly white & Clear

With *Ammonia* it produces, *Acetate* of *Ammonia (Liquor Ammoniæ Acetatis* P. L.); prepared by saturating distilled *Acetic Acid* with *Ammonia*. — Form, *liquid*. — Taste, *urinous*.— Employed as a *diaphoretic*; sometimes also used externally as a *discutient*.

Order of attraction, *Barytes, Potash, Soda, Strontian, Lime, Ammonia, Magnesia, Metallic Oxyds, Water, Alcohol.*

If equal parts of Chalk & Muriate of Ammon [illegible] thin Acetic Acid & apply a gentle heat you [illegible] get [illegible]

## *Of Tartaric Acid.*

The radical has only that of Oxygen [illegible]

This Acid has strong affinity for Lime

Obtained from *Acidulous Tartrate of Potash* by means of *Lime*, or *Carbonate of Lime*, and the subsequent addition of *Sulphuric Acid*. May also be prepared by the *Sulphuric Acid* alone.

Crystallizes in small transparent scales or needles. Not altered by exposure to *Air*. Readily soluble in *Water*, and of an agreeably acid taste.

Easily decomposed by *Heat*.

Yields *Oxalic Acid* by treatment with the *Nitric*, and *Acetic* by digestion with *Water* and *Alcohol*.

Its more important saline compounds are,

ou apply Sulphuric Acid to Acetate of
Str. Sulph
tash of 4 parts of y Acid 1/3 Parts of Acetate of
Good
tash by Distilling this you obtain Acetic
apply a Gentle heat
id: it frequently contains a portion
which may be known by dropping into it Acetate of Baryt
Sulphureous Acid ~~you~~, which arises
om a Decomposition of y Sulphuric
id in y Retort; of this it may be depri
putting y Acid into a clean retort
d with it a little Black Oxyde of
anganese & a little Baryte. by this
eans you will get Pure Acetic Acid
cetate of Baryte the test for Sulph: Acid
y Saturating Soda Subcarb. with Distil
negar and evaporating it down to a dry
ter.

its Pure State its Acid Volatile & in
me degree inflammable Nitric Acid,
verts it into water and Carbonic Acid
ific Gravity a little above that of water

does not act on y Simple Combustible
bstances but when Combined with the
ntial aromatic Oils it makes a pleasant
made
elling fluid
Aromatic Vinegar is by Acetic Acid
ang Oz 1/4 to a Pint of Alcohol 2 Dra
~~Alcohol~~ Camphire Spirit of L ʒ.
m
Lemons: ʒ, Ol. Pimento ʒi

it is possible to Obtain in the State of
Chrystals but by being very Volatil
it is difficult;
Acetic Acid Dont act on Gold &c but it Oxydates so
of the Metals as Copper Nickel. Unites with all
the earths excepting Silex Argill Zircon.
Acetic Acid may be Combined with Soda & by boiling
you will get a dry Salt the Acetate of Soda –

## Tartaric Acid

it a
a Veg: Acid, in a Concrete form its it is
radical Carbon & Hydrogen like that of Vineg
Lavoisier considered it contained Azote
When United with an excess of Potash
~~it~~ it forms ye Cream of Tartar (or Acidulo
which is sparingly soluble in Bottle
Tartrate of Potash) ; The Impure State of it
is purified by Solution to make ye white
Cream of Tartar

It is met with in ye juice of grapes Apples &c
(Acidulous Tartrate of Potash) ∴ We obtain the
Tartaric Acid from Common Cream of Tart
which Changes litmus paper red Shewing
excess in Acid ∴ this is dissolved in hot water then
weigh up a quantity of Carbonate of
lime forms with Tartaric Acid an
insoluble Compound forming Tartrate of
which is a white insoluble powder falls to the botto
Lime ∴ from which ye Tartaric Acid is formed
weighing up a quantity of Acid Sulph: equal
the weight to the Chalk we used the Acid will
Combine with the Lime & form Sulphate of Li
or Selenite & the Tartaric Acid will be for

-dergo very little change by exposure to the air
Chrystals of Tartaric Acid is very soluble
water— Tartaric Acid is Discovered
affording Chrystals when saturated
tash: but it is not so in Soda.
rtareous Acid is poured into Sulphating Potash under
welve sizes so
Acid dissolves Oxyde of Iron hence
d by Calico Printers ~~bo~~ as a Discharge
king various figures.
forms triple Salts with most
the Oxydes of Metals and also with
tash. The Rochelle Salt is an instance
bined with 2 Salifiable bases
ome obtained by adding to a Solution
Cream of Tartar & Soda it is made
union of these two preparations
is a Mild Cathartic & taste rather
tter; in most of its properties
the Tartrate of Potash.—

Tartareous Acid is forming from and
its called Red Argol When from white
White Argol

Take a Boiling Solution of Cream of Tartar
pour into a Boiling Solution Subcarbon
of Soda

1st. *Acidulous Tartrate of Potash,* prepared from *crude Tartar* (the spontaneous deposit from new wine) by solution and evaporation (*Potassæ super tartras* P. L.), or by crystallization under cooling.—Form *crystalline.*—Taste agreeably *acid.*—Of little solubility in *Water.*—Decomposed by the application of *Heat*; its chief products, an *Acid liquor*, and *Carbonate of Potash*, which has therefore been called *Salt of Tartar.*—Of various application in the arts, as in *Tinning, Dying, Hat-making*; employed also extensively in *Medicine.*

2d. *Tartrate of Potash* (*Potassæ Tartras* P. L.); prepared from the solution of the former, either by precipitating its excess of acid by means of *Chalk*, or by saturating it with additional *Potash*—Form, *crystalline.*—Taste, *saltish-bitter.*—Attracts moisture from the atmosphere; also very soluble in *water*; hence its former name *Soluble Tartar.*—Decomposed by heat, nearly in the same way as the *Acidulous Tartrate of Potash.*—Employed only in medicine, as a *mild Cathartic.*

3d. *Tartrate of Potash and Soda* (*Soda Tartarizata* P. L.); obtained, by evaporation and crystallization, from the union of *Soda* with *Acidulous Tartrate of Potash.*—Form of its crystals, *prismatic.*—Taste, *bitterish saline.*—In most of its properties, and in its application, analagous to the *Tartrate of Potash.*

Order of attraction of Tartarous Acid, *Lime, Barytes, Strontian, Magnesia, Potash, Soda, Ammonia, Alumine, Metallic Oxyds, Water, Alcohol.*

Use confined to *Medicine.*

## *Of Oxalic Acid.*

[illegible]

So called from being contained in the *Oxalis Acetosella*, or *Wood Sorrel.*

Obtained from *Sugar, Malt, Galls,* and various other substances, as well animal as vegetable, by treating them with *Nitric Acid.*

Form, *concrete.* Crystallizes in transparent quadrangular *Needles.* Taste, very *Acid.*

Readily soluble in *Water:* soluble also, and without decomposition, in the *Sulphuric* and other *Acids, Spirit of Wine, Æther, essential* and *expressed Oils.*

Easily decomposed under the application of the higher degrees of *Heat.*

Forms peculiar compounds with the *Alkalies,* with most of the *Earths,* and with several of the *Metallic Oxyds.*

Oxalic acid may be obtained from Honey It
changes all the vegetable blues red except
Indigo

# Oxalic Acid

hi Acid is existing in Common Wood
orrel & In Germany this plant grows ve
y uncommonly. Dr Wollaston thinks it can
ta in 3 or 4 diff proportion of Oxygen

o Make it Take 6 parts of Nitric Acid diluted
S G 1.250 Water ~~1000~~
ith an equal part of Water 1 Part of y
st Loaf Sugar, it should be heated very
adually and made under a Chimney to
ous fumes
low y escape of y Nitric ~~Acid Gas~~. The Sugar
imes y Acid of its Oxygen & forms y Oxalic
d, you now have a Solution of Oxalic Acid
d the Chrystals will be formed by Evaporati
it may also be obtained from Gum Arabic
y the way the same process with Nitric
d Soluble in twice its weight of Cold
ter. and its equal weight of boiling Water

does Quicksilver or Arsen
alic Acid not act on Gold Platina &c but most
werfully on Iron which it readily
ydates, for this purpose by Calico Printers
or taking out Iron Mould~~s~~

Compounds of this Acid with a Salifiable
is are termed Oxylates, . it is capable of
ting with Potash in 1 2 & 4 proportion

t of Sorrel as it is called is the Superoxylate

It is Capable of forming with Soda and then Makes Oxylate of Potash

The Oxylate of Ammonia is a very usefu Compound indeed You have nothing to do than to Saturate down by Oxalic Acid, Ammon & evaporate the Solution

Ammonia like ye other Alkalies is Capable of taking

The Oxylate of Ammonia is a Delicate test for Lime, because the Oxalic Acid forms with the Lime an insoluble Compound which is precipitated To know ye quantity of Lime present filter it and put it into a Crucible & apply heat

# Citric Acid

It is existing in Cherries Lemons
Limes

This Acid like Oxalic forms with Lime
n insoluble Compound

We obtain it from Lemon Juice
nd Carbonate of Lime, you throw
on a filter wash it & gradually dry

e Chrystales don't deliquesce in ye Air

t acts more powerfully on oxyde of Iron
han ye Oxalic Acid

which takes place, and subsequent *Caystallization.*

Forms small granular or needle-like *Crystals,* of a sour but not astringent *Taste.*

More soluble in *Spirit* than in *Water.*

Burns in the open fire, leaving behind a hard insoluble *Charcoal.*

In close vessels, yields an *acid Liquor* and a *whitish saline Sublimate.*

A similar salt procurable from Galls, by *simple Distillation*; this also called *Gallic Acid.*

Remarkable for the property of producing a black colour with *Iron* and its saline compounds; hence the formation of *Ink.*

*Hydro-carbon* the basis of both these forms of *Gallic Acid,* but united with different portions of *Oxygen.*

## *Of Phosphoric Acid.*

Sources of this acid various. Usually procured from common *Phosphorus,* by deflagration; or by slow combustion, under long exposure to *Air*; or by treatment with the *Nitric Acid.*

hen Ink has been obliterated it may
renewed by various Means.–
do it you pencil the part with
russiate of Potash and then follow
with Sulphuric Acid

emon Juice when written with will
ot show itself until it is heated by
fire. Sulphuric Acid will thus act

Metallic Solution of various Substan
e this property, if you write with
Solution of Sugar of Lead nothing will
ppear, but you pass over it Sulphu-
etted Hydrogen Water.

# Phosphoric Acid

To make it Take of Nitric Acid placed in a Florence Oil flask and put in Sticks of Phosphorus until ye Nitrous fumes cease to pass off

It forms Compound with Salifiable basis called Phosphites

a Solution of Phosphites is Capable of precipitating Gold in Solution

Strong Phosphoric Acid is produced when Phosphorus enters into rapid Combustion

Phosphoric Acid may be Concentrated by Evaporating the Water --

Phosphoric Acid has not that Corrosive effect on Animal Matter as Sulphuric Acid

Glass of Phosphorous is Rather Deli-
quescent when exposed to the
tmosphere.

It Combines with the Salifiable
Basis and forms Phosphates.
(Phosphoric Acid Does)

Phosphate of Soda is a Mild Cathar
t it more pleasant than the Sulpha
Soda or Sulphate of Magnesia

Differs in its sensible properties according to the degree of *Oxygenation:* hence distinguished into *Phosphoreous* and *Phosphoric* Acid.—In the latter form, generally liquid; but by evaporation and cooling, crystallizable into quadrangular *Prisms.*

*Taste,* intensely *acid,* but not *corrosive.* *Specific gravity* 2. 687.

Has a strong attraction for *Moisture.*

Under the application of the higher degrees of *Heat,* fuses into a transparent *Glass,* capable of re-assuming its *acid properties* by long exposure to *Air* or maceration in *Water.*

With the *Alkalies, Earths,* and *Metals,* forms particular compounds, the chief of which is, *Phosphate of Soda* (*Soda Phosphorata* P. Edin.); obtained by uniting *Phosphoric Acid* and *Soda* to the point of saturation, evaporating, and cooling. Form *crystalline.*—Taste not unpleasantly *saline.*—*Efflorescent.*—Dissolves readily in *Water.*—Forms a triple salt with *Ammonia* (*Sal Microcosmicus*).—Lately introduced as a *cathartic.*

May, like most of the other acids, be partially or totally decomposed, by treatment with different *inflammable substances.*

In distillation with *Charcoal,* re-produces *Phosphorus* ; this therefore considered as its *Radical.*

Order of attraction, *Barytes, Strontian, Lime, Potash, Soda, Ammonia, Magnesia, Alumine, Metallic Oxyds, Water, Alcohol.*

## *Of Prussic Acid.*

Obtained from *Prussiate* of *Iron* (*Prussian Blue*), by boiling it in a solution of *Potash,* adding *Sulphuric Acid* to the liquor when filtered, and submitting it to distillation ; or by distilling a mixture of *Prussiate* of *Potash* and diluted *Sulphuric Acid,* and re-distilling the product from *Carbonate* of *Lime.*

Form, *gaseous.*

Unites readily with *Water.*

Combines with *Alkalies, Earths,* and *Metallic Oxyds* ; but these compounds easily decomposed by *Carbonic Acid.*

*Ferruginous Prussiates*—Their uses.—With *Oxyd* of *Iron* re-produces *Prussian Blue.*

Consists of the same elements as *Carbonate* of *Ammonia,* but in different proportions.

Order of attraction, *Barytes, Strontian, Potash, Soda, Lime, Magnesia, Ammonia, Metallic Oxyds, Water, Alcohol.*

# Prussic Acid

It may be Made Gaseous—

he Prussic Acid ought not to be exposed to
he Atmosphere & light or the Prussic acid will
n leave the water

t is principally of Animal Origin or Substan
hich contain Azote. It may be formed
y mixing Dried Ox blood with Subcarbonat
Potash (Blood ʒij Alkali ʒ.) then heated
Pot: Subcarbonas
ntil they no longer puff up; it must
hen be exposed to a red heat until it
ses to flame. — This substance thrown
to Water produces the Prussiate of Potas
hich is very liable to decomposition

russian Blue consists of equal parts of Oxyde of Iron
Prussic Acid.
is rather inflammable. Detonates when Mixt
ith Oxymuriate of Potash, when struck
yields in distillation Hyd: Ammon. Gas & Carb
mmonia

Blood alone will yield Prussic Acid by Distillation & Spirit of Hartshorn in Leaves of Peach Kernels of Apricots &c

To Scheele we are indebted for the Composition of this Acid.

Take 3 table Spoonsful of Charcoal pound.. the same quantity of Subcarbonate of Potash subjecting these 2 Substances to heat & then put in Muriate of Ammonia – decomp. of ammon. will take place

There is great tendency in Prussic Acid to Decompose and form Carbonate of Ammonia

When concentrated this acid is most violently poisonous

Prussic Acid is very Volatile – and Stands lowest as to the Salifiable basis of all of Acids.

We obtain in the Liquid form because Water Absorbs the Gas so readily, but this should not be exposed to Atmospheric Air

It will boil at the temperature of 85 or 90 of Farenheit

Prussian Blue ℥ij and oxyd of Mercury boil them together & you get a Solution of Prussiate of Mercury

a Solution of Prussiate of Mercury & Iron filings put into a retort and a little Concentrated Sulphuric Acid; it will cause Decomposition & by it you obtain Prussic Acid. – a clear Solution by allowing it to Stand & apply gentle heat & you will obtain the gaseous Prussic Acid, which may be absorbed

In order to act on Metals it Must
e Combined with Alkali; —

yanogen Gas by the French Chemists, when Combined with
ydrogen called Hydro Cyanogen Acid

he Green Sulphate of Iron is precipitated
hite by Prussic Acid but becomes
lue when exposed to the Air;

russic Acid. Alkalies & earths seem
o have the strongest Affinity for
t.

he Triple Salts formed by this Acid &
lkalies & earths, and Carbonic Acid
re very unlikely to Decomposition

Prussic Acid is Capable of 2 States of Ox-
ydation first the Prussous Acid
nd 2ndly the Prussetic Acid

he Solution of Prussic Acid will precipitate
Metals but not y Earths therefore Valuable
s a Solution of Copper it precipitates
a brown Color: a Solution of Nitrate of Iron
t will precipitate a white Color. a Solution
f Nitrate of Silver. it precipitates a yellow.

Ferruginous Pruss of Pot  Dy Pruss Blue & a Solution of Potash
t them together the blue color will be changed to brown keep adding
russian blue until it no longer changes color, after this pour the
whole upon a filter, then evaporate it down gently to dryness &
of Prussiate of Pot

To Make the Salt:

Take Caustic Potash add to it powdered Prussia Blue, which Changes its Color to a brow and Continue adding the Ps Blue un the Color of it is no longer Changed then filter it and you obtain a Clea Solution of ferruginous Prussiate of Pot: which is much more permanent. the Sulphur which it is very liable to Contai is got rid off by -- By evaporating the Solution you obtain the Prussiate of Potash in Chrystalls. The Mass that is left on the filter will you find Contain a portion of Prussian Blue

## Benzoic Acid

Little Soluble in water We have in a solid form from Gum Benzoin merely by heating it, found in Balsam of Peru & Tolu:

It has been discovered Combined with Lime in ye Urine of Horses & Cows

24 Parts of hot Water will Dissolve one part of it. Alcohol Dissolves it completely

Powder ye Benzoin subject it to heat and Cover the Vessel by a Drum on which on the Sides the Acid adheres: To Purify it subject it to a strong press and again Sublim it. when beautiful white Chrystals will be obtained. From: Amber by heat the Succ Acid is obtained an expensive Acid. Succinate of Am is ye only useful form of it.

e of Solution of Gum Benzoin in Lime, & pour a litt
uriatic Acid on it & you will obtain Flowers of
nzoin

## OF EARTHS.

Though comparatively *few* in number, met with under an infinite diversity of appearance, and in such abundance as to constitute the basis of the more solid parts of the globe.

Seldom if ever found free from foreign admixture: when purified artificially, distinguished by their want of *Tenacity, Fixity,* sparing solubility in *Water, Insipidity,* want of *Odour,* incapacity of communicating a tinge to *Glass,* and their specific gravity not exceeding that of *Water* more than in the proportion of five to one.

These characters possessed more perfectly by some of the earths than by others: hence their distinction into *saline* and *insipid.*

All the earths soluble in one or other of the *Acids:* cannot however be precipitated from their solutions, like the *Metals,* by *Prussiate* of *Potash* or of *Lime.*

Infusible even by the most intense degrees of *heat,* unless in a state of mixture; viz. with *each other,* with *Alkalies* or *other Salts,* or with *Metallic Oxyds.*

The earths at present known are, *Barytes, Strontian, Lime, Magnesia, Alumina, Silica, Zirconia,* or *Jargon Earth, Glucina, and Yttria.*

Of these *Lime, Alumina, Silica,* and *Magnesia,* by far the most abundant and useful.

## *Of Barytes, or Ponderous Earth.*

Found in combination, 1st. with Carbonic Acid, *Carbonate of Baryt;* 2d. with Sulphuric Acid (*Sulphate of Barytes, Baroselenite;*) or 3d. with Sulphuric Acid, Silex, Sulphate of Alumina, Sulphate of Lime, and Petroleum, (*Liver Stone.*)

Obtained in a caustic or separate state, by exposing a mixture of *Carbonate* of *Barytes* and *Charcoal,* or *Nitrate* of *Barytes,* to a strong heat.

Colour *greyish.*—Taste *caustic,* poisonous.

Discovered by Davy to be a *Metallic peroxide.*—*Barium.*—Means of obtaining, and properties.

Slakes like *Lime* on exposure to air, and imbibes water with avidity, forming with it a powerful cement.

Malic Acid    Aiken's Chemical Diction

useful in forming with Lime a
luble compound. so by means of
ic Acid you obtain Lime from Barytes
ic Acid exists in a Variety of fruits.—
n disengage the Malic Acid from
ther Acids by Alcohol. Malic Acid is
ot capable of Chrystallization ;

Suberric Acid &c

t may be obtained by applying heat
Pieces of Cork ——
6 Parts of Acid Nit fort & water
1 Do of Cork applying heat filter & Evaporate
drynefs — Formic Acid Lactic Sebacic
ic Acid. &c

Barytes

Glob [illegible] of Silex

dark color of Mould owing to Carbonaceous
atter —

gil has the property of holding a large portion
water which would not the Vegetable
d on the Contrary scarcely holds water
le
bonate Lime Silex argil form the best
d

When the particles of earth are left to them
-selves they form Chrystals, the confus
of them forms Stones & Rocks —
Silex is the Basis of Sand Gravel Flint St
Argil the Basis of Clay Lime the Bas
of Chalk Marble Shells of fishes &c
The other earths are only found in little
quantity & in particular Stones

The Lime & Magnesia are considered Se

Alkaline.
If you mix with Clay Lime and apply heat yo
will melt it altho' you could not melt t
separately

## Barytes

formerly named Witherite derives its nam
from Greek being very Ponderous
The Sulphate of Barytes more frequently foun
than Carbonate. The Sulphate generally
chrystallizes in a Tabular form —
The Specific Gravity of Barytes is 4406
Water being 1000
it has the Strongest attraction for Acids of
all the Salifiable Bases. The Carbona
of Barytes is employed as a Poison
We met with it in Cumberland Sibe
To obtain the Pure Baryte from Sulp
of it
Powder the Sulphate & mix with it Tw

weight of Charcoal & put it into a Cruci
d apply heat

e the Sulphat of Barytes
ke a Solution of Carbonate of Potash throw
water add to it the Sulphat of
in powder stirring them –
decomposition takes place
Sulphuric Acid unite with the
tash & the Carbonic Acid with the
rytes forming Carbonate of Barytes

ryte will absorb a portion of Water
then appear dry forming a Hydrate

ryte water is a good test for Carbonic
d, as well as Lime, When it
posed to the air we may soon observe
ilm of Carbonate of Barytes on its
face

The Carbonate of Barytes altho As Soluble in Nitric Acid were not without gain Solutio combined with Acetic Acid its a good test for Sulphuric Acid in Vinegar

Nitrate of Barytes in Styptic Taste & heavy Soluble in 12 times its weight of Cold water & 2 times in Boiling The form of the Chrystals is an Octohedron

Acetate of Barytes forming needle Shaped Ch Soluble in 12 times its weight of Cold wate a Solution of Muriate of Barytes was employed in Medicine

Soluble in about 20 times its weight of cold, and in less than twice its weight of boiling water (*Barytic Water,*) from which in cooling it crystallizes in transparent prisms.

Imparts a lemon colour to the flame of *Alcohol.*

Unites with the *Sulphuric Acid* into a compound requiring for its solution 40,000 times its weight of *Water.*

With the *Nitric* and *Muriatic Acids,* forms crystallizable salts.

Unites with *Sulphur* into a species of Hepar (*Sulphuret* of *Barytes.*)

Order of attraction in the moist way, *Sulphuric Acid, Oxalic, Succinic, Fluoric, Phosphoric, Saccho-lactic, Nitric, Muriatic, Citric, Tartaric, Arsenic, Lactic, Benzoic, Acetic, Boracic, Sulphureous, Carbonic,* and *Prussic* ; *Sulphur, Phosphorous Water, Unctuous Oils ;* in the dry way, *Phosphoric, Boracic, Arsenic, Sulphuric, Succinic, Fluoric, Nitric, Muriatic, &c.* ; *Potash, Soda, Sulphur, Oxyd of Lead.*

The *Carbonate* of *Baryt* and other forms of this earth, remarkable for their violent effects, when exhibited internally.

Used principally as a test for ascertaining the presence of *Sulphuric Acid.*

## *Of Strontian.*

Found either in combination, with carbonic acid, *Strontianite;* or with sulphuric acid, *Sulphate af Strontian.*

Best obtained in a separate or pure state from *Carbonate* or *Nitrate* of *Strontian,* by exposing them to a strong heat, as in the preparation of *Baryt,* to which it is analagous in many of its properties.

Discovered by Davy to be a *Metallic Peroxide —Strontium.—Strontian* nearly resembles *Barytes*—Soluble in 160 parts cold water, in less of hot water—The solution on being evaporated affords crystals of pure *Strontian.*

Remarkable for the brilliancy of the flame which it exhibits when treated on charcoal by the blow-pipe; also for the red colour which it imparts to the flame of *Alcohol.*

The order of its attraction nearly the same with that of *Baryt,* though inferior to it in degree.

## *Of Lime or Calcareous Earth.*

Found abundantly in different parts of the world, combined with *Carbonic Acid* in the forms

# Strontian

luble in about 1600 times its weight of Boiling
ter

e Strontian may be procured from the
rbonate of Strontian by Powdering it
d Mixing it with Charcoal
may
obtain Pure Strontian by all the means
f them been pointed out for obtaining
e ~~Strontian~~ Baryte

Carbonate of Stront exposed to heat
n readily parts with its Carbonic Acid
e Baryte
ontian gives to the flame of Alcohol
blood red Color Baryte a yellow

tian does not act on the Metals but will
e with Some of their Oxyde

nate of Strontian may be obtained by

inate of Stront is obtained in the Same
ner only using the Selected mineral
s.

Lime sometimes found with Clay when its called
Marl

# Lime

its Pure State white Caustic Tends to dissolve Animal
bstances - like Alkalies it Changes a violet
or green Turmeric paper Brown
ypt & Mountain Water which are the Same
orbs Carbonic Acid powerfully

careous Spar & Marble, in Kent the Soil in
n parts Consists entirely of Carbonate of
In Commerce rarely met with in a
te of Carbonate
lk generally occurs in a thin Stratum with
es of flint in it. Coral Consists mostly
arbonate of Lime The Shells of fishes & Birds
ggs are Composed principally of Carbonate
Lime

the State of Carbon it most Common
n Chrystallized its Rhombic form

either effloresces nor deliquesces in the air

Chrystals of Carbonate of Lime

Carbonic Acid may be Separated from
lk by heat then its forms lime which known
heat Should be intense

For our Chemical purposes we Collect the
fine white Marble to make pure Lime
which has a peculiar Caustic taste
we may obtain it very pure by dissolving
Lime in Muriatic Acid & add pure
ammonia if any other earth be present
there will be a precipitate your filter it
& heat strongly

Burnt Lime when good is somewhat Sonorous
the lighter the better Chalk in Burning 100 parts
[illegible] Lose 45 parts

Aq Calcis made by putting an Ounce of Lime into
a Gallon of Water. Lime is only capable of
uniting in a certain proportion;
Slack'd Lime is in the State of Hydrate
before this takes place it is called Quick Lime
55 Parts of Lime capable of Combining with 45
parts of Water. The Heat given out is very
great sufficient to [illegible] Iron it will
[illegible] without the presence of Iron

The Combination of Mortar must be varied according
to the purposes intended for. Sand & Lime is the Base
of all kinds of Mortar
The presence of Lime seems to dispose Metals to absorb
Oxygen
Lime seems to have a greater attraction for A
than Silex Argil, Silex & Lime mixt fuse very easily.
Lime is used in many Manufactories as the Soap
& Tanning refining of Sugar Making of the Hair

of *Chalk, Lime-stone* and *Marble*—also in the bones and horns of animals, and the shells of fishes and the eggs of birds—Prepared for various purposes from *Carbonate of Lime,* by the continued application of a strong heat.

Form *concrete* or *powdery.* Taste *hot, pungent, caustic.*—According to Davy, is a *metallic peroxide.*

Soluble in about 500 times its weight of water *(Liquor Calcis* P. L.) Changes vegetable blue colours to green.

On being suddenly moistened, emits both *Heat* and *Light,* losing at the same time its attraction of cohesion, *Slaked Lime.* The same takes place spontaneously on exposure to *Air.* On further exposure attracts Carbonic Acid from the Atmosphere.

Though infusible *per se,* promotes very powerfully the fusion of most of the other earthy Bodies: hence its use in working metallic ores, more especially those of *Iron.*

Melts with *Borax* and *Microcosmic Salt,* without effervescence. Melts also with *Oxyd of Lead.*

Use of *Lime* as a cement—composition of mortar—substances which give it the property of resisting the action of water—importance of

*Lime* as a manure—methods of analysing *Lime Stones.*

*Sulphate of Lime,* called also *Gypsum* or *Selenite,* soluble in about 500 parts of water, but in less if the water contain an excess of acid—when heated to redness falls into a soft white powder.

*Plaster of Paris*—its uses.

With *Nitric* and *Muriatic Acids* forms *deliquescent Salts.*

*Phosphate of Lime* obained from burnt bones, sometimes found native, as in *Apatite.*

*Fluate of Lime* found in Derbyshire, Cornwall, and various parts of the world—When heated *phosphorescent*—With *Sulphur* forms a calcareous Hepar; with *Phosphorus* a liver-coloured compound, which yields *Phosphureted Hydrogen Gas* on the affusion of water; with *unctuous substances,* peculiar *Soaps.*

Order of attraction in the moist way, *Oxalic Acid, Sulphuric, Tartaric, Succinic, Phosphoric, Saccho-lactic, Nitric, Muriatic, Fluoric, Arsenic, Lactic, Citric, Benzoic, Acetic, Boracic, Sulphureous, Carbonic,* and *Prussic, Sulphur, Phosphorous, Unctuous Oils,* and *Water;* in the dry way, *Phosphoric, Boracic, Arsenic, Sulphuric, Succinic, Nitric, Muriatic, Fluoric, Lactic, Ben-*

ti Quick Lime that is used for Making
ortar. The more labor used in Making
er the better. as it more effectually fills
the interstices. When Mortar is kept
a long time excluded from ye Air, it be-
mes more durable. The Setting of
ortar depends on 2 or 3 Causes;, If it
to be exposed to Water it should be well
t before it is exposed to it, it forms a solid Hydr
rate of Lime 1 part: —  3 parts of
uzzolana Sand it should be well incorporated
and Water Cement is also Made: with
ual parts of Aberthaw and Sand.

me is often employed in Agriculture, for this it
ould be free from other earths. besides remedying
the effect of a cold earth, it hastens putrefaction
by this means is useful in Vegetation. it
ould be used only on Land where there be a
ge Quantity of Vegetable Matter, but not
erwise, as it would injure the Land very much
e lime Stones which Contain Magnesia
the varieties of Marble Consist of Carbonic
cid & Lime —

Pliny informs us that the Ancient romans enjoined that Mortar should be used b
3 years old having been excluded from
the atmosphere

The use of iron in forming Cement is seen Th
Sometimes when the Shank of an anchor is broken
when the Stones around it will be found
extremely Compact

Iron Ore roasted has the property of giv
hardness to Cement under Water

The Iron thrown off heated iron by Blacksm
when hammering it when is powdered fin
& mixt with water forms a firm Cement

For Fish Ponds Take 2 Parts of Lime Containing
1 Part of <u>Puzzelana</u> & 3 & 4 Parts of Sharp Clean Sand
forms a most Excellent water Cement

ort of blue Mortar is made by 2 Measures
berthaw Lime Stones &c
th Muriatic Acid forms with it Muriate
ime with Nitric Acid Nitrate of Lime

Sulphate of Lime is useful in
griculture. Sulphate of Iron will
urify Calcareous Earths.

To obtain Phosphate of Lime you will,
ash bone ash, then add Muriatic Acid
it, and then precipitate the pure Phos-
hate of Lime by Ammonia.

Strong Cement is made as by —
Measures of Sifted Lime 1 of Sand – 3 of
ound Ashes & Bock water & afterwards a
le oil is added

ever met with a Stone easily Scratched
ffervesces in Acid one may be fully
n its Carbonate of Lime
phate of Lime Slightly soluble in Water & gives it
unpleasant taste it may be precipitated
highly rectified Alcohol but it ought to be very
n it contains in State of Sensibility a large quan
ty of water of Chrystallization. Casts may be
de very Conveniently with Sulphate of Lime
he Cast of a Bone &c. The former may be take
y easily

# Magnesia

When Pure a White Powder, sparingly soluble
7950 times its weight to dissolve it
in Water but like Lime Can absorb a portion
and appear dry. Alkaline properties slight, like a
infusible in y greatest heat. it will Combine
with Sulphur only (of the Combustibles)
Pure Mag differs from Lime in nothing caustic
when its Carbonic Acid is driven off.
Sea water Contains it in considerable portions

From a Solution of Sulphate of Magnesia -
the Magnesia used in Medicine is prepared -
it is precipitated by Sub Carbonate of ~~Soda~~ Potash

The Patent Magnesia is Made exactly by the same
process the precipitation when Dry is Cut
into square pieces by Means of a Saw.
Magnesia Usta is Made by burning the Carb:
of Magnesia in a Crucible

Sulphuric acid entirely dissolves Sulphuric
Acid, but it will not Sulphate of Lime
Oxalate of Ammonia will precipitate Nitrate
of Lime but not Magnesia therefore a test for
Lime. Pure Ammonia will throw down Mag-
nesia but not Lime

[illegible] of Lime with [illegible]

zoic, and *Acetic Acid*; *Potash, Sulphur, Oxyd of Lead.*

Used in *Dying, Bleaching, Tanning, Sugar-baking,* and various other arts, besides its application in *Medicine.*

Specimens of Stones in which *Lime* forms a principal part.

is sometimes found Pure but as a Carbonate
[illegible] it is found also in the lichen

## *Of Magnesia.*

Supposed by Davy to be a *Metallic Peroxide.*

Prepared from a solution of *Sulphate of Magnesia,* by the addition of *Carbonate of Potash,* and subsequent exposure of the washed earthy precipitate to a strong and continued heat (*Magnesia* P. L.)

Form *pulverulent.* Colour *pure white.* Taste *insipid.*

Requires for its solution 7,900 times its weight of water. Tinges vegetable blues of a light green.

Infusible without addition, even in the most intense degrees of heat, by which it is merely contracted in its dimensions; but melts into a glass with *Lime, Microcosmic salt,* or *Borax,* or with a mixture of *alumina* and *silica.*

Unites with all the Acids. With the *Sulphuric Acid* regenerates *Sulphate of Magnesia (Magnesiæ Sulphas* P.L.) With *Carbonic Acid,* Carbonate of Magnesia *(Magnesiæ Carbonas* P. L.)

May be combined, in small proportions, with *Sulphur*.

Order of attraction in the moist way, *Oxalic Acid, Phosphoric, Sulphuric, Fluoric, Arsenic, Saccho-lactic, Succinic, Nitric, Muriatic, Tartaric, Citric, Lactic, Benzoic, Acetic, Boracic, Sulphureous, Carbonic,* and *Prussic, Sulphur, Phosphorus,* and *Water*; in the dry way, *Phosphoric, Boracic, Arsenic, Sulphuric, Fluoric, Succinic, Nitric, Muriatic, Lactic, Benzoic* and *Acetic Acid; Potash, Sulphur, Oxyd of Lead.*

In common use in disorders of the *Primæ Viæ* as an *antacid* and *laxative,* and in the form of steatite as an ingredient in the Manufacture of the finer kinds of *Pottery.*

Specimens of Stones to which it gives a distinguishing character.

## *Of Alumina.*

Obtained in its purest form from a solution of common *Alum,* or *Sulphate of Alumina,* by the

Magnesia enters into y composition of
ral Stones. In Steatite or Soap Rock
nters The Lapis Ollaris it is (or
ot Stone)—

The Rock called <u>Serpentine</u> is a Magnesian Specimen

he Steatite & Pot Stone are Magnesian Specimens

# Argil

Argil is obtained from Common Alum
It is not so much acted upon by the Acids as ~~Sulph~~ M
Magnesia

Alum is Sulphate of Argil, it is difficult to Chrystallize w
but will under Slow evaporation

The Acidulous Sulphate of Argil will Chrystallize
the best but a Solution of this will not Chrystall
without Potash is added The Chrystals are Octo
form

The Alumen Ustum of the Shops is Common alum
which has had its water of Chrystallyzation driven

To a Solution of Common Alum, pour ~~[illegible]~~ in Ammonia
& there will be a precipitate

Dissolve Argil in Caustic Potash & heat to redness the
pour in Muriate of Ammonia & you will have
the pure earth of argil left
The Pure earth of Argil is insoluble in Water

Some of the Earths have a Strong attraction for each other
Magnesia has a Strong attraction for Argil

If Lime is present with argil the surest way is to precip
with ammonia & the Caustic Potash will take out
argil

Wedgewoods Crucible compact but dont bear heat w

ugil has a Strong attraction for Vegetable Matter
is invaluable to the Dyer as a Mordant

ulphat of Iron is frequently a Component part of
um which is prejudicial to the Dyer

is may be got rid off by Boiling it & Straining it under
s this divides the particles very much & the Sulphate of Iro
n be washed out. for Woollen this Ferr: Sulph: dont signify
t does harm when for Silk &c
a Solution of Cochineal be treated with a Solution
ugil the Coloring Matter of the Animal Substance
ie Combine with it & form the Coloring matter
ed Lake Vegetable Matter answers equally well as Madder

uch Chalk is a Magnesian Specimen. As a Sketch

ugil is very useful in making Bricks but it
by burning rendered incapable of becoming plasti
imbibing Water

a brick may be made twice as Strong as anoth
om the Same Materials The more the Stone
is are Comminuted the Stronger will the
ck be other made The ashes of Coal are advantag
ndon added this is useful in making them
urn better They burn best in a Kiln
and Color of bricks & Tiles is dependant on Same
ding Iron in a State of Peroxyde Sometimes

Tho' insoluble in Water it May be Suspended in
When Dry it will absorb a Large Quantity of Water —

3 Argil 2 Lime 1 Magnesia when united will fuse in a Heat

Oxygen has no effect on Argil. This is not correctly ascertained

Argil has a strong attraction for Vegetable & animal Matter, which is very wisely s.-govern'd by Nature.

But above all it is useful in Dyeing, as a Mordant

Fullers earth Consists of argil & Alum. therefore when app to Vegetable or Animal Matter (which it is employed by some for) on account of its strong attraction for them it removes the

Argil has a particular action on ye Metallic Oxyds. forming Ochres or what was formerly called Boles. They are all in found in (cannot be done)

Pipe Clay Contracts a great deal when a high heat is applied thereupon in Making Pottery its necessary to add a certain quantity of Siliceous Matter in it to prevent its Cracking

The Kentish black flints is the best. Its blackness arising from Carbonaceous Matter. its ground to a very fine powder before it is used for making Pottery — This & the Common Tobacco Pipe Clay makes the Common Pottery. They used to sift the Silex but it injured the workmen very much & The Silex being very insoluble it injured their lungs. The Silex is Mix'd with the W & put by ready for the Workman at a certain fi
They make on an hour about 100 ½ Pint Mugs.

lay is not so readily acted upon by the strong Acids as
ulph: Muri: Nitric &c
austic Alkali readily dissolves it therefore exceedingly useful
in Analysis. as for example when with Lime & Magnesia
hich it will not dissolve.

ne & Silex
, but dissolves
by Alkali
ing in
Sulph.
n will not
h the Silex.

addition of *Potash, Soda,* or *Ammonia*; hence its present denomination.

Form *powdery*. Colour, when dry, *pure white.* Feel *unctuous.* Taste *insipid.* Smell, when breathed on, *earthy.*

Insoluble in *Water*. When moistened becomes plastic, and contracts and hardens when exposed to the higher degrees of *Heat*; therefore the basis of the different kinds of *Pottery*. After baking is no longer capable of becoming plastic.

Soluble in the humid way by *Alkalies*.

Fusible, with effervescence, both with *Microcosmic Salt,* and *Borax*, fusible also with *Lime*.

Combines with most *Acids,* though with difficulty, except under precipitation, and produces with them compounds which are more or less astringent. The most important of these, the *Sulphate of Alumina* or *common Alum,* prepared from the decomposition of *Argillaceous Schistus*. This properly a triple, sometimes a quadruple, salt. Form of its crystals *octohedral.* Taste *astringent*. Soluble in about 14 times its weight of cold, and somewhat more than an equal weight of boiling water. Undergoes watery fusion, and parts with its water of crystallization, on exposure to *Heat* (*Alumen exsiccatum* P. L.) When calcined with certain in-

They now strain is mix'd with Water thus a Scina.

in common ware are polished as by a common
flint. White lead & oxyd of Tin & sometimes a alkali
they are melted &

Porcelain will bear the heat of a common furnace without
melting at all. Porcelain when broken is looking like glass
or something the appearance of wax. Common earthen ware
looks
granular

flammable substances, as yolk of egg, or sugar, produces a compound, which takes fire spontaneously on exposure to *Air* (*Pyrophorus* of *Homberg.*)

Has, of all the *Earths*, the greatest attraction for *Metallic Oxyds*; has also a strong attraction both for *Silica* and *Magnesia*.

Silver Leaf
antimony
Shades of
Manganese
violet
Enamelled
ware

Order of attraction of *Alumina* in the moist way, *Sulphuric Acid, Nitric, Muriatic, Oxalic, Arsenic, Fluoric, Tartaric, Succinic, Saccho-lactic, Citric, Phosphoric, Lactic, Benzoic, Acetic, Boracic, Sulphureous, Carbonic,* and *Prussic*; in the dry way, *Phosphoric, Boracic, Arsenic, Sulphuric, Nitric, Muriatic, Fluoric, Succinic, Lactic, Benzoic,* and *Acetic Acid*; *Potash, Sulphur, Oxyd of Lead.*

Uses, comprehending those of Sulphate of Alumina, *Dying, Tanning, Printing, Silvering, Painting, Pottery, Medicine, &c.*

Specimens of Stones containing this Earth in considerable proportion.

The glaze of common plate is made of Oxyd. of Lead Tin & the Oxyds of
Lead & Tin 10 to 20 Plints Mix them with one 4th of Soda Muri: heat them &
grind them with Water when thus prepared the plate is dipped into it

[illegible] glazed [illegible] should never be employed for
culinary purposes as when Vinegar is employed

## Of Silica.

Exists, with very little mixture, in Sand, Gravel, Flint, and Rock Crystal.

Porcelain will bear the most feeble kind of
Glaze as Borax. The earth of Porcelain for^d
of 2 earths. They form the Chinese porcelain
or Japan ware.
Porcelain so Hard that it strikes fire with Steel & resists
bears the strongest heat with impunity

n the Cast has been taken they are Set by & after a
n turned as a Turner turns a piece of Wood
th an iron tool so as to beautify them — They are
terwards finished by other workmen in Turning
Polish & workman — They are heated again
omes out in a form which they Call Biscuit as
Common Pots there is no Glaze on them
Oxydes of Metals have the property of making
fferent Coloured Glass
yde of Copper Green Cobalt Blue, Gold
Antimony — Yellow
y grind up the Oxyd of Cobalt and paint them as a
pper plate Printer they are afterwards washed
t by to be Glazed. The Common red Pans are
ored with Oxyde of Lead.

## Silica or Silex —

Flint Contains a large portion of it & many other
tones

It Cant be Chrystallized by art but under peculiar
ircumstances,

s Capable of absorbing 1/4 of its weight of Water
is infusible by itself in the Strongest Heat
uoric Acid acts on it very strongly

Silex has a very strong attraction for ye Alkalies.

If 1 part of powdered Silex 3 Parts of Carb: of Soda, heat them together and it will afterwards dissolve in Water. then by pouring in Acid: Muriat: you precipitate the earth, Silex, from the Ac having a stronger attraction for the Alkali tha the Alkali has for ye Silex.

Silex is not acted on by Oxygen and any combustible Substances.

Pure Caustic Barytes seems to act on it in ye Same Manner as ye Alkalies

Silex is Obtained in a State of Purity from ye

When Silex is melted with a large proportion of Alk it forms a Compd Soluble in Water but hea intensely with a smaller proportion of Alkal it forms Glass. This Substance was known a very early period — in British Museum Pe in form of beads which they used to give as admissions Tickets to their plays —

t was not till the 3rd Century that Glass
came in general use for Windows
& then it was not common

Part Silex & 2 Parts of Calcined Borax
ith form a fine Glass, this is the
composition made to imitate various
ns. they are Coloured by various Metals

ilex used in Britain for Making Glass
the Sand this is prepared by washing best
comes from Lynn in Norfolk
and for Common purposes they obtain
ir Alkali from Wood ashes & Kelp —

Green tinged glass is owing to the pre-
sence of Iron: a portion of Lime
used to preventing the Glass from Cracking
when exposed to variety in temperature
t also causes to Work used in

Parts of Silex with requisite portion of Alkali
not then more than 7 or 8 Parts

rax is used in Making the best Glass

harge is very useful in Making Glass
r Optical Purposes

d the Glass made with it is subject
have Veins in it

Borax

Flint Glass is acted on powerfully by Sulphurett
Hydrogen

— Church.

White Oxyde of Arsenic is a powerful flux. Must
be only used in Small quantities for
as in excess it becomes Soft & [illegible]
it is unsafe for Drinking Vessels

Nitre is used for Making Some of the
Coloured Glasses

When Perfectly [illegible] Stir up
the whole with a Wooden Pole

Silex mixed with twice its weight of Soda
forms a Glass but its Soluble in Water
& Deliquesces — Silex with the Same quanti
of Alkali is Melted also — a Perfect Glass can
be formed when the Alkali is 1/3 the Quan
of the Silex

May be separated from most of these by fusion with either of the fixed alkalies, and re-digestion in the nitric or any other of the stronger acids.

Colour *white*. *Insipid*. *Dry* to the touch. Sparingly if at all soluble in *Water*. Specific gravity 2.66. *Infusible*.

Soluble in the *Fluoric*, but in no other acid.

Soluble also in the solution of either of the *fixed Alkalies*, by the assistance of heat. Precipitates and combines with lime on being added to lime water; unites too in the humid way with some of the metallic oxyds.

May be fused with *Lime*, *Microcosmic Salt*, or *Borax*; but much more readily with *Potash* or *Soda*: hence the preparation of the different kinds of *Glass*.

When melted with a large proportion of *Alkali*, forms a deliquescent compound, *(Liquor Silicum,)* the decomposition of which by an *Acid*, furnishes a gelatinous precipitate, thought to be soluble in about 1000 parts of *Water*.

Order of attraction in the moist way, *Fluoric Acid*, *Potash*; in the dry way, *Potash*, *Boracic Acid*, *Phosphoric Acid*, *Oxyd of Lead*.

Used principally in *Polishing*, *Painting*, and *Glass-making*.

Specimens of Stones of which this Earth forms a principal part.

## *Of Zirconia*, or *Jargon Earth.*

Combined with silex, iron, and nickel in the stone called *Jargon* or *Zircon*: found also in the *Hyacinth.*

Obtained from these by fusion with potash, and subsequent solution in, and precipitation from the *Muriatic Acid.*

Colour, *white.* Insoluble in water; when moist, *semi-transparent.* Specific gravity estimated at 4.300

When heated in contact with charcoal, is imperfectly vitrified, and becomes of sufficient hardness to strike fire with steel.

Resembles *Silica* in its action on *Metallic Oxides*, and *Alumina* in forming astringent compounds with the *Acids*: but differs from both in being insoluble in the *Fixed Alkalies.*

Order of its attraction as yet unknown.

## *Of Glucina.*

Obtained by fusing *Aquamarine*, the *Beryl*, or the *Emerald* with three times their weight

s the Alkali is volatile it is driven off by an
linar heat & the Silex will keep behind therefore
ly error you have too much alkali there is only
e expence of Fuel to drive off the Alkali

Crown Glass of lowest Specific Gravity
ite Sand 30 Parts 15 Part, Pearlash or Sod
rbonate 2 of Chalk. — This is brought
a red heat & it will form a perfect
ass    Flint Glass used for Decanters &
Softer than Crown G

0 P of Wh Sand 33 Pearl ash
Oxyde of Lead 11 Part of Nitre & about
200 parts weight of the whole of the Materials
e little Glass Plumes are made by draw
ing it on a reel —

Plate Glass made as by
0 Part Sand 67 of Sub Sod a 11 P of
ine Manganese ½ in a hundred —
Portion of Borax may be useful these
aterials require 30 hours unless we heat
hem its poured into Moulds
e Common G Glass is Made of Common
aterials
e Materials are Melted in a large
ep vessels

fore the Materials are put into a vessel
ey are all heated to reduce their bu

Fritting after this Process they are all M
together for 38 hours or more —
The Materials are Skimmed — Now the
process is over the Next is the Refines
Process —
After the Glass is perfectly formed it
by

Their principal instruments are a Simply Com
Tube

If Glass is suddenly cooled after it has
made it will readily crack therefore
after it is Made into the form they are
it Sent to the annealing furnace
which Cools it gradually —

Zircon from France

procured from Jargon
order to procure Powder the Jargon
d Mix it with 5 or 6 times its
ight. of Caustic Alkali & heat it
gether for a few hours —

ircon is not acted on by Caustic
lkali but it does the Silex
hen it is done it ought to be quite
hite — Muriatic acid will dissolve
ircon from which Solution it may
—

## Glucina

Calld Glucin because the earths form
from it have a Sweetish Taste

## Yttria

It resembles Glucina in forming wit
earths a Sweet Taste & being Soluble in
Carbonate of Potash

Is a very rare Earth

## Remarks on Agriculture

All animals depend on them as existence
for Animal food ——

Carbon & Hyd: form a great part of the bu
of Vegetables — If the Vegetable is remov
as Hay & Corn is the earth becomes
impoverished.

Water necessary to Earth for Vegetabl
to flourish —

of *Potash*, separating the *Silica* and *Alumina* by the usual methods—then adding to the solution *liquid Carbonate of Ammonia* in excess, boil until the *Glucina* precipitates.

Colour, *white*. *Insipid*. *Insoluble* in water. *Adhesive* to the tongue. *Infusible per se*; but melts with *Borax* into a transparent *Glass*.

Soluble in most of the *Acids*, and likewise in the solutions of the fixed *Alkalies* and of *Carbonate of Ammonia*.

Its *saline* compounds slightly astringent, and of a *sweet taste* : hence its name.

Its affinity for *Acids* intermediate between that of *Magnesia* and *Alumina*.

## *Yttria*.

Found in the *Gadolinite*, a Swedish stone, so called from this earth being discovered in it by *M. Gadolin*.

Procured by treating the powdered mineral with *Nitric* and *Muriatic Acids*—evaporating the solution to dryness—diluting with *Water* and precipitating the *Yttria* with *Ammonia*.

Colour of this earth *pure white*—Without *taste* or *smell*—*Infusible*—Spec. grav. 4,84—With *Borax* melts into a white transparent glass—Soluble in *Carbonate* of *Ammonia,* though not in either of the *caustic fixed Alkalies*—Insoluble in *Water.*

With the *Sulphuric, Nitric, Muriatic,* and with other acids, forms compounds remarkable, like those of *Glucina,* for their astringency and sweetness, to which earth it is considered in many respects as analogous, though in others essentially different.

## OF COMBUSTIBLE SUBSTANCES.

The substances usually denominated *Combustible,* are such as are more especially remarkable for exhibiting the phenomenon of *Combustion,* when heated to a certain degree in contact with *Air.*

The changes produced on the *Air* in this process, and the alteration which the *Inflammable Substances* themselves undergo, already particularly treated of.

In their *Form, Consistence, Weight, Volatility,* &c. the substances of this class differ widely

e more divided the Particles of a Soil are
e better — Thus Ploughing & Harrowing are
ful.

lay when mix in with

e Fertility of Soils influenced by Temperature
at which raises the Th: most is best

e Carbonate of Lime

Phosphate of Lime has been found in Oak,
Peas beans &c

Powdered Bone has been ordered for
manure better than Bonedust as in
cost there is no Gelatin Woollen
gs &c or whatever contains Gelat
manure &c

Vegetable Tube containing much

Quick lime very quickly promotes t
decomposition of Ligneous fibre i
Tanners Bark & whenever a Soil
contains the roots of Plants as Pea
Quick lime is very useful

Carbonate of Magnesia is Poisonous t
Plants so is Quicklime but this is
rendered by it absorbing quickly
large quantity of Carbonic Acid

That earth which bears

Denominations & Divisions of Rock
1 Primitive Rock, Granite, which is consist
of Quartz or Silex Feltspar & Mica
There is such a thing as Secondary Gr
-nite Porphyry is a Primitive Rock
it is exceedingly hard Gneiss is a
Primitive Rock Trap

or Volcanic Formation

ydrogen has the strongest attraction for
xygen

Rich Soil has been found to contain the
following ingredients viz
o Parts of Fine Sand 5 P Carbon of Lime
part of food of Plants 15 P of Silex 14 of Argil
the rest oxyde of Iron

Barren Soils —

00 from Sulphte. of Iron rendered
Quick Lime If from Chalk Quick lime
Clay. —

Carbon is widely diffused thro' the Globe
Animal & vegetable Bodies
When Charcoal gets hot the whole is covered
& when Cooled it will be fit for use
this will not be found sufficiently
ened

# Carbon

It is not found in a Solid State but very largely in a Gaseous form, it exists largely in Coal Wood &c, its diffused in ye Air in form of Carbonic Acid Gas.

Charcoal differs in Purity according to ye Mode it is produced

The Charcoal from Animal Subst: requires a higher temperature to burn it than that of Vegetable

Common Charcoal is generally produced from Oak - Chesnut &c Cut up & dried for 2 or 3 Months a Place on the ground is prepared & the wood Piled up with alternate layers of brush wood holes [illegible] left in it & the fire is applied to it,+

In Scotland they carry on ye process of making Charcoal very extensively.

The Purest Carbon is perhaps procured from Lamb Black for very delicate experiments.

Charcoal has a disposition to Absorb Water from ye Atmosphere and increase in Weight

Charcoal from Fir Lignum Vit. Box Oak Mahogany all absorb different proportion from each other. They are comparatively *lighter* than most other bodies.

May be divided into two classes—*Simple* and *Campounded*.

The simple combustibles are, *Hydrogen*, *Carbon*, *Sulphur* and *Phosphorus*.

## *Hydrogen.*

Already treated of under *Aeriform fluids*.

## *Carbon.*

Obtained in its common form *Charcoal*, from vegetable, animal and bituminous substances by exposure to heat in close vessels.

Varies in its form, quantity and purity, according to the nature of the substance from which it is prepared.

The charcoal of common wood, *black*, *light*, *brittle*, *sonorous*, *insipid*, *inodorous*, and of great *durability*.

Capable of sustaining the most intense degrees of *Heat* in close vessels, without alteration; but upon access of *Air,* burns with a white flame, and yields *Carbonic Acid Gas,* leaving behind a small quantity of *earthy saline Ashes.*

Decomposes the *Sulphuric Acid* and all its compounds, by the assistance of *Heat.*

Decomposes also the *Nitric Acid* without *Heat,* and sometimes with such rapidity as to occasion *Combustion.* Detonates with *Nitre.*

Dissolves, by fusion, in the *fixed Alkalies;* very readily also in *Alkaline Sulphurets.*

Combines by cementation with *Iron* either in a small proportion, *Steel,* or in a larger, *Plumbago.*

Of the properties and uses of *native Plumbago.*

Charcoal remarkable for correcting *Fœtor* and depriving many substances of *Colour,* especially when used in its fresh burnt state.

Exists in its present form in the *Diamond.*

Used chiefly as an article of *Fuel* and in certain arts, trades, and manufactures.

## *Of Sulphur.*

Found either uncombined, as deposited by water, or sublimed by subterranean fire, *Native Sulphur*; or in combination with other bodies, more especially with different *Metals.*

For very Delicate Experiments we inclose
ieces of Box Wood in a Crucible filled
ith Sand and apply a steady heat for
out an hour. when you will procure
n Carbon. it should be kept in Dry
topped, Closely, Glass Bottles.

e Charcoal of Common wood is black, light,
nd sonorous.
getable Substances will form Charcoal without
aid of heat thus when wood is under water
arcoal is formed
en expose a Solution of Silver or Gold to air & Charcoal
ice become coated
Carbon is infusible in any Common Heat

& water to make it into a Paste
harcoal & Linseed Meal when Mix'd form a very
ood lining for Crucibles, convenient for small experiments

Charcoal is a very Durable its not Capable
f Putrefaction hence the practice of
pplying it to Stakes before they are
riven into $y^e$ ground. The Acids don't
ct upon it but it readily decomposes
them. Charcoal is Capable of Combining
ith iron. its so Combined in Black Lead
hich being inclosed in Cedar forms the
Black Lead Pencils. Plumbago best found in Cumbe
harcoal detonates with $\frac{e}{7}$

The Best kind is produced in this Country

The Substance of Carbon is Spongy & porous
after being heated & exposed to air it absorbs a large por

it will absorb Carbonic acid from Water complet

1 Part of Charcoal in a few hours will absorb
three times its Weight of atmospheric Air

Charcoal very readily will take the Coloring
Matter of various Substances, it has been kn
to take the Color out of Red Wine & Vinegar

Charcoal has a great power in Correcting Put
of bad Water or Meat, by either throwing it
into ye Water in which the Meat is lying
or the Water that has been tainted Wat
the Sulphuretted Hydrogen

It is rarely if ever found Pure. The Diamon
is found to be the most Pure: it will
withstand the greatest heat.

We are at a loss to know How the the Diam
is formed. They are generally found a
a rough Coat only found in India &
Brazils

Diamond of all known bodies has the
eatest power of refracting the Rays of
ight. they are excessively hard. & Sir
Isaac Newton suspected it combusted
spec. G 3500 water being a 1000 a non Conductor

Trying the Naturalist found that they
were not at all acted on by heat.
plain that he never tried the experiment

If they are Colored it lessens very Much
the Value, but its partly got rid of by
pplying heat in a Close vessel flaws are
removed by judiciously Splitting the Diamond

Diamond is a non Conductor of heat.

he Value of them increases very Much &
with the weight of them. according to the weight
them. The largest Diamond is in Possession of Emp
[illegible] weighs —

oke is Made by heating in Close Vessels
common Bituminous Coal. it does
bon [illegible] even when you are giving
strong heat.

harcoal forms a very excellent Dentifrice
in a very fine powder.-

rcoal may be rendered very hard if
ated in

Compound not Containing any oxygen
termed Carburetts

# Sulphur

Its Specific G: in its Native State is 2000 water being 1000 when melted less or Non Conductor of Electricity

The Compounds of Sulphur without Oxygen are called Sulphurets, it is considered as Element not having been decomposed, Sulphur begins attract Oxygen at 180 of Farenht: than it begins melt

The Acid: Nit: acts on Sulphur: so the Chlorine G wile, with which it forms a red Liquor Gas.

Sulphur begins to attract Oxygen at a temperature of      of Farenheit

at 560, of Farent: it becomes an elastic fluid.

Sulphur is insoluble in Spirits of Wine but in Sparingly Soluble

100 Parts of it Consist of 15 Carbon less than 0.5 — Davy thought there was little or no Carbon in

May be obtained artificially by the decomposition of *Sulphuric Acid.*

Colour, *pale yellow.*—Sp. Gr. 2.033.—*Hard, brittle, insipid, insoluble.*—Very easily melted.—Sublimes in close vessels into *light yellow* flowers, formerly called *Flores Sulphuris.*

Burns with a *blue* flame, and by absorbing *Oxygen* from the Air, is converted into *Sulphureous Acid Gas, Sulphureous* or *Sulphuric Acid,* according to the proportion of this principle.—Similar effects are produced on it by deflagration with *Nitre.*

Is little affected by *Acids.*

Unites readily with the *Alkalies,* and also with the *saline Earths,* producing liver-coloured compounds (*Sulphuret of Potash,* &c.) which are soluble in *Water,* and may be decomposed by all the *Acids* (*Sulphur præcipitatum* P.L.)

When intimately mixed with certain proportions of *Potash* and *Nitre,* produces a compound which when gradually exposed to heat, explodes with great violence (*Pulvis fulminans*).

With *Nitre* and *Charcoal,* in mixture, it constitutes *common Gunpowder.*

Combines by fusion with all the metals except *Platina, Gold,* and *Zinc.*

Is insoluble in *Spirit of Wine,* but unites with *oily* matter of every kind, and with all the liquid *bituminous* bodies, into compounds of increased consistence (*Balsams of Sulphur*).

Order of attraction in the moist way, *Lead, Tin, Silver, Quicksilver, Arsenic, Antimony, Iron, Potash, Ammonia, Barytes, Lime, Magnesia, Unctuous Oils, Essential Oils, Æther, Spirit*; in the dry way, *Potash, Soda. Iron, Copper, Tin, Lead, Silver, Cobalt, Nickel, Bismuth, Antimony, Quicksilver, Arsenic.*

Employed principally in *Bleaching,* in the manufacture of *Sulphuric Acid,* and of *Gunpowder,* frequently also in *Medicine.*

## *Of Phosphorus.*

Obtained, by decomposing calcined *Bones* by means of diluted *Sulphuric Acid,* evaporating the supernatent liquor to the consistence of a syrup, mixing it with powdered *Charcoal,* and distilling in the open fire; or by adding *Nitrate* or *Acetite of Lead* to common *Urine,* collecting the precipitate, mixing this with *Charcoal* and distilling as above.

s extremely Volatile, it will decrease the Weight of the Ther:
siderably. it has somewhat of an offensive Smell
s off the hand like Ether when applied —

you add a little of this fluid to Oxygen Gas
will expand and by applying Heat
will detonate violently —, & deposits Sulphur
Nitrous Acid Gas it produces by applying
t a beautiful blue flame — never deposits
lphur. Sulphur enters into the Composition of Gun
wder

Sulphur is found in Sicily in its purest State.

Sulphur has a great effect of restraining the virulen
ness of these Poisons. When Sulphur is
nbined with Alkalies they are termed
Sulphurets.

mmon Flowers of Sulphur generally contains

equal Parts of Ca~~ustic~~rbonate of Potash & flowers
Sulphur and you will obtain Hepar
Sulphur or Sulphuret of Potash. If any Acid is
d to it it gives off Sulphuretted Hyd: Gas the Sulphur
recipitated also —

By throwing Sulphuret of Potash into Water y^e
effect will be

Lac Sulphur is Made by precip.^d a Sulphuret by
an Acid.

By taking a Solution of Sulphuret of Potash &
by pouring into it Sulphuric or Nitric Acid
and you will form the Sulphur Precip

Baryte is capable of combining with it, it also fo
compound with Ammonia

It should be kept in Green Bottles

Oily Matter is capable of Dissolving all Sulph.
by Boiling it in Olive Oil you form y^e
Balsam of Sulphur. — vel Oleum Sulphur
Sulphur is widely diff^d thro' y^e earth and
the Class of Veget. called Tetradynamia
United with Hydrogen in many Mineral
Waters.. —

a Mixture of Flor Sulph. 1 Part Potass Car
2 parts, Nitre 3 Parts this Mix become
detonate when heat is applied The Cause of
explosion is not exactly ascertained.

The Sulph: containing Arsenic

k 100 Grains of of Sulph: in a Florence
ask with Oil of Turpentine what is
t undissolved will be Arsenic

effect of Sulphur is restraining
Poisonous effect of Arsenic is well
own also that of Antimony

lphur [illegible] Chrystallize in
ctohedra but the faces of them are
e dissimilar in length Sulphur
found very largely in Italy & Saxony
hemia & some in this Country
lphur is got by heating the ore of
lphur

ulphur will combine with Phosphorus

# Phosphorus

Was accidentally discovered in 1677 —

This is of an amber Color & Semitranspa
Consistence that of Wax & Acts in a Similar
insoluble in water S G 1770 —
Phosphorus is undergoing decomposition when
exposed to light & air — at a temp: 110 of Fa
219 its vapour at 248 it boils
it Melts — In the Slow Combustion Pho
rous Acid is formed in rapid Combustion
Phosphoric Acid is formed Capable of unit
with 3 diff^t proportions of Oxygen

Phosph has a tendency to Chrystallize in Alcoh
but the faces are all irregular you may obta
these Chrystales by melting it & suffering it to Co
Slowly. The water in which Phosph is kept
should be as much as possible robbed of its air
we should not keep a large quantity in Water a
in cold weather the water may freeze & the bo
break, the phosphorous will absorb oxygen
become into a flame.

Phosphorus may be dissolved in very Pure
Oxygen Gas

When an oily Solution of P^h is exposed to the air
it becomes luminous

At the Temp of 100 it burns & at a hundred & twenty it bu
very quickly —

Phosphorus will burn most beautifully in
xygen Gas —

Purified by cautious re-distillation, or straining it, when melted, through leather.

Colour *pearly-white*. *Semi-transparent*. *Waxy*. *Insoluble* in *Water*. Very *fusible*.

When exposed to air, at a low temperature, emits a white fume, and is luminous in the dark; if heated, burns with great rapidity; and in both cases acquires acid properties, *Phosphoric Acid*.

Decomposes the *Nitric Acid*, occasioning combustion by the sudden separation of its *Oxygen*.

By treatment with the *fixed Alkalies* or *Lime*, yields a permanently elastic fluid which explodes on admission of *Air* (*Phosphuretted Hydrogen Gas.*)

Dissolves in *Essential* and *Unctuous Oils*, *Spirit* of *Wine* and *Æthers*.

Unites by fusion with *Sulphur*.

Unites also with several of the *Metals*, and decomposes most of their *Oxyds*.

Used in the preparation of *liquid Phosphorus*, *Phosphoric Matches*, and portable *Phosphoric Bottles*. Attempts have also been made to employ it medicinally in small doses.

## *Compound Combustibles.*

Found abundantly in the vegetable, animal, and mineral departments; some prepared artificially.

Consist principally of *Hydrogen* and *Carbon* variously combined.

May be divided into five kinds, *Alcohol* and *Æther, Fixed Oils, Volatile* or *Essential Oils, Resin* and *Bitumen.*

## *Of Alcohol.*

Obtained from such organised substances, or their products, as have undergone the *Vinous Fermentation,* of which those containing *saccharine Matter* are alone susceptible.

This process materially influenced by *Rest, Dilution, Temperature,* and *Exposure to Air.*—Divisible into different stages, the *vinous* productive of Alcohol, the *acetous* affording Vinegar, and the *Putrid* generating Ammonia.

These changes promoted or retarded by various means, *Ferments.*

hosph combines with Metals & forming
osphurets

hosphorus will burn under water if Oxyge
as is given to it; The Red Oxyde of Phosph
roduced. Put into a Vessel some water
t a little Oxymuriat of Potash with
then drop in some bits of Phosphorus
n pour in a little concentrated Sulph
is Light is instantly produced directly
ouches the Phosphorus & there is a combus
ire. Phosphorus detonates with most of
nitrates & more particularly with the
rate of Metals as Silver & tin thus the
ver is produced to its metallic State
Hyperoxygenated Muriat of Ammo
th Ph. makes a terrible detonation
combines with Sulphur they must be
elted under water it unites in various
portions with Sulphur

Bottle may be coated with Phosphorus,

hosphuret of Lime

ovide yourself a Porcelain tube Put into it some
mps of lime and at one end some Phospho
ich is heated & the Phosphuret of lime wil
formed Phosphurus when burned with
rthy nitrates

neither Silver nor Copper

Phosph produces Strong effects when taken into the S
it has killed Animals & their Stomachs appeared lu
in the dark, it should only be given in 1/3 or 1/4
a Grain at once rubbed down with Sugar,
By dropping a little essential Oil on Sulph: it ma
be ground to a fine powder

The Production of Phosphorus in animals is
sometimes very great

Phosphorus enters into Combination with
many Stony Substances

Phosph has been obtained by simply distilling
the Roe of fishes. Fish in the dark never appe
luminous a Dunghill often appears luminous
in Dark. The Discovery of Phosphorus was
mere accident
He collected a quantity of urine which is
evaporated to the Consistence of a Syrup
mixt with Sand & Distilled a Strong
heat given and a portion of Phosp: is obt

---

30 — If the part of a fluid be taken into a speedy
Fermentation at once, when the first process of F
is over it must be put into Casks & kept in a C
Cellar. Port Wine contains a portion of Tannin
The Colouring matter of Port is principally from the h
of the Grapes. a Vinous Liquor is procured
from Apples Pears &c forming Perry &
In order the procure a vinous Liquor fr
[illegible] 31

our then lute on over the retort
which ought to be Coated with Sand &
ay. The retort ought to be wider at the
outh. The neck of the retort Should
put into water

ight 8 Parts of Bone Ashes 3 parts of Aci
alf Dilute pour it on bone Ash
t it Stand for a few Days then filter
by evaporation you

ke Glass of Phosphorus & mix with it an
little Charcoal & Put into a retort

Ph will not be quite transparent but
ay be made so by redistillation

## Alcohol

rmentation is always attended with more or less
ffervescence, all Substances containing Sugar are
ily converted into Vinous Liquors. Thus we get
n Grapes. & all roots which contain a portion
arinaceous matter.
Of Sugar will ferment with about ½ a Gallon of an Acid
Process begins then by abstracting a portion of the Oxyge
n of Sugar. The lower the Temperature, when
mentation is going on the more Spirit will
left in your Compound. During the Process of
mentation Caloric is evolved.
n Consists of Alcohol intimately combined
th various proportions of Vegetable Acid
When Acetous acid is proved by Litmu

Alcohol is very inflammable and leav
no residuum; If you put a little Gun
Powder into a small quantity of Alcohol
and set it on fire, the gunpowder after
the Alcohol has burned off its good, will
explode.

To Shew the diminution of v
when Spirit & Water are

The Alcohol [illegible] thermometers

Alcohol readily mixes with Water in any
proportion, with a diminution of volume
and an increase of heat. Shewing that the
two fluids have a strong attraction for each
& Specific Gr: greater after the Mixture
other ✓ By pouring Alcohol on a Solution of
Sulphate of Potash, the salt will be precipita
The Chrystals come together in a very confused State

Muriate of Lead. Silver &c are insoluble in
Alcohol. —

or Potash
Sulphate of Lime or Selenite, is quickly
precipitated by alcohol. When dissolved in Water
the alcohol having a stronger attraction for Water tha
Alcohol has is decomposed

It does not act on Sulphur except in a State
of vapour — both of them very little effe
on Phosphorus, It acts powerfully on resin
dissolving it & separating it from Gum.
Fixed Oils as Olive Oil will not Combine with
Alcohol, but it will, when its combined w
Alkali; The flame of Alcohol may be made
burn of different colours with Strontian &c
but the Spirit should hold some water
Alcohol is also a powerful Antiseptic
and is used for the purpose of keeping Anatom

Muriate of Lime & highly rectified Spirit brought
with a Gentle heat & the alcohol will be of
considerable purity

Distillation from Sugar Cane produces Rum.

Repeated distillation and digestion on dried *Muriate of Lime* or on *Potash*, necessary to bring *Alcohol* to its utmost degree of purity.

When pure *colourless* and *transparent*.

Taste *hot* and *pungent*. Sp. Gr. 0.815.

Miscible with *Water* in all proportions.

Burns with a bluish flame, producing in combustion *Carbonic Acid Gas* and *Water*.

Undergoes singular changes in its properties by treatment with the different *Acids*; hence the preparation of *Æthers, Oleum Vini*, &c.

Dissolves the *Alkalies*, and many of the *neutral Salts*, particularly such as are deliquescent. Also dissolves *Soap*, and acts readily as a solvent on *Essential Oils* and *Resins*, on *Balsams* and on *Camphor*; hence the preparation of various *Spirituous Liquors, Tinctures, Varnishes*, &c.

Considered by *Lavoisier* and others, as a compound of *Hydrogen, Carbon*, and *Oxygen*, produced by the decomposition of the sugar, in the act of *Fermentation*.

Order of Attraction, *Water, Æther, Essential Oils, Ammonia, Potash, Alkaline Sulphurets, Sulphur*.

In general use for various *technical* as well as *dietetical* and *medical* purposes.

Specific Grav
when pure one
twice Comas
800 water
being 100

The Sp. G
is thermo
wrought
take before
out the pu
rity of

Brandy
or viz
Port Sherry
of this Coun
[illegible] half
Bulk
Brandy —
Port 25
Cent of alc
Madeira 24
of alc
[illegible] 10
Per Cent
[illegible]
12
of alc
only 9
of alc
Stout
7 Porter
8
alcohol
[illegible]

ndy 53 Parts in 100 the rest Water Rum the
me Hollands a little less

ka the famed Wine containing only 10 P Cent

The Hydrometer is the instrument used to
determine the Specific Gravity of Alcohol
Nicholson's the best it weighs 700 Grains the
if [illegible] or fluid is light it would sink
it

## Of Fixed Oils.

Obtained both from *Vegetables* and *Animals.*

From the *former* sometimes by boiling, but mostly by pressure, from certain *Fruits, Kernels,* and *Seeds,* hence called *Expressed Oils;* called also *Unctuous Oils.*

From the adipose membrane of the *latter,* of different colours and consistence according to the part, the age, and the species of animal from which it is taken, *Lard, Suet, Fish Oil.*

The difference between Animal and Vegetable Oils not exactly ascertained. The Animal in distillation furnish a peculiar acid, *Sebacic Acid.*

Both vary in the temperature at which they become *solid;* are insoluble both in *Water* and *Alcohol;* become *rancid* by keeping; yield, by distillation in close vessels, an *acid Phlegm,* a lighter and a denser *Oil, (Empyreumatic Oil,)* a large quantity of *Hydrogen Gas* mixed with *Carbonic Acid Gas,* and leave behind a small proportion of *Charcoal.*

Afford *Water* and *Carbonic Acid Gas* by inflammation in contact with *Air.*

By mixture with the stronger *Acids,* produce,

Sulphuric Æther is made by taking
qual parts of Alcohol & Sulphuric Aci
hey must be mix'd cautiously Æthe
ut applied very Gently.

s it is obtained in ye first instance
ntains Sulphurous Acid, when you

ther Contains a greater proportion of
ydrogen, and a smaller portion
Carbon. Æther will not boil till
temperature of 200 of Farenheit's Thermom
Sp. Gravity of Æther

the latter stage of ye Process we have
of Wine,

may obtain the Ol Vin: by taking in
first instance a larger portion of Sulph
d in ye Process - when you will have
t little Æther but a large quantity
Ol: Vini

small portion of Æther may be formed withou
id of heat by a Mixture of

Æther will not readily unite with Wat
which may be observed by lighting it
on the surface of Water

It is one of the Lightest fluids we have

It boils at 90 in the air & 20 below Ze
in a Vacuum, Good Æther evaporates
Good very quickly at 40 Deg: below Zero its Sa
to Chrystallize

it is quickly decomposed by Chlorine, and

Oxygenized Muriatic Acid — –

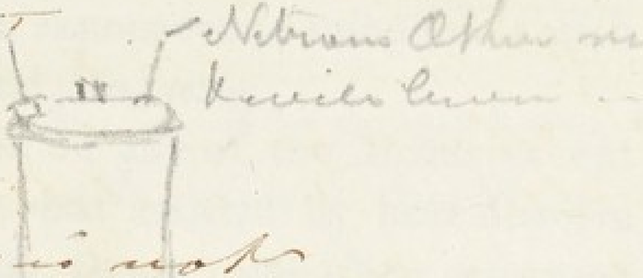
When the Æther is good, by putting a small
of it, into Chlorine it will slightly detonate and
The inside of ye Vessel is covered with Carbon
This experiment should be made with Cautio
danger is sometimes the result of it but not ordinar
but this ought to be done Carefully
Æther has ye property of dissolving a portion
of Gold

Æther is also obtained by mixing Alcohol
with Nitric Acid, but this should be done
with Caution. –

It is extremely Volatile, so that if exposed in Wa
Whether you will observe a number of air
bubbles

Nitric Æther also has the power of dissolvin

Æther: Nitras: Made by 4 Parts of Alcohol and
part of strong Nitric Acid by weight
Mix them Cautiously & draw off 3 Parts & ½ during
whole process a good deal of Gas is extricated
Spirit Æther Nitr were by exposure to air get purer Acid [illegible]
By Mixing Alcohol 2 Parts by Measure
nd one part of Nitric Acid, this will
hew the action of the Nitric Acid
of Alcohol.—



Muriatic Æther is not
tained by employing the Smoking liquor of Liba
Alcohol Take Wolfe's App. put Alcohol into them
n with Common Salt & muriatic Sulp Acid

a very agreeable Æther is
Produced by equal parts of Acetic Acid
nd Alcohol.— Distill with gentle heats
product having a good deal of Acetic Acid therefo
ke it up with Carbonate of Soda
Its general properties, the Acetic
ther, resembles very much the other
thers. and is employed much in
edicine.—

# Fixed Oils

Some of them as linseed will not congeal at an
Common temperature of this Climate

Specific g less than that of Water

Castor Oil is perfectly Soluble in Alcohol free fro
Water which may be promoted by the addition
little Camphire

Fixt Oil undergo a change when exposed to the air
they become thick & ropy these are called fatty Oi
from Absorbing Oxygen from the air The others h
the property of hardening them form Called Dr
Oils as the oils from various Seeds The fat Oils
by some degree become Drying by boiling the
Charcoal insoluble in fixt Oils —

Sulphur readily dissolved in fat Oils
Acid Sulph has considerable action on fixed
If you take fixt Oil nearly boiling & drop
Concentrated Sulphuric Acid and then in
afterwards made a Solid Soap will be
formed

None of the Neutral Salts Decompose

these Oils will form Emulsions when rubb
with Sugar or Mucilage, Fixed Oils will
Good a long time if excluded from the air

in some instances, *saponaceous Compounds;* in others occasion *Combustion.*

Unite more perfectly with the *Alkalies,* more especially with *Potash* and *Soda*; with the latter, form common *Soap.*

Unite also into saponaceous compounds with *Barytes, Lime,* and *Magnesia.*

Have no action on any of the *Metals* except *Copper* and *Iron,* but assisted by heat dissolve most of the *metallic Oxyds,* and when separated again from these, are found to be soluble in *Alcohol.*

Combine by the assistance of heat, with *Sulphur* and with most of the *Bituminous Bodies.*

Considered as differing principally from the *Volatile* or *Essential Oils,* in containing different portions of *Mucilage.*

Employed in *Painting, Varnishing, Soapmaking,* in *Mechanics,* for *Fuel,* in *Diet, Medicine,* &c.

## *Of Sperma-ceti.*

Obtained from the brain of a particular species of whale, (*Cetus dentatus* Lin.) thence called the Sperma-ceti whale; obtained also in small quantity from the oil of the same fish.

After refinement, *white, semi-transparent, crystalline, friable, insipid, inodorous.*

Differs chiefly from the fixed oils in being little altered by distillation, and not easily acted upon by *Acids* or *Alkalies.*

Supposed to have the same relation to *Unctuous Oils* that *Camphor* has to the *Essential.*

Used chiefly for making *Sperma-ceti candles,* and in the composition of *Ointments, Plaisters, &c.*

## *Of Bees-Wax.*

Deposited by the *Bee* in the construction of the *Honey-comb.* Colour, *yellow.*

Very analagous to *Fixed Oils* in all its essential properties.

Becomes white on exposure to *Air,* or treatment with the *Oxygenized Muriatic Acid.*

Forms the basis of several *Cerates, Ointments,* and *Plaisters.*

Employed also in several of the *Arts,* but principally in making *Wax candles.*

## *Of Volatile or Essential Oils.*

Obtained from most fragrant vegetables, by expression, or distillation with Water.

Alkaline Solution the Specific Gr should

ke 24 Oz of Sod Salt 12 O of Lime a
allon of Water boil them & evaporate
until you make a bottle that will hold
a ounce of water will hold an Oz & 1/4
he line

bases of all Soap is these Caustic Alkaline Solut
oap for Med$^{l}$ Purp is made by the Olive
Almond oil.

tash will not make a Hard Soap

ap may be readily decomposed by an Acid

Common hard Soap there is a Portion of
sin in the preparation of it
p is Soluble in Alcohol & Sol$^{n}$ of Soap is often
ployed for a Chemical Test as for Selenite
ump water is said to be hard this depends
its containing earthy Salts which may
emedied by a a little Potash

e kinds of Soap as Mottled which is Do
mixture of some of Metallic Oxydes or the
Oxydes of Iron

very preparation that fixt Oils contain

Fixt Oil is obtained from Vegetables & anim

Fat being cut into small pieces & boiled in wa
forms Tallow the last portion is obtained b
pressing the membranous parts of it is call
Greaves & employed to feed Dogs

The Oil of the Seal never yields a small Portion
of Spermaceti Cetin, as Contained in the h
of the whale Sp. Cetin is purified by a Sol
in Caustic Alkali

Melts at 212 of Farent & further arises in
Distillation by redistilling it from
time to time it becomes permanently fl

By grinding it with Sugar or Almonds &
yolk of egg miscible with water

Sp Cetin gets rancid by exposure to air
may be purified by Caustic Alkali
The fluid Oil by long standing will affo
Chrystales of Sperm Cetin

n expressed Oils from Veg generally got
m Seeds Sometimes found in the
ness of Plants Stems or roots of Veg afford
ry little

lmond Oil may be procured either from
eet or Bitter Almond The last remains
nger without becoming rancid
y are put into hair bags & Subjected to
Strong press—
Recin is obtained by Pression & as cool
ould as be done as possible
mond Oil is either called Cold Drawn
r hot drawn Oil

e difference of Ol Olivæ is dependent on
method of getting it The finest Oil is
t by only pressing the ripe olives gently
mperfectly the Pulp—

oil from Poppy seed which on account of
drying properties is so useful to
inters
e Drying Oils when mixt with alum
y & and vegetable alkalies cease to be
y liable to Set free

e fixt Oil undergo a change on being heated
y to separate a portion of their Carbon

Lac in the [illegible]

This Varnish is very useful in preparing
varnishes thought to be principally [illegible]
one of the Ingred. of Sealing Wax & Dissolved
in Alcohol a very good Varnish
Borax 20 grs Water ℥i & 100 Parts of Shellac
heat them & add more water as it evaporates
you will by this means the Lac [illegible]
The Balsams some of them have a pleasant Smell as
Bal of Tolu Peru Styrax &c In making
of Gum resins we employ Alcohol Dilute

Copal is a Species of resin but this not Soluble in
Alcohol, or fixt oils but like the other Resins it is Soluble in
alkalies and Nitric Acid. but not by water &c The best Copal comes
from . as it is not Soluble in Water
and very little to other Substances, it forms
a good Varnish. for Preparations &c

℥ii of Powdered Copal ℥v of Ol: Terebinth: rec.
apply heat until the Ol: Turpentine boils you
then add gradually the Powdered Copal until
you find the last portion is hardly acted upon
at all the Steam as it will be thick but dilute
a little hot Ol Terebinth
Mastich ℥v, Gum Juniper ℥iii mix them
Powdered Glass then take Alcohol
digest it for 2 or 3 days then take Terebinth
put it to the Solution & Strain
[illegible]

called Essential Oils
in Some plants they reside in the flowers as the Rose
Lavender & Sometimes in Bark as Cinnamon
in Seeds as Carraway
if Essential Oil is good it ought to Evaporate
without scarcely leaving a Stain

Taste *pungent*. Odour, colour, and consistence, *various*. Most of them lighter, some heavier than *Water*. (Oil of Cloves)

Thicken and become less odourous by absorbing *Oxygen* when exposed to *Air*; hence the supposed formation of *Balsams* and *Resins*, which differ chiefly in consistence and the occasional presence of *Benzoic Acid*.

Vapour of Oil

Also affected by exposure to *Light*.

Sparingly soluble in *Water*; but readily so in *Alcohol*.

*Volatile* in close vessels, at or under the temperature of 212 *Farenh*. By repeated distillation lose their characteristic properties, and are brought nearly to resemble each other.

Highly inflammable when heated in contact with *Air*.

Decompose the stronger *Acids*; in some instances with such rapidity as to occasion actual *Combustion*.

May be united with the *Alkalies* and *Lime* so as to form *Soaps*.

Combine intimately with *Sulphur*.

Combine also with *Phosphorus, Unctuous Oils*, and *Camphor*.

Purity ascertained by solution in *Spirit,* or exposure to *Heat.*

Chiefly employed in *Medicine.*

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## *Of Camphor.*

Thought to be a *Volatile Essential Oil,* containing a large proportion of *Carbon.*

Exists in many of the fragrant plants, as *Lavender, Rosemary, Marjoram,* &c. but principally procured by distillation with water, from a particular species of laurel, *(Laurus Camphora* Lin.)

Requires certain additions in its subsequent refinement by sublimation.

*White. Transparent. Friable.* Taste *pungent* and *bitterish.* Specifically lighter than *Water.*

Evaporates completely if kept exposed to the *Air.*

Burns with a white flame, and is entirely consumed.

Sparingly soluble in *Water*; but readily so in *Spirit of Wine* and *Æthers,* in *Unctuous* and *Essential Oils.*

Dissolves both in the *Sulphuric* and *Nitric Acid,* without decomposition; by repeated dis-

Copal in many of its properties resembles
mber.. Amber

Camphor

camphor is found interspersed in the veins of the wood

mphor more vol: than essential oils Iz

ignes at temperature of 302 Deg. of F to
elt it if heated suddenly
mphor is highly infl: Carbonic Acid is produced
Camphoric Acid

Lighter than Water, it swims readily burns on
surface.

in warm weather it evaporates completely

t is very inflammable, and leaves no residuum
hen burnt it gives off Carbonic Acid &
mphoric Acid.

By repeated Distillation with Nitric Acid Campho
converted into a peculiar Acid

lcohol Æther & Acid will dissolve it.
om Alcohol precipitated by Water, the
ater having a greater attraction for the Spiri
an the Camphire has.

There is a Kind of Laurel in Japan whic
will yield Camphor

Camphor has been found in Many Plants
as Lavender Rosemary &c

Water will only dissolve 1/10000ths Part but
abundantly soluble by Alcohol

By the intervention of Gum or Sugar Camphor
with water will form an emulsion

If a small piece of Camphor is placed on Pure Wa
It will begin to move round the vessel very qu
but if any portion of essential oil is added t
motion will be readily Stopped this has
been satisfactorily explained.

By passing Acid: muriatic Gas thro' Ol. Terebint
oil of turpentine Camphire is formed

## Bituminous Bodies

They are either liquid or Solid & found
n many degrees of Purity & appear to
ave passed their many gradations

Naphtha.. found in East is is an extremely inflam^ble Substan
ound at Baku in the Borders of Caspi
a also in Italy Lighter than Other

t's composed of Carbon & Hydrogen, Simple
posure to the Air will carry off a large
rtion of y Hydrogen.

Petroleum or Tar

s the Carbon is increased it will more
adily combine with Alcohol

Mineral Pitch or Maltha

Resembles Common Pitch —

distilled harden it & called Asphaltum
which will Melt & is very inflammable

The Main bulk of Jet is Asphaltum
It may be turned into various Shapes
as is Specified in Making ornaments

Camel Coal, is full black
Produced in Lancashire
100 Parts contain 72 pts of Carbon 22 of Malt
but no Asphaltum (and earthy Matter)

When Distilled it, affords an oil like Tar
and what is left will be Coke —
which Contains more Carbonaceous Matter & b
better than ye Coal..

100 Parts of Whitham, 57 Parts of Carbon 4 of Maltha & Asphaltum
and nearly 2 Parts of earthy residuum — G

aphtha is remarkable for its fluidity & [illegible] of all other oily substances

tillation with the latter, is converted into a peculiar *Acid.* Artificial substance resembling *Camphor.*

Chiefly employed in *Medicine.*

## *Of Bituminous Bodies.*

Found either liquid and devoid of colour, *Naphtha*; or more or less liquid and of a dark colour, *Petroleum, Barbadoes Tar*; of a harder consistence, *Maltha*; or perfectly solid, black, and of a compact or slaty texture, *Asphaltum, Jet, Coal.*

The more liquid Bitumens by continued exposure to *Air,* convertible into the more consistent, and all yielding similar products in distillation. *Coal* considered as a variety of *Bitumen.*—Origin and formation of *Coal.*—Artificial formation of *Bitumen* from *vegetable Matter,* by heat and pressure. In the different kinds of *Coal* there exists more or less *earthy* admixture, and often *Iron Pyrites.*

The *bituminous* bodies immiscible with *Water* and insoluble in *Spirit of Wine.*

## *Of Amber.*

Nearly allied to the foregoing.

Found for the most part in irregular masses more or less transparent, and of a brownish or yellowish colour.—Specific gravity from 1.055 to 1.000. Emits a peculiar odour on friction and becomes *electric*. Melts at 550 *Farenh.* Burns with a whitish flame. In distillation yields *Water, Empyreumatic Oil,* (*Oleum Succini* P. L.) and a concrete *Acid.*

Insoluble in *Water* and nearly so in *Spirit of Wine,* also in all the acids, the *Sulphuric Acid* excepted, in the solutions of the *Alkalies* and in *essential* and *expressed Oils*; but the *Balsams* dissolve it readily.

Of the methods usually employed for rendering *Amber* transparent.

Is probably of *vegetable* origin.

Artificial Musk is prepared by taking equal parts of Nitric Acid & Oil of Amber

# Amber

ian infl: Substance its a brittle transparent
llow Substance

Specific gravity little more than that of
water. when rubbed it becomes electrical

Water does not act on it, but alcohol will
solve ⅛ part of it Alkalies will
solve it also. Nitric Acid. - it must
heated considerably. like Copal before
can be used for a Varnish. but
t ought to be roasted
is of Roasted Amber ℥24 ol Turpenth;

he Acid. afforded by the Distillation of
mber already spoken off. Succinic Aci
he Same process affords its Ol: Succin
purified by Distilling this it becomes

mber abundantly found in Prussia
ume & eastern Shores also found
t is probable that Amber is formed from
getable Substances which have been acted
by Sulphur

e Oil & Acid used to be used in Medicine

Camphor
It is a volatile essential Combined with
a large portion of Carbon Hyd. & Oxyg

## Coal

E Coals are found in the earth seldom
in Strata but in Seams.—

The thickness is mostly uniform the direction
of them generally east & West.

The Seams don't run parallel with the
Horizon :— In the County of are
the Deepest Seams of Coal: that nearest
the Surface is Commonly the Worst.
but this is not always the case.—

a Species of Coal, called Wood Coal is found in Devonshire
near Exeter; it lies in Strata, but
the Strata are not parallel to each other
direction from east to West, there is evident
traces of Wood in it.

the Carbon has been freed from $\frac{2}{7}$

the Character of Bitumen is very apparen

turf & Peat, the last found in Bog

mbergrease was formerly supposed to

a bitumen but now known to be of Animal Ori
een found in Stomach of Spermaceti whale
parts of it. Consists of 53, of Adiposcir
, Resin 11 Bezoar Acid 5 of Charcoal
t wash on Sea Coast found floating or b
t has been in the Stomach of the Spermac
whale, considered a disease of this fish
& S generally thrown back

t is inflammable & softens in a Moderate
eat, only Nitric acid will act on it strong

sed by some as a perfume.–
Essence of Amb
ʒj of Ambergrease, ʒij of Sugar, a few grs of
usk, fʒij ʒss of Spirit. Vin: rectif: This
akes the Essence of Ambergrease

entral Acids & Ethers also dissolve it

hen Diluted it becomes fragrant.

## OF METALS.

Found generally in the clefts or fissures of stony or other strata, forming what are called *Metallic Veins*; or in indeterminate *Masses*; or in *Beds*; or *disseminated* through other substances.

In these instances they are either *native*; or *alloyed* with each other; or in different states of *Oxydation*; or *mineralized* with certain combustible bodies, particularly *Sulphur*; or lastly, combined with one or other of the *Acids*.

Different processes therefore commonly necessary for obtaining them in their separate and proper forms; as, *Pounding, Washing, Roasting, Amalgamation, Reduction,* and *Refinement*.

When pure, easily distinguished from other bodies by their united properties of *Weight, Opacity* and *Splendour*, as well as by their power of conducting the *Electric Fluid*. Great specific *Weight*, however, is not a character common to all *Metals*.

Some remarkable for their *Ductility*, or *Malleability*, or both; others for their comparative *Brittleness*: hence the *common* though *inaccurate* distinction into *Metals* and *Semi-metals*.

Differ also from each other in their comparative *Hardness* and *Softness:* when hardened by mechanical extension, may be made soft again by exposure to red heat—*Annealing.*

All *fusible* in close vessels if heated to their respectively necessary degrees ; are convex when in fusion, and in cooling disposed to *crystallize.*

Some, particularly *Iron* and *Platina,* grow soft before they melt, and hence are capable of being united by the operation of *Welding.*

Some, as *Platina, Gold* and *Silver,* remain *fixed* during fusion ; others, as *Quicksilver, Arsenic, Zinc* and *Antimony* are *volatile* or convertible into a state of *Vapour.*

Variously affected on exposure to *Air,* by which in some instances they are merely *tarnished,* in others deprived of their metallic properties more completely, being converted into a state of *Oxyd :* hence the utility of *Tinning, Silvering, Gilding,* &c.

All, except *Platina, Gold* and *Silver,* still more readily *oxydated* by the united action of *Air* and *Heat*; hence their division into *Noble* and *Base* metals. The circumstances in which these differ from each other in their *Oxydation* are ; the comparative facility with which they become *oxydated,* the temperature required for that pur-

o know Whether an Ore contains any Metal
on by means of a piece of Charcoal, and
tting a little of ye Ore into a hole in this
eviously, and likewise a little black flux
nd apply heat & you will distinctly
e Metallic Globules — —

e Ductility & Malleability differ very
uch: the most remarkable Metals for
is property are Lead Iron and es-
cially Gold & Platina likewise
ese are all capable of being drawn out
to a Wire, and beaten into an extreme
in Sheet. The thickness of Sheet Gold
ccording to experiment is not found
exceed one 28000th part of an Inch
lver and Quicksilver when cooled to ye
oper temperature, will be found
uctile & Malleable —
ntimony Bismuth &c are not found
ssess these properties remarkably —

ey differ also in Point of Hardness —
s we know Iron when Converted into Steel
in ye Case of ye Instrument called ye file
ence our Coins are alloyed. thus ye Silver
Gold are mixt with an inferior Metal

By exposure to heat we are able to extend into a Sheet many Metals, wh would Crack if heat was not applied. This is Called ye Process of Annealing.

It is often of importance in Constructi of various Machines to know, ye degre of hardness of a Metal. Dr Babington has an instrument to effect this given him by Mr Pepys

Metallic bodies generally are Capable of fu but they differ in ye respect to ye degree of ye Temperature, Comming when in fusion and on Cooling are disposed to Chrystallize, Lead will fuse much more easily than Silver but this la is more easily fused than Iron Platina requires an intense heat to fuse it

In Cases where Solder is applied it right that it should be more fusible than ye Substance to be Soldered.

you Cant by fusion Combine Iron
ith Quicksilver,

If you wish to Separate any two
etals, as Lead with Copper you
ust expose it to a degree of heat

ome of Metals as Platina & Iron
come soft before it became fused
his is very useful as it renders
hem Capable of being united by
application of Compression (What
Called Welding) this is done continu
lly by Blacksmiths. — When ye
lacksmith has heated his Iron
uses Sand which acts as a
ux — thus the Solderer uses Borax
hich Converts the Metallic Oxyde
to a State of glass —

an cant take Oxyde of Zinc, and mix it
ith a flux without excluding it from
air, otherwise you will have ye Flor: Zinci
t it be done in a retort (a Close Vessel)
etallic Bodies are effected by exposure
air Gold Platina & Silver are not
ted on. but we find Copper Iron
will become affected. — hence ye
tility of Tinning, Silvering and Gildin
hich we know are not affected [illegible]

We can Gild on brass, Copper, & Silve

When Lead is Melted its surface expose
ye Atmosphere, it will form an Oxyde,
Iron may be melted very readily by mea
of Oxygen Gas. Copper Burns in Oxygen G
with a Green flame

The Most effectual modes of Oxydating Met
is by means of an Acid. Combined wi
Water, thus Concentrated Sulphuric Acid
will scarcely act on it, but very strong
when diluted, the reason of this is owing, ch
said to a predisposing affinity, of ye wat
The Acid is ye Solvent of ye Oxyde not ye Metal
When a Metal is brought to a State of Oxide
it is capable of forming with ye Acids Neutra
Salts

No Metal can be dissolved in Acid excepting when in a Sta
Oxyde –

The ~~Oxyde~~ Metal becomes sometimes insoluble in Acid by Conta
too much Oxygen this is the case with Peroxyde
Arsenic and Mollyb. & Chrom are capab
combd with enough Oxygen to bring them to the Stat

All Metallic Oxydes may be may again be made
Reguline, or in its metallic State.

It may also may be brought into its metal
State by Chemical affinity. thus ye Nitrat
of Bismuth decomposed by Water it
having a stronger affinity for Acid the
the Bismuth

pose, the quantity of *Oxygen* which they respectively imbibe, the force with which they afterwards retain it, and the phenomena which they present during *Oxydation*.

Of *perfect* and *imperfect* metallic oxyds.

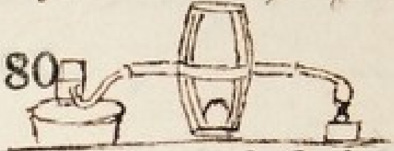
*Metallic Oxyds*, however produced, vary in their properties, not only from each other, but also from their respective metals. Those of the volatile metals much more fixed than the metals themselves:—Some capable of being decomposed or deprived of their *Oxygen* by heat alone, as those of *Platina, Gold, Silver*, and *Quicksilver* —Such as are not decomposed by the simple application of heat are *vitrifiable*; hence the necessity of *Fluxes*.

Remarkable for the *Colours* and sometimes for the *Opacity* which they communicate to *Glass*: hence the preparation of *Pastes* in imitation of precious stones, and also the preparation of *Enamels*.

Metals also capable of being oxydated by the decomposition of water—Few of them at a common temperature have any considerable action upon *Water*, in general therefore void of *Taste*; some however when aided by a red heat readily decompose it, and are thereby converted into

Oxydes of Tin & Lead soluble in Soda, Oxydes of Copper & Cobalt soluble in Ammonia

Water may be decomposed by being made to pass thro' red ho
as in this Apparatus



*Oxyds:* hence the explanation of their effects on various other fluids.

Metals also capable of being oxydated by acids—Previous *Oxydation* necessary to their combination with acids (*Metallic Salts.*) Hence, in their solution, the partial decomposition of the *Acid* itself, or of the *Water* by which it is diluted; and the consequent evolution of *Sulphureous, Nitrous* or *Hydrogen* gas.

In some instances they are furnished with so large a proportion of *Oxygen* as to become *insoluble,* in others acidified. (*Acid of Arsenic, of Molybdena,* &c.)

*Metallic Salts* for the most part possessed of *Colour* and more or less *Corrosive.*

The *Acidifiable Metals,* and those, the *Oxyds* of which have a disposition to combine with *Earths* and *Alkalies,* may be readily *oxydated* by these through the medium of *Water.*

Many *Metallic Oxyds* soluble in solutions of the *Alkalies,* forming with them permanent compounds. The partial decomposition of the *Oxyd* by the *Alkali* sometimes necessary to this.

*Neutral Salts,* acted on but slowly by *Metals* unless aided by *heat,* which, by assisting to decompose their acids, *oxydates* the metal and renders it combinable with the *Alkali.*

e Metallic Solution can be decomposed
ye Alkalies & the Oxydes precipitated. a Solution
Bismuth decomposed by water alone

r a little ammonia on Verdigris (Oxyde of
pper) and ye Verdigris will become decom
sed. A Slip of Copper immersed in
trate of ~~Cop~~ Silver will become covered with
Coat of Quicksilver, If a Slip of Iron be
t into Nitrate of Copper it will become
ered with Copper i.e. It can be removed by
Acid. there is a proportionate quantity of iron
olved in ye Acid also therefore there is an exchange
n may be als-coated by Nitrate of Quicksilver when put i
t is    Metals of Capable of Combining with Simple Suff: Subst:
ins Hydrogen Gas will dissolve a portion of Iro

Steel is a Carburet of Iron.

Metals except Gold & Zinc will Combine with Sulphur
Sulphuretted Hydrogen Gas have a Considerabl
tion on Metals, it will tarnish Silver
rticularly, and to this Gas, is to be impu-
the ready tarnishing of Silver in Shops
by Fusion
tals will Combine with each other forming
& more brittle
lloys, which is always harder, than either of
Separate Metals, Soldering depends
this property of forming Alloys a
ismuth 8 Parts, 5 Ps of Lead 3 Parts Tin, the
lted together are capable of dissolving in
ling Water, if Quicksilver be added its more
sible

The Caustic effect of Oxydes seems to depends on the
yielding their Oxygen to ye Animal fibre.

The Classification of Metals is of very little consequence
The Best order we adopt is to be divided into 2 Classes those whi
form ye Alkalies & earthy & Cant be oxidised by heat
Carbon
2 Those which Can be deprived of their Oxygen, by
Carbon or heat alone, The last might be Subdiv
into the Malleable Metals & Brittle —
1 Gold Platin Lead Nickel Zinc Palladium Mercury
Iron &c
Brittle, Chrome Arsen Bismuth Ant^y Mangan
Tellurium Tungsten Molybden Columium or
Tantalium —&c

Dalton Wollaston &c think that Oxygen unites
unite in certain proportion,

Within these last few months experiments have
made to shew that ye Same law prevails in the
vegetable Kingdom as in the Acids &c

The 1 Calcium Strontium and a considerable num

The 6 last have not been obtained in their pure s

The 2nd ~~are 6~~ they ~~have~~ are very numerous

etallic Oxydes are employed as the Colouring
atter in Making Pastes &c — The Oxyde of
balt

e Oxydes of Metals are poisonous which are
ot in their reguline state — therefore
e Metals that are poisonous owe their
leterious effects to the Oxygen

union of Metals with the Oxymuriatic Acid

ere is every reason to believe in our present
ate of knowledge that metals are simple bodie

is a question whether oxygen will combine
metals in determinate proportions only

# Platina

In Spanish means Silver. Called Platinum by
Dr Thompson, It is not capable of Oxydation they
Classed with Gold & Silver
Not more than 60 years since Introduced into this Coun

Platina was for a long time Supposed to be peculi
to South America

The Natural History of it imperfectly known

Always found accompanying Gold —

The Grains in which it is found are somewhat
flattened & Smooth
They are partly attracted by Magnet this is owing to so
portion of Iron being mixed with them
Platina but seldom found in large pieces, one pi
in France as large as an Egg. found in 1800

As weighed.

Platina in granular form is impure its Sp
is between 15 & 18 it generally contains 80 p
of Pure Platina the rest being made up of o
Metals as Gold Iro

*Metallic Oxyds* already formed sometimes combine with *Neutral Salts,* and produce with them triple compounds.

*Iron* the only metal capable of combining with *Charcoal*; but this, and almost all the others, or their *Oxyds,* unite readily with *Sulphur,* their common mineralizer: many also combine with *Phosphorus,* and form fusible compounds.

With very few exceptions they unite with each other by fusion in all proportions.

*Metallic bases* of the earths and alkalies. General history of that discovery.

Classification of metals.—The metals at present known are the following; *Platina, Gold, Silver, Quicksilver, Lead, Copper, Iron, Tin, Bismuth, Nickel, Arsenic, Cobalt, Zinc, Antimony, Manganese, Wolfram, Uranium. Molybdena, Titanium, Tellurium, Chrome* and *Columbium.*

## *Of Platina.*

Brought from *South America,* in small grains of a dull silver colour, and commonly mixed with

1/4 of Gold in 1 oz of Ore but as much as 7/8 in 3.
found sometimes more than this

*Quicksilver, Ferruginous Sand,* particles of *Native Gold,* and no less than *four new* discovered *Metallic Bodies.* Found also sometimes, though rarely, in lumps—Bed and matrix unknown.

Manner of purifying, by fusion with *Phosphorus;* or amalgamation with *Quicksilver,* and solution in *Oxy-muriatic Acid*—Wrought in the large way by repeatedly melting with *Arsenic* and *Potash,* and subsequent roasting and hammering.

When pure, of a *Silver white* colour, inclining to *Iron-grey.*

*Malleability* and *Ductility* intermediate between those of *Gold* and *Silver*—*Hardness* greater than that of either—*Tenacity* next to *Copper*—*Specific Gravity* in its native granular state 17,7; in its malleable state 21,3, but varying a little according to the degree of compression.

Extremely difficult of *Fusion*; but when urged by an intense heat, becomes capable of being *welded,* though imperfectly.

Less disposed to *Tarnish* than either *Gold* or *Silver* on exposure to air—and not *Oxydable* by it even under the strongest heat; but may be reduced to a powdery *Oxyd* by the *Electrical Spark.*

Platina is capable of being brought to a
state of fusion by burning it in Oxygen
s Iron when burnt in Oxygen
s produces a very pretty appearance
Quicksilver may be driven off by heat.
~~[illegible]~~ Dissolve the Gold by Nitro Muriatic
& precipitate it by Sulphat of Iron.
Platina not acted on by Acids excepting by
Nitro
muriatic Acids & Oxymuriatic Acids
when dissolved in Nitro Muriatic Acid may be precipitated
by Muriat of Ammonia
The Muriate of Platina may be Chrystal-
lized

Nitro
When Platina is dissolved in ~~Oxy~~muriatic
Acid it is capable of being precipitated by
Solution of Muriate of Ammonia —
forming Ammoniacal Muriate of Platina
The Solution remaining would be found to contain
on & the new Metals Palladium & Rhodium
To obtain the Platina in its Metallic form from
the precipitation formed from Muriate of
Ammonia. having obtained this salts you may.
by applying heat to this precipitate the Ammonia is
driven off & a Mass is left which by being
repeatedly heated & hammered the perfect Metal
obtained quite Malleable.

Purchased in Bars at 15s ~~Oz~~ In Grains 3 or 4 Shillings ʒ;
The Color of Pure Platina is a sort of a whitish grey
Very Ductile & Malliable Pressed may be into Plates &
drawn into wire.
Price of Platina in Grains 3 or 4 Shillings ʒ
ness
Its hard~~ly~~ scarcely infr to Iron will take a fine polish
Dr Marcet has an Eighteen Penny piece of it which is twice the
weight of a Silver one

~~Both Soda &~~ Potash will precipitate Plati
but soda does not ~~act~~

The Specific Gravity of Mall: Platina is 21 3/10th

Dr Wollaston succeeded in drawing a wire of Pt 1/10000th part
inch in Diameter, & which supported Gr 1 1/3rd without br
-eaks Dr W succeeded in drawing one 1/18000 part of an i
(Silver its Sp: Gravity only 11) The wire in the Operation of dr
the form is covered with Silver which is dissolved in Nitrous A

Solutions of Muriate of Platina decompos
by the Muriate of Tin & other Metallic Salts
The Muriate of Tin imparts to it a bright red c
or rather a yellow —. The Action of Caustic Alk
at high Temp: is very obvious therefore can't be
in all cases of analysis

Platina by fusion is Capable of uniting
with many Metals, forming alloys
Gold & Lead & Silver.
It is not Capable of Combining with Sulphu

Platina is not much used in the Arts on
account of its high Price — it makes
exceedingly serviceable Crucibles on account of th
difficulty of fusion in Analytical Chemistry. Evap
dishes are made of it for smaller experiments
Platina is used for the touch holes of Guns
Gold used to be employed for that purpose
but it is much softer than Platina

Mirrors for reflecting Telescopes are sometimes ma
of Platina

Platina Vessels have been used lately
ry much by Manufactorers - in
the preparation of Vitriolic Acid.
y are Glass vessels but they are continually
ursting & are very expensive the Plan the
stone vessel on the fire in a Sand Bath -
Metallic Glazing which coats
thenware Vessels, is made by the
yde of Platina - this glazing has a
yish white color

latina may be fused by urging the flame of a Spirit
mp by means of Oxygen Gas. it is melted in this way
th extreme facility. it was some time ago considered
usible.

tina at a white heat possesses the valuable property of
lding

atina is being capable of being laminated therefore
y useful in conducting small assays: when
ed into the Shape of a Spoon Small Tongs are
ade also of Platina which are very useful

Soluble only in the *Nitro* and *Oxy-muriatic Acids,* to which it communicates at first a *yellow,* and afterwards a deep *reddish brown* colour.

Precipitable from its solutions in these by the *Alkalies* and several of their compounds—With *Muriate* of *Ammonia,* as with many of the others, it forms a *Triple Salt,* which on being submitted to an intense heat, and strongly hammered when in a state of incandescence, furnishes the pure *Metal.*—Precipitable also by many of the other metals and their solutions, more especially by *Tin.*

In its metallic state is not acted on, unless exposed to very high temperatures, by *Earths* or *Alkalies,* or any of their compound salts, except the *Nitrate* and *Oxy-muriate* of *Potash,* by which it may be superficially *oxydated* in the dry way.

Has no affinity with *Sulphur ;* but, like *Gold,* is soluble in *Alkaline Sulphurets*—Combines readily with *Phosphorus.*

When pure, amalgamates intimately with *Quicksilver,* and unites by fusion, in different proportions, with most of the other *Metals*—most easily with *Zinc*—with *Copper* produces a golden-coloured, hard and durable compound, which is malleable, close-grained, and susceptible of a fine polish—remarkable for giving a considerable degree of toughness to *Cast Iron.* With *steel* forms a compound incapable of being touched by the file.

Order of attraction, in the moist way, *Æther, Muriatic, Oxy-muriatic, Nitric, Sulphuric, Arsenic, Fluoric, Tartareous, Phosphoric, Sebacic, Oxalic, Citric, Formic, Lactic, Acetic,* and *Succinic Acids*; in the dry way, *Arsenic—Gold—Copper — Tin — Bismuth — Zinc — Antimony—Nickel—Cobalt—Manganese—Iron—Lead— Silver—Quicksilver*—and *Sulphuret* of *Potash.*

Use as yet, principally confined to *Chemical* and *Philosophical* purposes. Employed to make the touch-holes of guns—likely to be soon more extensively used.

## *Of Iridium, Osmium, Rhodium, and Palladium.*

These four metals always found mixed or combined with crude platina. *Iridium* and *Osmium,* discovered in the black powder which remains undissolved after the action of nitro-muriatic acid on crude platina; and *Rhodium* and *Palladium* obtained from the solution itself.

Iridium first found by Mr Tennant;

separated it from bl$^k$ powder caustic alkali

muriatic acid

properties are dissolve in all acids but

st in acid: muriat.

Metal is reduced by heat alone not obtained

metallic mass but in a spongy mass.

been fused by the Galvanic Battery -

Osmium & ~~Palladium~~ Iridium.

<u>Osmium</u> is obtained by heating the black po
in Silver crucible

If a gentle heat be applied the Oxyde will
volatilyze

a Solution of Oxyde of Os: is colorless & does n
redden vegetable blues If heat is applied the
Oxyde may be volatilized from it. it is volatil
at a lower Temp: than any other Oxyde of Met

Os: has never been got in Pure Metallic form
only in form of a Black powder

<u>Rhodium</u> found in nitro Muriatic Sol
discovered by Dr Woll: precipitated by the
intervention of Muriate of Soda

Called Rhodium from Greek on account
of the rose color of its Salts

Pure Rhodium is White

Specific Gravity only 11

Palladium may be got either from the sam
solution by Prussiate of Mercury
Prussiate of Palladium is form:
100
100 Grains of Platina only gives ½ a Grain of
Palladium

In external appearance it resembles Pl:
atina its very malleable more fusible
than Platina Minerals acids do not po
ice

It combines with most of metals form
alloys Dr Woll: discovered a piece of pa
ago since

Solutions of *Iridium* varying in colour according to the degree of oxygination of this metal—How obtained pure. Soluble in acids, and especially in the muriatic. From its combination with this acid, may be obtained pure by heat alone.

*Osmium,* thus called from its peculiar smell. How obtained. Has never been procured in any other state than that of oxyd.—This oxyd very volatile and soluble in water. From this solution (which is colourless and transparent) the metal can be obtained in the form of a black powder. General properties of this substance.

*Rhodium,* thus called from the rose colour of its solutions. How separated from crude platina, and obtained in its reguline state. Its general properties.

*Palladium,* how obtained in its metallic state. Its general properties. Lately found in Brazil in grains of pure Palladium *mixed* with Platina, but not *alloyed* with it.

## *Of Gold.*

Though less abundant, yet occurs more generally than most of the other Metals.

Found, either alloyed with a small proportion of Silver, Copper, Iron—*Native Gold*; or, combined with Sulphur, Antimony, Arsenic, Lead, Iron and Silver—*Grey Gold Ore*; or, with Bismuth and Sulphur—*White Gold Ore*—*Aurum Graphicum.*

Manner of collecting it from its ores.

When pure, of a *bright yellow* colour; *soft*; *inelastic*; *flexible*; very *tough*; *ductile* and *malleable* to an extraordinary degree; not *sonorous.*

Next to Platina the *heaviest* of the metals; its specific gravity when uncompressed being 19.30.

Scarcely *tarnishes* even by continued exposure to air or moisture.

*Melts* soon after becoming red hot, or at 32° *Wedgw.*—5237 *Farenht.*—Whilst in fusion, of a *sea-green* colour.

Though unalterable in the common fire, may, by a more intense degree of heat, be *volatilized*, or imperfectly *oxydated.*

*Crystallizes* in cooling, into quadrangular pyramids.

If fused by the lowest degree of heat required for that purpose, becomes afterwards *brittle*—becomes also *hard* and *brittle* by compression; hence the necessity of *Annealing*.

# Gold

considered above all other Metals —
account of its Ductility Malleability
nd its not being acted on by $y^e$
tmosphere — —

t exist in largest quantities in Mexico
ungary. — Peru &

$y^e$ Vicinity of $^t$          in Ireland it is
ound

found in flattened fragments of Considerable
agnitude

has been discovered in an imperfect chrystally
te more frequently found in Capillary State &
e frequently in the form of Dust.
llurium contains some gold
you mix Gold & Silver Leaf together and
t it into Nitric Acid you will find the
ver acted upon but not the Gold.

of Gold may be extended 13000 Miles in length

n united with Silver may be separated by pouring
e Dilute Nitric acid

ecific Gr: of Gold 19 4 3/10th.

d is very ductile so that a wire 1/10th of an inch in
iameter will support

When Pure requires a White heat for its fusi
but when impure it will Melt at a red heat.

It can't be Oxydated — only by the Galvanic Batt
Gold may be melted by means of a Spirit lamp whi
urged by a Stream of Oxygen Gas. as Platina may.
The Solvent of Gold is the Nitro Muriatic Aci
which is formed of Acid: Nit: 2 Parts. Acid: Muriat
Part
Soluble in Oxymuriatic Acid

Solutions of Gold are of a rich Color

They are decomposed by y — Alkalies and the
famous Compound called —
Fulminating Gold is formed by precipitatin
a Powder, by Ammonia, from a Solution of gold i
Nitro Muriatic Acid.
In the preparation of it the heat

The Powder should be placed on a card and held o
a lamp when it will explode violently. The explosi
is owing to the sudden formation of elastic Matter.
The precipitating y Powder of Cassius. is form
by putting Tin into a Solution of Gold. Both th
Oxydes are precipitated in the form of a purple po
Also precipitated by the Sulphate of Iron in th
state of pure Gold. but its not bright but can b
made so by means of heat & Drying it. The S
Iron will not precipitate the other metals ov
Gold.

Gold has so little attraction for Oxygen that even
alone will reduce the Gold into its Metallic State

y slow cooling Gold it will Chrystallize.

e attraction of Gold for Oxygen is so weak that
e acids Scarcely affect its Solutions.
Solutions of Gold are very corrosive they
e precipitated by Alkalies

e Solutions of Gold are Decomposed & the Gold
cipitated in its Metallic form by some of
e Combustibles.

Gold forms Alloys with most of the Metals

With Silver in

The Coin of this Country consists of 1 Part of Copp
to 11 of Gold

℥i of Gold is worth intrinsically £3-12-6.

Gold unites with Quicksilver with great ea
forming an amalgam of a yellowish white
color this is much used in Gilding:

Gold Leaf affords another means of Gild
as applied to wood with Size

Glass is Gilded by

In the form of Gold leaf, is converted by *Electrical Explosions* into a *purple Oxyd;* and when ignited by the *Galvanic Fluid,* burns with *vivid white* flame, inclining to *blue.*

Like Platina, *soluble* only in the *Oxy* and *Nitro-muriatic Acids,* without effervescence; and in the solutions of *Alkaline Sulphurets*—Its acid solutions of a *yellow* colour and *caustic,* stain the skin *purple,* and, when evaporated, yield deliquescent crystals, which like the oxyds of this metal are decomposed by simple heat.

Gold separable from its solutions by *Æthers, Essential Oils, Phosphorus, Hydrogen Gas, burning Sulphur,* &c. May likewise be precipitated by all the *Alkalies,* and *Earths* in the form of a *yellow Oxyd,* which by exposure to light is partially decomposed, and becomes of a *purple* colour, and no longer soluble in acids.

The precipitate by *Ammonia* long known for the property of exploding with great violence when exposed to a moderate heat (*Aurum Fulminans.*)—This an *Ammoniacal Oxyd,* the explosive power of which depends on the double decomposition which takes place between the *Oxyd* and the *Ammonia*; hence the effects of exposing *Aurum Fulminans* to a gentle heat, or of mixing it with *Oil* or *Sulphur,* or of heating it under strong *Compression.*

The precipitate of Gold by *Tin—(Purple Powder of Cassius,)* proved by the experiments of *Pelletier* to be an intimate mixture of *Oxyd* of *Tin* with imperfect *Oxyd* of *Gold.*

Gold distinguishable from Platina, by being precipitable from its solution by *green Sulphate of Iron*; but not by *Muriate of Ammonia.*

Its *Oxyds* unite by means of *Alkalies* with the *vitrifiable Earths.*

Has no affinity in its metallic state, for either *Sulphur* or *Carbon*; but unites with a small proportion of *Phosphorus,* and thereby becomes *paler,* and more *fusible.*

Combines with all the *Metals* in various proportions, acquiring different shades of colour and hardness, according to the quantity of alloy.

With *Copper* assumes a deeper colour and becomes more fusible, harder, and more elastic.

Amalgamates readily with *Quicksilver*; hence the art of water-gilding, and manner of collecting it from its ores, as before mentioned.

May be freed from admixture of imperfect metallic matter, by fusion with *Lead,* or *Bismuth* under free access of air; hence the process of Cupellation.

trinsic Value of pure Gold is £3-17-6
Annum —

lass is Gilded by wetting the Part with —
lution of Borax and heat afterwards
plied

not on account of Color that we use the
lor of Gold but on account of its not being
ted upon by air & moisture

Most easily and effectually separated from *Silver* by diluted *Nitric Acid:* hence the process of *parting*.

Order of attraction in the moist way, *Æther, Muriatic, Oxy-muriatic, Nitric, Sulphuric, Arsenic, Fluoric, Tartareous, Phosphoric, Sebacic,* and *Prussic Acid, Potash, Ammonia*; in the dry way, *Quicksilver, Copper, Silver, Lead, Bismuth, Tin, Antimony, Iron, Platina, Zinc, Nickel, Arsenic, Cobalt, Manganese, Sulphuret* of *Potash.*

Used extensively in the construction of *Utensils,* and different kinds of *Ornaments ;* in *Enamelling, Gilding, Dying, Soldering.* &c.

## *Of Silver.*

Found, 1*st.* united to a small proportion of Gold, Copper, or Iron, *Native Silver* ;—2*d.* in alloy with Antimony, or with Antimony, Arsenic and Iron—*Antimoniated* and *Arsenical Silver Ores* ; 3*d.* mineralized by Sulphur—*Vitreous Silver Ore ;* 4*th.* combined, in the state of oxyd, with oxyd of Antimony and Sulphur—*Red Silver Ore ;* 5*th.* with Lead, Sulphur, Antimony, Iron, Alumine and Silex—*White Silver Ore ;*

*6th.* with Muriatic Acid, Oxyd of Iron, Alumine, and a little Sulphuric Acid—*Horn Silver Ore.*

Manner of extracting it from its ores.—Purified by *Cupellation* or reduction from *Muriate of Silver.*

Colour *white*—has neither *Smell* nor *Taste*—is less *ductile* and *tenaceous* than Gold; but *harder*, more *splendid* and more *opake*—*Elasticity* between *Gold* and *Copper*—very *sonorous*—*Specific Gravity* from 10,253 to 11,091.

*Tarnishes* on exposure to air, and becomes occasionally encrusted with *Sulphuret of Silver.*

*Melts* below a white heat, or at 28 *Wedgw.* =4717 *Farenh.* Is very *brilliant* when in fusion—and in cooling, *crystallizes* into quadrangular pyramids or octahedrons. By intense heat may, like *Gold,* be *volatilized* and partially *oxydated.*

By *electrical explosions* is converted into an *Oxyd* of a greenish grey colour—by the *Galvanic Fluid* burns with an *emerald-green* flame.

Its *Oxyds* decomposable by *Heat* alone.

Most readily *soluble* in *Nitric Acid*—the solution *bitter* and *corrosive*—stains the skin and other animal substances *black.*

Upon evaporation yields a crystallizable salt, susceptible of watery fusion *(Argenti Nitras* e Vitreous Silver ore is a Sulphuret of Silver

e red Silver Ore is a Compd of Antimony Silver
Sulphur

e Grey Silver ore is a Compd of Lead Silver &
ntimony

e Horn Silver is the form of a crust on a pure
Quartz

Extraction of Silver from its ores is not difficult

ver of a Pure white Color but Tarnishes readily
t from Oxygen but from Sulphur

n Sil: very Malle: the finest Silver leaf being
ooo th Part of an inch in thickness

Ductility is great but less than that of Gold
tina & Iron

lts at 22 or 23 of Wedgewoods Pyrometer

en fused may be made to chrystallize in Tube

lver leaf may be Oxydated like Gold by Galvanic
ttery

The Sulphuric acid to act on Silver requires the assistance of Boiling

Solutions of Argent: Nit: on exposure to light deposits black particles which is Silver almost in a Metallic State.

x Silver is evaporated to dryness is forms the Luna Cornea.

The Silver may be obtained pure from the Luna Cornea by heat.

The Luna Cornea appears to consists of pts 19 of Acid to 81 of Silver –

When the Luna Cornea is Melted.

Muriatic Acid as scarcely any action on
ilver but will precipitate it from Solution;

Nitric Acid the most powerful Solvent for Silver
ut it necessary it should be Diluted with
water. this is remarkable, numerous bubbles
ise which is owing to decomposition of the acid in Contact
th the Silver & Nitrous Gas is evolved
itrate of Silver is formed. if the Solution was
vaporated to dryness.

olutions of this Salt when exposed to heat will
rystallize & hold a large portion of water of
rystallization
hen it is exposed to heat it fuses and is Conver-
d into Argent:, or Lunar Caustic.

Muriatic Acid readily unites with its Oxydes
ilver & precipitates them. When the Muriate of ✗
Nitrate of Silver blackens on exposure to
he atmosphere,

Nitrate of Silver decomposed by other Metals
es if a Solution of this Salt be applied to
plate of Copper it become coated with Silver

Arbor Dianæ is formed

Silver like Gold is precipitated from its
Solutions by.–

Fulminating Silver is made by precipitating by Aq. Calcis, and washing it with Ammonia Solution
It explodes on the slightest friction or heat being applied to it. The explosion is owing to a sudden union of the Oxygen.
Take 40 gr of pure Silver. dissolved in ℥j Ac
Nitrous c Aq. ℥ij Sp: Vin: ℥j, then gently apply heat precipitates of a white powder, this is not inferior to the fulminating Silver.
is detonated by Pressure Percussion in Contact with Aqu: Sulphuric
Plating performed in a manner similar to Gilding. The Silver is made into an amalgam with Quicksilver

Take of Black powder which is precipitated by Copper from Solutions of Nitrate of Silver
4 parts Common Salt & Sal Am: part: 16
Hyd: Oxy: ℥j rubbed together & made into a Paste with Water rub the surface of Copper with Aq: fort: and apply it
Another Method of Silvering
℞ of the same Bk Powder as above ʒx Sod: Muri: ℥ij Cream of Tart: ℥ij.

P. L.) Yields a *Metallic Precipitate* to many of the other *Metals,* as also to *Phosphorus,* burning *Charcoal,* burning *Sulphur,* &c.—and an *Oxyd* of silver to the *Fixed Alkalies* and *Earths.*— With *Ammonia* forms a triple compound still more remarkable for its fulminating property than that of *Gold* (*Argentum Fulminans.*) Manner of preparing this—and causes of failure.

Silver also soluble in Nitro-Sulphuric Acid (*Aqua Regina* of *Keir.*)

And in the common *Sulphuric Acid* by the assistance of a boiling heat.

Although slightly or not at all acted on by the other *Acids,* many combine readily with its *Oxyd*; hence the decomposition of *Nitrate of Silver* by *Muriatic* or *Oxy-muriatic Acid,* and their compounds, and the consequent formation of Muriate of Silver (*Luna Cornea.*) This remarkable for its easy *Fusibility, Insolubility* in water, and becoming *dark coloured* on exposure to *Light,* which produces a change of colour, equally striking, in *Chromate of Silver.*

Silver, in its *metallic state,* not combinable either with *Alkalies* or *Earths,* or with any of their saline compounds.

In the state of *Oxyd* it communicates a *yellowish olive* or *brown* colour to glass.

Unites in various proportions with most of the other *Metals,* and with all the other *combustible Bodies, Carbon, Azote* and *Hydrogen* excepted.—Loses its *Ductility* by combination with *Tin,* and with Copper, its usual alloy, becomes *harder* and more *sonorous.*—Forms a *dark violet coloured* mass with *Sulphur.*—With *Phosphorus* becomes more *fusible* and *brittle.*

Order of attraction in the moist way, *Muriatic, Sebacic, Oxalic, Sulphuric, Saccho-lactic, Phosphoric, Nitric, Arsenic, Fluoric, Tartareous, Citric, Formic, Lactic, Acetous, Succinic, Prussic,* and *Carbonic Acids, Ammonia*; in the dry way, *Lead, Copper, Quicksilver, Bismuth, Tin, Gold, Antimony, Iron, Manganese, Zinc, Arsenic, Nickel, Platina, Sulphuret* of *Potash, Sulphur.*

Used in the construction of various *Utensils*; in the composition of *Bell-metal*; in *Silvering, Enamelling, Soldering, Dying, Medicine,* &c.

## *Of Quicksilver.*

Found chiefly either in a *Native State*; or alloyed with silver, *Native Amalgam*; or in union with muriatic and sulphuric acids, *Horn*

Black Powder 18 grains ʒj Soda Murias
tartarat
j Potass Sulp, ʒss c̄ Alum made into a
aste and spread over the metallic
urface you want to silver, but the
ost substantial mode of Silvering
nsists in sprinkling over the plate
ss of Borax & lay on this a piece of laml
ted Silver & they are bound together & heat applied
itrate of Silver afford a very delicate test
r. Muriatic Acid —— as also for Arsenic
sed as an indelible Ink and by some
Darken the Hair also commonly used
a Caustic by Surgeons in this Country

Part of Nitre with Acid Sulph. Pts 10 this compd
adily dissolves Silver
lver can combine with Sulphur and also
th most of the Metals.
ith Copper in certain proportions forms the
ver coins of this Country -

n & Iron filings

# Quicksilver

Sometimes found in Combination with other Metals

When pure it has a brilliant bright surface the fluid opaque perfectly, reflect images Sp: Gr: 13

When exposed to 39 below Zero or 71 Deg: below the freezing point it congeals, this experiment may be made by mixing Snow & Muriate of Lime

Mr Walker however has shewn that it may be Congealed without Snow or ice by ye Simple action of cooling Mixtures
It may be congealed by ye evaporation of Sulphuret of Carbon or Ether a substance which is remarkably evaporable Dr Marcet has Surrounded with this liquor, Filled with Quicksilver & Wrapt it in Lint Wetted with ye fluid, & placed it in expanding receiver Surrounded well Dr Marcet applied the Tube in which the frozen Quicksilver was Contained, and applied it to his tongue when it produced a film of ice and found difficulty in detaching it. This is ye Drs explanation of this phenomenon.

Congealed Mercury undergoes much Contraction directly opposite in that respect to Water 1/23rd part of the whole bulk. it increases in Size Cavendish expd th

Congealing Mercury gives an appearance of Chrystalli
ation

rcury boils at a Temp: of 650 or 660 its Vapor is
visible like air Condenses again by cold: its Vapor
be expanded like Water by the operation of Caloric

Change of Color Quicksilver undergoes when exposed to
air is owing to impurities being mix'd with it When
by Distillation this change does not take place
itation produces a Change of it makes it of a dark Color
merly thought Oxygen was Absorbed during this Agitation
urcroy found that it was an Oxyde but Dr Mar:
ms to say there is doubt about it. . This is not thought
in the Case of Burzerius. . The reason why its not
ined that Oxygen is absorbed is because the Mercury
s run from perforations Spontaneously.

ury rubbed with Mucilage Chalk or fat are
ght to be oxydes as Empl: Hyd: Ung: Hyd: Pil Hyd.

n Mercury is exposed to a boiling Heat in a
sels & the Quicksilver gradually loses its Metallic
ance it is converted into the Hyd: Oxyd: rubrum
Contains 8 parts in 100 of Oxygen by
ircroy considered to be so    If the Heat
creased the Oxygen is expelled again & the
cksilver is reduced again.

rcury acted upon more less by Acids
rticularly by Acid Sulph: with which
forms a Super Sulphate of Mercury
the excess of Acid is driven off by Heat it becomes
Neutral Salt in this state it is soluble in
ter. If Hot water be added to the Neutral
lphate of Mercury it becomes yellow & a
Sulphate of Mercury is formed

owing to the Water attracting some of the acid fro the Salt. This yellow powder was called Turpe Mineral. Now Hyd: Sub flavus or Edinbro'.

Acid: Nitric: act powerfully on Mercury. If Stron the action is rapid. a White Chrystall is obtai Hyd: Nitrat. This is readily decomposed by Ammonia by its Stronger affinity for Nitr Acid.

*Mercury*; or mineralised by sulphur, *Native Cinnabar*.

Manner of obtaining it from its ores, and of ascertaining its purity. Freed most effectually from foreign admixture by cautious distillation.

When pure, of a *silver white* colour, *brilliant*, *fluid* at a common temperature, specific gravity 13.568.

Congeals at 39 below 0 *Farenh.* and then found to be malleable.

In its liquid form attracts moisture on exposure to the atmosphere, loses its splendor and contracts a grey pellicle. By agitation with access of air or trituration with mucilage or other tenaceous substances, is converted into a *greyish* or *black Oxyd:* hence the more common preparations of quicksilver, viz. *Pilul. Hydrarg.* P. L. *Unguent. Hydrarg.* P. L. *Emplast. Hydrarg.* P. L. &c.

Passes from its liquid state into that of vapour in vacuo even at a common temperature; but under atmospherical pressure, requires to be heated to 600 *Farenh.*

If continued under exposure to air at this temperature, is converted into a sparkling *red Oxyd,* containing a larger proportion of *Oxygen* than that obtained by trituration, *(Hydrarg. oxyd. rubrum* P. L.) Of the chemical properties of this oxyd.—When exposed to a red heat in close vessels it is decomposed, yielding pure *Oxygen Gas,* and the original *Metal.*

*Quicksilver* acts either directly or indirectly on all the *Acids.*

Partially decomposes and combines with the *Sulphuric Acid* by the assistance of heat. Produces with it a white ponderous saline mass, which on the affusion of boiling water assumes a *lemon yellow* colour, (*Hydrarg. Vitriolat.* of the old Pharmac.) The change of colour thought to depend upon the abstraction of a portion of the undecomposed acid.

Dissolves in the *Nitric Acid* more or less readily, and with a more or less copious evolution of *Nitrous Gas,* according to the temperature and strength or dilution of the acid, *Nitrate of Quicksilver.*—This exposed to a low red heat, by a further and more complete decomposition of the acid, yields a red *Oxyd, (Hydrarg. Nitrico-oxyd.* P. L.) Analogous in all its properties to the *Hydrarg. Calcinat.* or common *Oxyd.*

Has no action on the common *muriatic acid,* unless previously oxydated; but with the *Oxygenised Acid* combines with great facility and

or Turpeth Mineral
forming the Sub Sulphate of Mercury, this change is ing to the water attracting the Acid

r Smarck employed this in Hydrocephal: with a ule relief

d: Nit acts powerfully on Hyd: but the Acid should be centrated & if heat be applied the action is increased whether you employ dilute or pure Acid Nit n obtain ~~Argent:~~ Hyd: Nitrat but the 2 Salts differ very ch

Nitrate of Mercury be heated it melts & the water Crys: is driven off. & it will become of a yellow our after this by continued heat it becomes red orming the red Precipitate vel Hyd Nitr Oxyd L Pharmacopeia, the Acid: is disengaged this not very different from the Hyd: Oxyd: rubrum cury not acted upon by Acid: Muriat: unless in State of Oxyde — :

d: Oxymur: Soluble in 20 times its weight of cold ter: it is very soluble in Alcohol

(H) [M] Hyd Oxymur

Liq Hyd Oxymur: Made by Gr viij Hyd
℥i of Solution the Spirit promotes the Solution

Hyd: Oxymur: detected by viz means
one of the test as viz. Dip a piece of Gold in
a fluid Containing Hyd: Oxymur: Take a
piece of Zinc Wire & bring it into Contact w
Gold: the Zinc

Muriate of Tin in Solution being added a precipitat
will appear & a change of Color to brownish
Color in

When the Hyd: Oxymur: is taken in large quantities
it produces Infl: of small intestines a Very sma
dose will sometimes cause Salivation very quick
Dose 1/10 of a grain to 1/2.
Hyd: Oxy: as viz:. Purified Quick. 2 parts. Sulph: Ac
& Muriate of Soda.

e quantity of Hyd: Oxyd: with carefully rubbed
ith its weight of Quicksilver so the whole is
ade of a greyish color. If this is heated &
ublimed a white powder is produced
hich is Calomel This is sublimed 2 or 3
imes before its pure. — If Lime Water
oured on Calomel by which its deprived
a greater portion of its acid: it is Hyd: Oxyd:
inereum of Mur Ph: thought not to be likely to
rritate of Bowels

mmonia also deprives it of its acid & makes
ark colored

olutions of Corrosive Subl: decomposed by
Alkalies. Acids & ammon: not capable of
ombining excepting in a state of

uriate of Ammonia & Potass: Subcarbon.

recipitating a Solution of ~~Argent~~ Hyd: Nit: by a
olution of Soda of Muriate will form
precipitate analogous to Hyd: Submur.

R 100 G of Merc: in ℥iss of Acid Nit: by heat dissolved
into Cold Solution pour ℥ij of Alcohol by
measure & apply heat a fume arises & a
powder falls down. This must be washed with
Cold Water & afterwards dry it in a Water ba

Exploding Force of Fulminating Mercury is produ

Fulminating Silver

Fa

by Measure
Dis 100 G of Hyd: in Acid Nit ℥iss & apply
heat, into the Solution when Cold
add ℥ii of Spirit a fume arises
& a Powder precipitates it must
be washed with Cold water

without effervescence: hence the preparation of *Oxy-Muriate of Quicksilver, (Hydrarg. Oxy-Murias.* P. L.) and of *mild Muriate of Quicksilver, (Hydrarg. sub-Murias*; and *Hydrarg. oxyd cinereum,* P. L.)

Of the processes employed for obtaining these as well in the moist as in the dry way—new views of these compounds.

Of the combination of *Oxyd* of quicksilver with the *Acetic* and other *Acids.*

The acid solutions of this, like those of other *Metals,* decomposed by *Alkalies* and *Alkaline Sulphurets,* and by most of the *Earths.* The degree of previous *Oxydation* indicated by the colour of the resulting precipitates; those by *Potash* and *Soda* are of a yellow or reddish brown; those by *Ammonia* of a grey or white colour, *(Hydrarg. Præcipit. Alb.* P. L.) *Ammoniacal Muriate of Quicksilver*—FOURCROY.

*Zinc, Iron* and *Copper* precipitate *Quicksilver* from its solutions in its *metallic* form; a similar effect produced, though slowly, by *Phosphorus.* —*Alcohol,* added to the solution of *Nitrate of Quicksilver,* and assisted by heat, furnishes a precipitate, which when dried and heated, explodes with great violence, *Howard's Fulminating Mercury.*

*Quicksilver* amalgamates with most other *Metals*; very readily with *Gold, Silver, Lead, Tin, Zinc* and *Bismuth*; less easily with *Platina, Copper,* and *Arsenic,* and difficultly, if at all, with *Iron*.

Combines by different *Modes*, and, as was supposed, under different degrees of *Oxydation* with *Sulphur*. By fusion and subsequent trituration, or by trituration simply, into a ponderous black powder *(Hydrarg. cum Sulph.* of the old Pharmac.*) Œthiop's Mineral*; and by fusion and sublimation into a red striated mass *(Hydrarg. Sulphuret Rubr.* P. L.) *Vermillion. Artificial Cinnabar.* Which may also be prepared by double decomposition, from a mixture of *Muriate of Quicksilver* and *Sulphuret of Antimony, Cinnabar Antimonii.*

Preparations analogous to the former procurable, by agitating *Quicksilver* in solutions of *Alkaline Sulphurets.*

Order of attraction in the moist way, *Sebacic, Muriatic, Oxalic, Succinic, Arsenic, Phosphoric, Saccho-lactic, Tartareous, Citric, Nitric Fluoric, Acetous, Boracic,* and *Carbonic Acid*; in the dry way, *Gold, Silver, Platina, Lead, Tin, Zinc, Bismuth, Copper, Antimony, Arsenic, Iron, Alkaline Sulphurets, Sulphur.*

ercury combines with most of the Met

n Amalgam of Gold with Quicksilver is much
nployed in Gilding

-1 parts of Sulph: only be mixed with 7 or 8 parts of
uicksilver & Sublimed. Vermilion is produced

uicksilver is very important in arts &c

reparat: of Mercury: as viz in Lond: P
uicksilver in its pure State.
l: Hyd Hyd c Cret: Ung: Hyd: in great division
perhaps some Oxydat
yd: Oxyd: rubrum
yd: Nitrico Oxyd:
yd: Oxymurias vel Corrosive Sublimate
yd: Submurias vel Calomel
yd: Oxyd Cinereum
yd: Precipit: Album - which is Hyd Oxyd
precipitated by Ammonia:
yd: Sulph: rubrum or Vermilion

Loses its lustre readily on exposure to *Air*, becoming first of a dull *grey* colour, and afterwards *whitish*.

Melts at 540 *Farenh.* and if cooled slowly crystallizes into quadrangular pyramids. Heated more intensely, it boils and emits fumes; if under exposure to air, it passes readily into a state of *Oxyd*, and assumes different colours, according to the degree of oxydation; hence *Grey Oxyd, Massicot, Minium* and *Litharge*. These and all the other oxyds of lead easily vitrified, *Glass of Lead*; and this easily decomposed, if heated, with the addition of *Charcoal*.

*Lead* in its metallic state little affected, either by the *Sulphuric* or *Muriatic Acid*, but dissolves readily in the diluted *Nitric Acid*, and forms with it a crystallizable salt.

Exposed to the vapour of the *Acetous Acid*, is converted into a laminated white oxyd, (*Flake White, Ceruse*, or *Plumbi Carbonas* of the last Pharm.), which, dissolved in a further portion of this acid, produces a crystallizable astringent salt, remarkable for its sweetness, (*Sugar of Lead, Plumbi Super-acetas*, P. L.) (*Liquor Plumbi Acetatis*, P. L.)

When highly oxydated, as by treatment of its red oxyd by *Nitric* or *Oxy-muriatic Acid*, forms

The Red Oxyde by being heated gives out its
Oxygen & which forms a Brown Substance
which is called Lytharge

ommon Wafers are colored with the Red Oxyde
Lead the best tho with Vermilion  If a
mmon wafer is burnt small globules
ie Lim of Lead & may be caught on paper

hen the red Oxyde is heated to Redness it gives
t Oxygen & will lastly form Lytharge
tharge by exposure to air absorbs a portion
rbonic Acid, which induced chemists &
merly to believe it a Carbonate but this is
w known not to be the case

ad will not decompose water at any temp..
ut if kept covered with water it becomes
ated with a white crust perhaps by the
ygen acting upon it

d: Muriatic acts feebly on Lead even if combined
th heat

Acid. Nit.

Phosphate readily formed by precipitating
or from Nitrate of Lead by Phosphate of Soda

If Sheets of Lead be exposed to Boiling Acetic Aci
the White Ceruse is formed. it is a Carbonate
Lead

If Ceruse be boiled in Vinegar a Neutral Salt
is formed the Plumbi Superacetas or new S A
it is a Combination of the Ceruse with the Vineg

The Liq. Plumb. Acet. dilut. is made by dissolving the
Acetate of Lead in Water forming Goulard's W

a *brown* precipitate, which inflames without detonation when strongly triturated with *Sulphur*.

Is precipitated from its solutions of a *white* colour by *Alkalies* and by *Earths*, and of a *dark brown* by *Alkaline Sulphurets* and *Sulph. Hydrog. Gas.* Its solutions also decomposed by the *Sulphuric, Muriatic* and *Phosphoric Acids,* and their compounds.

May be oxydated by deflagration with *Nitre*, and by fusion with the *Fixed Alkalies* becomes soluble in water.

Unites by fusion with most of the metals, viz. with *Platina, Gold, Silver, Copper, Tin, Bismuth,* &c. Amalgamates readily with *Quicksilver,* but refuses to combine with *Iron.*

Melts with *Sulphur* into a grey coloured brittle compound, less fusible than itself, *Artificial Galena*; with *Phosphorus* into one which is malleable, but more disposed to tarnish.

The *Oxyds* of *Lead* soluble in *Expressed Oils* and *Animal Fats:* hence the preparation of certain *Plasters, Varnishes* and *Paints;* are capable also of decomposing several of the compounded *Salts (Patent Yellow);* and remarkably promote the vitrification of earthy bodies and other metallic oxyds, as in *Glass-making*, and in the *Refinement of Gold and Silver.*

Order of attraction in the moist way, *Sulphuric, Sebacic, Saccho-lactic, Oxalic, Arsenic, Tartareous, Phosphoric, Muriatic, Nitric, Fluoric, Citric, Formic, Lactic, Acetous, Boracic, Prussic* and *Carbonic Acid, Potash*; in the dry way, *Gold, Silver, Copper, Quicksilver, Bismuth, Tin, Antimony, Platina, Arsenic, Zinc, Nickel, Iron, Alkaline Sulphurets, Sulphur.*

Employed in *Medicine*, and very extensively in the *Arts*, particularly in the construction of *Buildings*, and different *Utensils*; in the making of *Shot, in Statuary, Glass-making, Glazing, Painting, Varnishing, Refinement of Gold* and *Silver, Composition of Pewter*, and *Plumber's Solder*, &c. &c.

## *Of Copper.*

Found 1*st*. *Native*; 2*d*. combined with oxygen and sometimes with iron, *Tile Ore, Pitch Copper Ore*; 3*d*. with carbonic acid, *Green* and *Azure Copper Ore*; 4*th*. with arsenic acid, *Arseniate of Copper*; 5*th*. with sulphuric acid, *Sulphate of Copper*; 6*th*. with muriatic acid, *Muriate of Copper*; 7*th*. with sulphur, *Vitreous Copper Ore*; 8*th*. with sulphur and iron, *Yellow*

The Spasms which Lead Causes are relievi
by Large doses of Opium

The Detection of Lead is very easy in
fluids, by some Preparation of Sulphur
hen the fluid suspected will become
ite dark,

## Copper

as known in most ancient times

e ores of Copper are very common

Carbonate of Copper is also called <u>Mallitite</u>

pper sometimes is in Solution in Some of the
pper Mines
und in Wales in a kind of Turf which
ntains a quantity of Copper, it was also observ
t the Shoes of horses that fed on that Soil bec
ted with Copper
Combined with Arsenic forming Arseniat
Copper

When Copper is heated in Contact with atmospher
air it becomes Colored variously by a further heat
brown Scales form

Copper readily unites with the Acids

By adding Ammonia to a Solution of Copper
a muddy precipitate is formed

In order to Combine Copper with Sulp. Acid Sligh
heat is required it forms the Cupri Sulphas of
L.P. its Emetic Tonic Caustic chiefly applied extern

*Copper Ore*; 9*th*. with arsenic and iron, *White Copper Ore*; and 10*th*. with lead, antimony, iron, sulphur, alumine, silex and silver, *Grey Copper Ore*.

Manner of *extracting* it from its ores, and of *purifying* it.

*Colour*, bright brownish red—*taste*, nauseous styptic—*odour*, when rubbed disagreeable—*hardness*, somewhat greater than that of *Gold* or *Silver*—*Malleability*, *Ductility* and *Tenacity* considerable—*Sp. Gr.* if soft 7.788, if compressed nearly 9—when hard, *elastic* and *sonorous*.

On exposure to *Air* loses its lustre and contracts a greenish rust: in the *open Fire* is converted into a dull brownish red or black *Oxyd*, which heated to redness with *Filings* of *Copper*, assumes an orange colour.

Fuses at 27° *Wedw.*=4587 *Farenh.* and if heated more intensely is *volatilized* in fumes.—In cooling slowly *crystallizes* into quadrilateral pyramids.

Is more or less acted on by all the *Acids*.

Dissolves with the assistance of a boiling heat in concentrated *Sulphuric Acid*, and affords transparent oblong rhomboidal crystals of a deep *blue* colour, *Sulphate of Copper, Blue* or *Roman Vitriol* (*Cuprum Vitriolatum* P. L.)

Dissolves in diluted *Nitric Acid* with effervescence and the production of *Nitrous Gas,* forming a deep *blue* solution, and by evaporation a deliquescent salt, which detonates on being suddenly heated *(Nitrate of Copper.)* The precipitate obtained from this solution by adding *Chalk,* forms a beautiful but fugitive pigment, *Blue-verditer.*

Is in its metallic state slowly acted on by the *Muriatic Acid,* unless assisted by heat ; the solution, of a *grass green* colour, on evaporation yields *cubical* crystals, whilst a solution of the orange coloured oxyd before mentioned, yields colourless *octahedrons,* which are not affected by *Ammonia,* unless after exposure to air.

Moistened with the *Acetous Acid,* under exposure to air, corrodes into a *green* saline *oxyd, Verdegris of Commerce (Ærugo* P. L.), which by additional acid dissolves, and yields a beautiful *dark green* transparent salt, *Distilled Verdegris :* both employed as pigments.

Easily attacked by the *Sebacic Acid* of rancid oil or fat, especially if before in any degree *oxydated.*

Most of the saline preparations of *Copper,* particularly the *Nitrate* and *Muriate,* soluble in *Alcohol,* which then burns with a *green* flame.

Nitrate of Copper has the property of dissolving
acting violently on some of the Metals
when some of the Powdered Salt is
rapped up in a piece of Tinfoil. - The tin
exceedingly disposed to attract Oxygen,

is Muriate no action unless aided by
at.

ien Copper is long exposed to the fumes
Vinegar Verdigris is formed.

Mixture of Verdigris or Sulphate of Copper
Parts Burg$^{dy}$ Pitch 4 Parts Muriate of
mmonia 2 Parts When this thrown on to
fire burns with a beautiful flame

of 3 Parts of Copper filings

Standard Gold is an alloy of 1 Part of Copper to 12 of Gold.

With Hyd: it forms an amalgam

Is more or less acted on by all the *Alkalies.* With *Ammonia* forms a beautiful *blue* solution, which disappears on the exclusion and returns on the admission of *Air. Ammonia* the most delicate test of the presence of *Copper,* with the exception mentioned above.

Is precipitated of a fine *grass green* colour from its solution in *Sulphuric Acid,* by *Arseniate of Potash, Scheele's Green Pigment.* Of a *blue* colour from the *Nitric Acid* by *Chalk,* as before mentioned, and in a *metallic* state from all its solutions by *Zinc* and *Iron, Zement Copper.*

Detonates with melted *Nitre,* and by the assistance of heat decomposes *Muriate of Ammonia.*

Unites by fusion with many of the other *Metals,* forming very important compounds, as with *Platina* into one of great density and hardness; with *Gold, Standard Gold*; with *Silver, Standard Silver* and *Silver Solder*; with *Tin, Bronze* and *Bell-metal*; with *Arsenic, Tombac*; with *Zinc, Brass* and *Manheim Gold,* and with *Antimony* a violet coloured alloy.

Combines also with *Sulphur* and *Phosphorus* by fusion. Is tarnished by immersion in *hepatized Water.*

The *Oxyds* of *Copper*, impart a *greenish* tinge to *Glass*.

Order of attraction in the moist way, *Oxalic, Tartareous, Muriatic, Sulphuric, Saccho-lactic, Nitric, Sebacic, Arsenic, Phosphoric, Succinic, Fluoric, Citric, Formic, Lactic, Acetous, Boracic, Prussic* and *Carbonic Acids, Potash, Soda, Ammonia, Uuctuous Oils*; in the dry way, *Gold, Silver, Arsenic, Iron, Manganese, Zinc, Antimony, Platina, Tin, Lead, Nickel, Bismuth, Cobalt, Quicksilver, Alkaline Sulphurets, Sulphur, Phosphorus.*

Use very extensive, being employed in the construction of *Buildings* and *Coppering of Ships*; in the formation of various *Culinary* or other *Utensils*, in *Bell* and *Cannon Founding*, in *Coinage*, in *Enamelling, Dying, Painting*, and *Medicine*.

## *Of Iron.*

Of all metals the most frequently and abundantly met with, and generally in the following forms; 1st. *Native.*—Circumstances always attending the presence of *Native Iron—Native*

# Iron

It Susceptible of Magnetism, of being welded

Soluble in most of the Acids

Iron is found Native but it attended with some curious circumstances

It is to the Researches of an english Chemist, Howard, that we are indebted for the knowledge of the productions of this metal.

The Masses of iron whenever coming from are Similar

The Earthy kind is always covered with a black crust which is composed of Nikel.

The various Substances are connected together by Silex Magnesia Oxyd of Iron & Nickel

ese Stones when fall have been found hot & the Surface of
tem nearly vitrified

n 1808 at Weston in North America a Meteor was
n by several persons, a correct account of it in the
blic Newspaper the whole Mass weighed Some Ct
blished in the 30 Vol: of Philosophical Magazine

y generally may always fall obliquely which seems
at they are projected with some considerable force
om Some Planet

t is Supposed by Some that they proceed from Small Planets
hich in Passing too near the Sun have Suffered explosio
t this is merely hypothesis (this is Mr Howard's Opinion)

ta Iron exists in greatest abundance in State of Oxyde
ecimens Known Red Oxyde of Iron or Haematite on
count of its being red
ubic Iron in Chrystalls Iron Comb$^{d}$ with Sulphur
om Isle of Elba.
icular Iron a Species of Haematite
y Iron is an Oxyde of Iron
Oxyde of Iron from Sweden which is Magnetic
ystallized Iron Ore a Compound of Iron
on Carbonic Acid & Manganese
gillaceous Oxyde of Iron
rites Iron or Sulphuret of Iron which is very
mmon

To obtain Iron from the Ore it is necessary to heat it so as to expel the Sulphur. The remaining ore is then put into a Furnace with Charcoal a quantity of Lime is used with it

The use of the Charcoal is to deoxygenate the Metal. The use of the Lime besides the absorbing the Sulphur assists in separating the other earth

Pig Iron, Cast Iron & Crude Iron, are Synonymous terms

Cast Iron more fusible than Pig iron

In order to convert Crude Iron into Pa it is melted & kept in a State of fusion continually stirring it in order to drive off the Carbon this is called forging when it forms Bar Ir

Forged Iron in proportion has its purity it is more Ductile & malleable

*Iron* proved to be of *Meteoric Origin.*—Description and chemical history of *Meteoric Stones.*—Origin of these stones discussed; 2*nd.* in state of grey oxyd, *Grey Iron Ore*; 3*rd.* united with carbonic acid, *Hæmatite*; 4*th.* with carbonic acid, alumine, and often phosphoric acid, *Argillaceous Iron Ore*; 5*th.* with carbonate of lime and oxyd of manganese, *Spathose Iron Ore*; 6*th.* with sulphuric acid, *Native Sulphate of Iron*; 7*th.* with chromic acid, alumine and silex, *Native Chromate of Iron*; 8*th.* with sulphur, with arsenic; or with both, *Iron Pyrites, Mispickel, Arsenical Pyrites.*

As obtained from its ores by the usual process of reduction, forms a fusible mass, of a blueish grey colour and coarse granular fracture, very hard and brittle. *Crude* or *Cast Iron,* which freed from its impurities by continued exposure to a strong heat and subsequent hammering and rolling, loses its brittleness, becomes of a lamellar or fibrous texture, and capable, when red hot, of having several portions welded by compression into a continuous mass, *Bar* or *forged Iron.*

This, by cementation or fusion with *charcoal,* acquires weight, becomes again fusible, brittle when cold, of a close granular texture, susceptible of a high polish, very elastic and capable of taking on a great degree of hardness if heated and suddenly cooled, *Common* and *Cast Steel*. Operation of *Tempering*.

*Bar Iron* the purest. Colour of this *blueish grey*, when polished very *splendid*—has a slightly subacid taste, and when rubbed a sensible *odour* —*harder* than most other metals—more *tenacious* than any—considerably more *ductile* than *malleable*; Sp. Gr. from 7.6000 to 8.166.

*Iron* distinguished by its being attracted by the *Magnet*.

Susceptible of different degrees of *Oxydation*. *Black* and *Red Oxyd*. Is speedily converted into a yellowish or reddish brown rust on exposure to air and moisture, (*Rubigo Ferri* of the former Pharm.), and still more speedily into a dark grey oxyd, by combustion in *Oxygen Gas*, digestion in warm *Water*, or the application of its vapour to it under ignition.

Dissolves more or less readily in all the *Acids*. Its solution generally accompanied with the evolution of *Hydrogen Gas*, and the resulting compounds possessing different properties according to its degree of *Oxydation*.

Requires the aid of heat to decompose *Concentrated Sulphuric Acid*, but dissolves readily in el is a Carburet of Iron

teel is sometimes prepared by Melting Iron
ith Charcoal

ut more commonly made by heating
on bars with Charcoal the Bars are
ade hot – Iron heated in this way
ome extremely brittle –

Plunging red hot Steel in Cold Water it increases
hardness very much

Temper Steel you make it red hot then dipped in
ter & taken out the degree of hardness is judged of
the Color that appears if a blue Color hardness
uted as that of Springs of Watches &c.

One of the most remarkable properties of Iron is its Magnetic
ity this applies principally to Pure Iron

Iron is very difficult of fusion but if in contact
th Carbon it fuses quickly, at a white heat Bar
e softens extremely Malleable & acquires the
valuable property of Welding

Burns in Oxygen Gas & fuses into drops
ich are black Oxyde of Iron which by
exposure to air absorbs more Oxygen
becomes the red Oxyde Iron

Oxydes may be obtained before
humid way then by keeping Iron filings
water the black Oxyde is formed

on suffers Ox when exposed to air Damp
Common Process of making but Rust
tains a Portion of Carbon

but when Iron Rusts by application of wa
without air Green Oxyde is formed.

The action of Sulphuric Acid on Iron evolves
Hydrogen

Precipitates spontaneously in the form of ochre from most of its acid solutions on exposure to *Air*. When thrown down from these by an *Alkali*, may be re-dissolved by the addition of a further portion of it, *Alkaline martial Tincture of Stahl.*

Combines with the *Fixed Alkalies* by fusion.

Deflagrates with *Nitrate of Potash*; and sublimes with *Muriate of Ammonia*, which it partially decomposes (*Ferrum Ammoniatum* P. L.)

When in the state of *Oxyd*, promotes the fusion of several of the *Earths*, and communicates different tinges to *Glass*, according to the degree of *Oxydation*.

Unites by fusion with all the other metals, except *Quicksilver*, *Lead*, and *Bismuth*. In combination with *Arsenic*, becomes brittle when heated, (*Red-short Iron.*)

Has of all metals the strongest attraction for *Sulphur*, with which, when heated, it unites very readily into a dark grey, brittle, and remarkably hard compound, *Artificial Pyrites*.

Is also capable of entering into combination with phosphorus, (*Cold-short Iron*), and with charcoal, *Steel* and *Plumbago*.

Order of attraction in the moist way, *Oxalic Acid, Tartareous, Sulphuric, Saccho-lactic Muri-*

verted into a *grey oxyd (Putty ;)* by a continuance of the heat is changed into a perfectly *white Oxyd,* extremely difficult of fusion or reduction, *Basis of White Enamel:* a similar *Oxyd* obtained by exposing it when in fusion to the vapour of *Water*.

Broken when nearly or just congealed, exhibits an irregular columnar *Structure,* and by agitation while passing from the fluid to the solid state, may be reduced into very small grains (*Pulvis Stanni* P. L.)

Does not dissolve in the *Sulphuric Acid,* but by the assistance of heat decomposes it and becomes *oxydated.*

Rapidly decomposes the *Nitric Acid,* with a copious evolution of *Nitrous Gas,* and is converted into a *white Oxyd:* but in the considerably diluted acid, unaided by heat, dissolves and forms *Nitrate of Tin,* which burns with a thick white flame, and detonates with a heated crucible.

Dissolves readily in the *Muriatic Acid;* the solution yielding needle-form crystals which attract moisture.

Dissolves with still greater readiness in the *Oxy-muriatic Acid,* and in the *Nitro-muriatic Acid,* or *Aqua Regia,* yielding solutions remarkable for their property of forming a brilliant

and permanent scarlet precipitate with infusion of *Cochineal* and other analogous substances, *(Carmine,* and *Scarlet-dye.)* When united with *Oxy-muriatic Acid* in the *dry way,* by distillation with *Muriate of Quicksilver,* a volatile colourless liquor is obtained, which, on exposure to the air, emits copious dense white fumes, *Smoking Liquor of Libavius.*

Is slowly corroded by the continued application of the *Acetous Acid* in the form of vapour; and by long digestion, this acid dissolves a small proportion of it.

The solutions of *Caustic Fixed Alkalies,* assisted by heat, exert a solvent power both on *Tin* and its *Oxyds,* but most on the latter: *Caustic Ammonia* affects only the *Oxyds.*

Is little affected in the *dry way,* either by *Alkalies* or *Earths,* but decomposes the compounds of the former with the *Sulphuric Acid.* Detonates rapidly with *Nitre,* and decomposes *Muriate of Ammonia.*

Decomposes moistened *Nitrate of Copper* with an impetuosity productive of actual combustion.

May be united more or less readily with all the other *Metals,* and in various proportions; occasioning in most of them an alteration in their *Malleability, Fusibility, Specific Gravity* and *Hard-*

*ness:* with *Copper,* according to the proportions, forms *Gun-Metal, Bronze, Bell-Metal, Speculum-Metal*; with a small proportion of *Iron* becomes harder and more sonorous; with half its weight of *Bismuth* forms *Tutenag;* with an equal weight of *Lead, Soft Solder.* When free from *Arsenic* does not, in small quantity, much impair the malleability of *Gold.*

Melted with *Sulphur,* produces a dark grey, striated, brittle compound; which, if prepared by sublimation, is of a light spongy texture and composed of golden coloured scales, used to imitate bronze, *Sulphuretted Oxyd of Tin, Aurum Musivum*; which may also be prepared by heating gradually equal parts of Sulphur and the *White Oxyd.*

May also be combined with *Phosphorus.*

Order of attraction in the moist way, *Sebacic, Tartareous, Muriatic, Sulphuric, Oxalic, Arsenic, Phosphoric, Nitric, Succinic, Fluoric, Saccholactic, Citric, Formic, Lactic, Acetic, Boracic, Prussic, Potash, Ammonia*; in the dry way, *Zinc, Quicksilver, Copper, Antimony, Gold, Silver, Lead, Iron, Manganese, Nickel, Arsenic, Platina, Bismuth, Cobalt, Alkaline Sulphurets, Sulphur, Phosphorus.*

Employed in the composition of *Solder, Pewter, Bell* and *Gun-Metal, Printer's Types,* &c. in the silvering of *Mirrors,* construction of *Electrical Instruments*; in *Tinning, Enamelling, Dying, Medicine,* &c.

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## *Of Bismuth.*

Found 1*st. Native*; 2*d.* in union with Oxygen, *Native Oxyd*; 3*d.* with Sulphur, *Sulphuret of Bismuth.*

Manner of procuring it from its *Ores.*

Colour, *yellowish white.*— Specific gravity 9.822.—Texture *foliated*—not very *brittle.*

But little subject to tarnish. Melts at 460 *Farenh.* and in cooling crystallizes into cubes.

If kept in fusion with access of *Air* is converted at first into a blueish and afterwards into a brown *Oxyd.*—Heated to redness burns, with a small blue flame, and emits a yellowish smoke, condensible into an *Oxyd* of a similar colour, (*Flowers of Bismuth,*) which by increase of heat melts into a greenish *Glass,* analogous to glass of *Lead.*

Dissolves most readily in the *Nitric Acid,* and furnishes a salt, which detonates readily when exposed to sudden *Heat;* and which may be decomposed by the affusion of *Water,* yielding a white *Oxyd, (Magistery of Bismuth).* The other acids dissolve its oxyds, but do not act upon the metal.

Its precipitate by *Sulphuret of Ammonia* of a similar appearance to that which this produces in solutions of *Lead.*

Deflagrates both with *Nitre* and with *Oxymuriate of Potash,* and is converted into an *Oxyd,* which, like those already mentioned, facilitates the fusion of the *Earthy Bodies,* and also of the other *Metallic Oxyds.*

Combines with most of the other *metallic Substances,* rendering *Platina, Gold,* and *Silver* more brittle, and the metals in general more fusible.

Precipitates *Platina, Gold, Silver,* and *Quicksilver* from their acid solutions, but is itself precipitated by *Lead.*

Has very little affinity to *Phosphorus.*

Unites easily with *Sulphur* into a blueish-grey striated compound, which resembles the native *Sulphuret,* and may be decomposed by *Silver* and *Lead.*

Its *Oxyds*, like those of ***Lead,*** dissolve in *Unctuous Oils* by the assistance of heat.

Order of attraction in the moist way, *Oxalic Acid, Arsenic, Tartareous, Phosphoric, Sulphuric, Sebacic, Muriatic, Nitric, Fluoric, Saccho-lactic, Succinic, Citric, Formic, Lactic, Acetous, Prussic, Carbonic, Ammonia*; in the dry way, *Lead, Silver, Gold, Quicksilver, Antimony, Tin, Copper, Platina, Nickel, Iron, Zinc, Alkaline Sulphurets, Sulphur.*

Used in the composition of *Pewter, Solder,* and *Printer's Types,* in *Painting, Imitation of Silvering,* and occasionally in place of *Lead* in the refinement of *Gold* and *Silver*, and in *Assaying*. The *white Oxyd of Bismuth,* likely to prove an useful medicine.

## *Of Nickel.*

Found 1*st*. alloyed with Iron, *Native Nickel*; 2*d*. combined with Oxygen, *Native Oxyd*; 3*d*. with Iron, Arsenic, Cobalt and Copper, *Kupfer Nickel.*

Extremely difficult to obtain it free from iron: accordingly varies somewhat in colour, being occasionally *reddish*, *yellowish* or *greyish* white.—Specific gravity also varies from 7.88 to 9.333.—Texture *minutely granulated.*—*Hard* yet somewhat *malleable*. Is likewise *magnetic*.

Requires nearly the same heat as iron to fuse it; is very fixed in the fire, and difficult of oxydation by heat.

Deflagrated with *Nitre* yields a *greenish Oxyd*, which communicates a hyacinthine tinge to *Glass*.

All its solutions of a *green* colour: that in the *Nitric Acid* (in which it dissolves most readily) affords green rhombic crystals. Precipitated from its solutions by lime water and by the alkalies; Ammonia re-dissolves it, and produces a *blue* solution.

Forms brittle compounds with *Gold*, *Copper*, *Iron* and *Tin*; all the *Meteoric Stones* contain *Nickel* united with *Iron*; refuses to combine either with *Silver* or *Quicksilver*, and unites readily by fusion both with *Sulphur* and *Phosphorus*.

Order of attraction in the moist way, *Oxalic*, *Muriatic*, *Sulphuric*, *Tartareous*, *Nitric*, *Sebacic*, *Phosphoric*, *Fluoric*, *Saccho-lactic*, *Succinic*, *Citric*, *Formic*, *Lactic*, *Acetous*, *Arsenic*, *Boracic*, *Prussic*, *and Carbonic Acids*, *Ammonia*; in the

# Arsenic

It is an Oxyde of Arsenic which we know under this nam
Arsenical Pyrites obt$^d$ from Sometimes g the
In nature it is found in its Metallic State, then commonly
alloyed with Iron.

When Comb$^d$ with Sulphur forms what is named Orpimen
Realgar. Sometimes these are mixt. the last is red & 1$^{st}$ yellow
f this is treated with Blowpipe it emits a Sulphur: smell.

Arseniate of Lime sometimes found but it is a rare producti

Pure arsenic brittle. Sp: G: 5.7
passes into a State of Vapor without previous fusion & if
the process be performed without excess of air it condense
at upper part of y$^e$ Vessel. D$^r$ Marcet performs this in a
Glass Tube which is well cleaned: this succeeded well.
White oxyde has an acrid taste & is corrosive. & soluble co
erably in Water. This Burns in Oxymuriatic Acid Ga
t reddens the Inf: of Litmus & Comb: with y$^e$ Alkalies
Flowers of Arsenic.

Arsenious Acid is obt$^d$ by evaporation dry way, *Iron, Cobalt, Arsenic, Copper, Gold Tin, Antimony, Platina, Bismuth, Lead, Silver, Zinc, Alkaline Sulphurets, Sulphur, Phosphorus.*

This Metal not yet applied to any use.

## *Of Arsenic.*

Found 1*st.* alloyed by Iron, *Native Arsenic;* 2*d.* combined with Oxygen, *Native Oxyd;* 3*d.* with different proportions of Sulphur, *Realgar, Orpiment;* and 4*th.* with Sulphur, Iron, and sometimes Silver, *Mispickel.*

Colour, *steel-grey*—texture, *scaly*—very *brittle,* but not *hard.*—Specific gravity 5.763 to 831.—Much disposed to *tarnish.*

Volatile in close vessels at 356 of *Farenh.* and in condensing crystallizes in tetrahedrons.

If exposed to *Air* under the heat of ignition, burns with a blue flame, and is converted into a white *Oxyd, Common white Arsenic, Flowers of Arsenic, Arsenious Acid.*

This said to be soluble in about 80 times its weight of cold and 15 times its weight of boiling water. Taste *caustic.*—Less volatile than the *Regulus.*—Emits a garlic smell on the application of *Heat.*—*Vitrescible.*—Promotes the fusion of *Earthy Bodies.* When melted with *Sulphur,* produces different shades of colour, according to the proportions and the degree of *Heat* or state of *oxydation*; hence artificial *Orpiment* and *Realgar.*—By treatment with the *Nitric Acid,* becomes more completely *oxygenated, Arsenic Acid.*—Decomposes *Nitre* in the dry way, producing a neutral crystallizable salt, *Arsenical Salt of Macquer.*—If distilled with unctuous matter, reassumes the form of *Regulus.*

In its *metallic* state, decomposes most of the mineral acids; the *nitric* most readily: if powdered and thrown into *Oxy-muriatic Acid Gas,* burns with a *white flame.*

Unites with most of the other *Metals*; rendering brittle those which are ductile, and in a remarkable manner increasing the fusibility of some, and diminishing that of others: thrown into *Oxy-muriatic Acid Gas,* burns with a *blue* flame.

To the red and yellowish metals communicates a silvery whiteness.

Soluble in *Alkaline Sulphurets.* Soluble also in *Uuctuous Oils,* with which it forms a consistent mixture.

Combines readily with *Phosphorus.*

Most of the preparations of this metal in a high degree *noxious*; the detection of their pre-

By a very strong heat ye Acid is Decompound &again
ecomes a white Oxyde

When Melted with Sulphur in diff$^t$ proportions
orms orpiment & Realgar.

rsenical Salts are obtained as viz:
eflagrating Nitre with ye White Oxyde of Arsenic
orms Arseniate of Arsenic —

or
ulphate of Copper mixt with Arseniate of Potash
makes a fine Green color Scheele's Green

rsenic Capable of for$^d$ alloys with most Metals destroys
ir ductility & increases their fusibility.
Alloy of Arsenic & Platina is very fusible indeed

rsenic used in Many of the arts
ye Manufactory of Glass it employed also used in
ing

Symptoms of Poison from Arsenic by Black

in a 1/4 of Hour Sickness & Distress th: & Heat in Bowels involunt: Salivation a Bloody fl^d from Mouth excess: pain & Vomit Syncope: Cramps extreme weakness. & D— —

Diss: Intest: Infl: & sometimes erosions of Stomach before Death. always the intestines But be guarded in saying erosions of Stomach are from arsenic as that takes place from the action of Gastric juice.

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Dr Marcet says it is merely infl: of Mucous Coat of the ~~Stom:~~ Intesty & no infl: of Peritoneal Covering, small ulcerations in Mucous Membrane of Intestin

Treatment. Plentiful Drinks of Mucilage as Decoct Hor Ol: Ricini are the most efficacious steps to be taken Water impregnated with Sulph: Hydrogen may be usefully employed. if this can't be born give Hep Sulph: in Pills but better in Solution

Test: different ways proposed by Dr Marcet. Take the Suspected Subs: & put them into a Vessel, the Heaviest portion subside. Separate this & mix it with a little Charcoal & Oil put it a glass Tube & expose it to heat. then if it be present it will Chrystallize at the upper part of the Vessel. a very small quantity ma be in this way detected. it produces a Metallic ring on the Tube

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a small quantity of the Metal may be exp with a little Charcoal & Oil & placed bet. 2 plates of Copper & Red heat applied if ars be present a White film will be produced

Arsenious Acid is the most active poison
Bl$^{k}$ Oxyd: of Arsenic a deadly poison
Pure Metallic Arsenic is ineffectual if alloyed
with another Metal if it is not it becomes
ydated & therefore poisonous
n Solution much less Dangerous than when
ken in Substance. Sulphuretted Hydrogen comb$^{d}$
th water is a good Antidote a Sulphuret
Arsenic is formed wh$^{h}$ is not very poisonous

---

the plate of Copper: If very thin plates of Copper
employed a Spirit lamp will succeed but
Marsh employed the furnace.
e have not always a sufficiency of Matter to
btain these results. Then the wy: mode is
ferable. Act upon it in a State of Solution
Most delicate test in this Way is y$^{e}$ Nitrate
Silver. The Silver comb: with y$^{e}$ Arsenic
forming a yellow precipitate a Little Alkali
Ammonia is necessary. a very small
antity indeed may in this Way be detected
a large quantity of Ammonia be added
appears.. as the precipitate is Soluble in
Solution of ammonia. Objections to this
there is a Muriatic Salts we shall have a
ite precipitate disguising the yellow one
uriate of Silver is produced? Phosphoric Acid
Producing the same yellow precipitate with
trate of Silver This has been thought an Objection
rtainly is one. as its not impossible for
sphoric Acid to be present in y$^{e}$ Sth but this
ection may be thrown aside an y$^{e}$ follow

Take ye precipitate of Arsenic formed by Argent Nitrat: & Mix it with Charcoal & apply heat, a Metallic film will be found on ye tu by this Means Dr M: believes 1/10th of a gr. can be made apparent;

Sulphate of Copper forming Scheele's Green is als a Test in ye humid Way, if the solution of Sulphate of Copper is at all Acid, it requires the addition of a little Ammonia.

Medically. Employed in Intermittent Fever. in ye Shape of ye Tasteless Ague Drops now employed in many disorders. The Dose is from 1/12 to 1 of a 6th of ye Oxyde dissolved in a Solution of Potash forming Arseniate of Potash & Liq: Arsenicalis gutt: it contains 1/10th part a Grain This Medicine is very useful in Intermittents Dr M deems partial to objected to an account of its occasioning Inflam: Diathesis. When it Disagrees causes pain in Head Nausea Tremor Dyspepsia & Swellings &c Stop ye Med: as soon as these symptoms appear

## Cobalt

Combined with Arsenic it is the grey Coba Ore sence therefore often of great moment. Various *tests of Arsenic. Water* impregnated with *sulphuretted hydrogen,* and solutions of *Alkaline Sulphurets,* recommended as antidotes. *Emetics, purgatives,* and copious dilution, the most effectual of these.

Order of attraction in the moist way, *Muriatic Acid, Oxalic, Sulphuric, Nitric, Sebacic, Tartareous, Phosphoric, Fluoric, Saccho-lactic, Succinic, Citric, Formic, Lactic, Arsenic, Acetous,* and *Prussic, Ammonia, Unctuous Oils, Water:* in the dry way, *Nickel, Cobalt, Copper, Iron, Silver, Tin, Lead, Gold, Platina, Zinc, Antimony, Alkaline Sulphurets, Sulphur, Phosphorus.*

Used principally in *Glass-making, Painting,* and *Medicine. (Arsenici Oxydum præpartum; Liquor Arsenicalis,* P. L.*)*

## *Of Cobalt.*

Found 1*st.* alloyed with Arsenic, *Grey Cobalt Ore*; 2*d.* united to Oxygen, *Native Oxyd*; 3*d.* to Arsenic Acid, *Cobalt Bloom*; 4*th,* to Sulphur, *Sulphuret of Cobalt*; and 5*th.* to Arsenic, Iron, and Sulphur, *White Cobalt Ore.*

Colour, *light grey*. Specific gravity, from 7.7 to 8.53.—*Compact, brittle*; *hardness that of Tin*.

When very pure, malleable in a red heat.—Fuses at 130 *Wedgw.* and in cooling crystallizes in regular prisms.—Undergoes no change either on exposure to *Air* or *Water* at a common temperature; but, when heated in contact with air, yields at first a brownish oxyd, *Zaffre*, which on further exposure becomes blue, and on fusion with Silex, produces a blue glass, *Smalt, Powder-blue*.

Dissolves with more or less facility in several acids; most easily in the *Nitric Acid*.

With the *Muriatic and Oxy-muriatic Acids* forms compounds, the reddish solutions of which, as often as exposed to heat, change to a beautiful green, *Sympathetic Ink*.

Detonates feebly with *Nitre*.

Unites by fusion with most of the other *Metals*.

Combines difficultly if at all with *Sulphur*; more readily with *Alkaline Sulphurets*.

With *Phosphorus* forms a compound more fusible than itself.

Its *Oxyd* soluble in *Ammonia*.

Native Oxyde of Cobalt

t gives a blue Color to any fusible
ubstance

Not applied to any use except in a State
Oxyde, therefore generally brought
to that State

obalt in its pure State is of a grey color

hen hot slightly malleable, like Iron
ttracted by ye Magnet.–

haracters written with a Solution of
obalt are invisible when Cold, but
e plainly seen when heat is applied
t loses its Color again when it cools
Dr Marcet thinks its owing to the Moisture
ing driven off by the application of heat
hat when dry it shews ye Color –
s use is to give a blue Color to vitreous
ubstances. When you suspect a Substance
be Cobalt take a small piece of Glass
Borax and the Suspicious Substance
nd if it is Cobalt its will tinge the Gla
Borax Blue. which would at once affo
e of ye existence of Cobalt – a very
mall quantity will by this experiment be
een

# Zince

The Discovery indebted to the Athans

Calamine an Oxyde of Zinc

Blend a Sulphuret of Zinc, but not a
pure Sulphuret.

Blend is often found in many part of
ye World but especially here

Calamine is ye Metal from which ye
Zinc is always obtained.

The surface is harsh to ye touch

Specific Gravity 7 and 2/10ths

Not Malleable (but little) or Ductile wh
cold but at a certain temperature
i more so but at a high temperature
t is rendered again brittle and can be
powdered: forming granulated Zinc

Order of attraction in the moist way, *Oxalic Acid, Muriatic, Sulphuric, Tartareous, Nitric, Sebacic, Phosphoric, Fluoric, Saccho-lactic, Succinic, Citric, Formic, Lactic, Acetous, Arsenic, Boracic, Prussic, Carbonic, Ammonia*; in the dry way, *Iron, Nickel, Arsenic, Copper, Gold, Platina, Tin, Antimony, Zinc, Alkaline Sulphurets, Sulphur? Phosphorus.*

Used to colour *Glass*, in *Glazing, Enamelling, Painting, Washing*, &c.

## *Of Zinc.*

Found 1*st*. combined with Oxygen, and frequently mixed with Oxyd of Iron, Silex and Alumine, *Calamine*; 2*d*. with Sulphur, Oxygen and other substances, *Sulphuret of Zinc*, or *Blend*; 3*d*. with Sulphuric Acid, *Sulphate of Zinc*; 4*th*. with Carbonic Acid, &c. *Carbonate of Zinc?*

Colour *blueish white*. Specific Gravity 7.190

Scarcely *malleable*, but can be rendered so by a particular process of *annealing*.

When heated is easily pulverised; and like iron is capable of Decomposing *Water*. Melts at about 700 of *Farenh*. Very easily *volatilized*.

In contact with air, burns soon after ignition, with a brilliant flame, and furnishes a white flocculent *Oxyd (Zinci Oxydum* P. L.) convertible by an increase of heat into a yellowish *Glass.*

Is readily acted on by Acids. During its solution in the *Sulphuric* and *Muriatic Acids, Hydrogen Gas* is evolved. Produces with the former Acid, a styptic crystallizable salt, (*Zinci Sulphas* P. L.) is also acted on by *Alkaline* solutions, and by *Water* previously impregnated with *Carbonic Acid Gas.*

May be precipitated from its solutions by *Earths* and *Alkalies.*

Decomposes, in the dry way, *Sulphate of Potash* and many other compounded salts. Detonates violently with *Nitre.* By simple trituration decomposes *Muriate of Ammonia.* Is also capable of precipitating *Alum* in the moist way.

Unites with all the other metallic substances except *Bismuth*; giving to *Copper* additional elasticity, durability and hardness.

In its *metallic form* cannot be combined with *Sulphur*; but when *oxydated* unites readily with it.

Order of attraction in the moist way, *Oxalic Acid, Sulphuric, Muriatic, Saccho-lactic, Nitric,*

When Melted in Contact with y Atmos-
here its covers itself with a grey powde

uring its Combustion the flor of Zinc
s formed.

n an intense heat this Oxyde is Vitrifi
nd if Charcoal is present its reduced

inc has scarcely any action on
water when Cold but when heated
ke Iron it decomposes it.

is Soluble in ye Acids, when Sulphu
cid is poured on Zinc, Hydrogen a Gas [illegible]
hich will burn, and when the flame
very Small, it will produce a beautifu
ound if it be covered by a hollow
be.

nc Detonates violently with Nitre

inc will combine with most of ye
etals

with Gold it changes its color to a
hite and destroys its Ductility

In a State of Sulphate it is used in Medicine

## Zinc

Calamine is an Oxyde of Zinc often comb$^d$ w$^h$ other Substanc

When Comb$^d$ with Sulph: forms Blend or Sulp: of Zin

The Color of Calamine gener: brown not a Pure Sulph:
Cont$^s$ generally Iron Lead arsenic &c
Blend & Calamine f$^d$ in many parts of y$^e$ World.
Zinc is generally obt$^d$ from Calamine it is powdered
& exposed to Heat with Charcoal. The Metallic Matter
Condenses in y$^e$ Top of y$^e$ Vessel.
Zinc of a bluish White Color.

Sp: G: 7 $^{2}/_{10}$$^{ths}$ Melts 700 of Farenh: If Heat be pushe
in Closed Vessels it volatilizes without Change

If Zinc is Heated it is Malable & Ductile. in high he
may be broken with facility.
The Flexibility by temperature in Zinc suggested th
utensils sh$^d$ be made of it but this is now abandi
When Zinc is Melted in air it Oxydates.
During y$^e$ Combustion of Zinc y$^e$ Zinc Oxyd is f
which rises

Zinc has a power of decomposing Water when Heated to redness -

Dilute Sulph: Acid acts upon Zinc powerfully & forms ye Zinci Sulph: of Lond. Ph.

e Nitrat & Muriatic Acids act upon Zinc readily ith ye Light Hyd: Gas is found?

nc violently deflagrates with Nitre.

inc in a State of Oxyde combines with Sulphur

inc forms amalgams with ye Metals with Gold t unites therein destroys its Ductility.

ith Copper it forms Brass - it is readily exposing alamine Charcoal & Copper to Heat & in this way t is readily formed

If a Mixture of Zinc in a granulated State - mixed with Water be thrown into a red ot Crucible it burns Splendidly.

inc is used in ye Construction of ye Galvanic ile

# Antimony.

a rare prod: in Nat State.

Other Metals occasionally found with it

Native Ant: of a yellowish White Color. when heat with ye Blow pipe gives out a peculiar Smell

The Sulphuret of Ant: ye most Abundant Variety of it Red Antimonial Ore 2 in a Mass of Quartz chrystalls of Red Antimony

Pure Antimony is obtd by Melting ye Sulpht of Ant. This when Separated is Called Crude Antimony Then purifyed by Heating it with Nitre.

Pure Ant: is of a bluish White Color party when recently bro it is Destitute of Ductility Moderately Hard but yeil to a Knife.

*Sebacic, Tartareous, Phosphoric, Citric, Succinic, Fluoric, Arsenic, Formic, Lactic, Acetous, Boracic, Prussic, and Carbonic, Ammonia*; in the dry way, *Copper, Antimony, Tin, Quicksilver, Silver, Gold, Cobalt, Arsenic, Platina, Bismuth, Lead, Nickel, Iron.*

Uses—in *Alloys,* particularly with *Copper* and *Tin*; externally and internally in *Medicine.*—A powerful agent in evolving *Galvanism.*

## *Of Antimony.*

Found 1*st. Native*; 2*d.* alloyed with Arsenic, *Native Arsenical Antimony*; 3*d.* in union with Oxygen, *Native Oxyd*; 4*th.* with Muriatic Acid, *Muriate of Antimony*; 5*th,* with Arsenic Acid and Sulphur, *Red Antimonial Ore*; 6*th.* with Sulphur only, *Grey Antimonial Ore*; and 7*th.* with Iron, Arsenic, Sulphur, and sometimes Silver, *Plumose Antimonial Ore.*

Manner of extracting it from its ores, and the different processes for obtaining its *Regulus.*

Colour, *silvery-white.* Hardness, equal to Zinc. Texture, *laminated. Very brittle.* Sp. Gr. from 6.702 to 6.860. Simply loses its lustre on exposure to the *Air*; and is not altered by *Water* unless exposed to it when red hot.

*Melts* soon after ignition; on cooling *crystallizes* into octohedrons; is *volatile* in close vessels. When heated in contact with *Air* is converted into a light *white Oxyd,* (formerly called *Argentine Flowers of Antimony)* which are soluble in water, and fusible into an *Hyacinthine Glass*; in close vessels by parting with different portions of oxygen, they acquire a *brown, orange,* or *yellow* colour.

Decomposes both with *Sulphuric* and *Nitric Acids,* the former with, the latter without, the assistance of heat. Requires long digestion for its solutions in the *Muriatic Acid*; but in the *Oxy-muriatic* dissolves with great facility.

Precipitable from the latter by Zinc or Iron, in the form of a *black Oxyd,* which when dried by a gentle heat *takes fire* spontaneously in the air, and is converted into *white Oxyd.*

Decomposes, in the dry way, most of the saline *Compounds* of the *Sulphuric Acid.* Detonates readily with *Nitre*; and decomposes *Muriate of Quicksilver.*

Combines with most other *Metals,* and renders them *brittle.* Said more than any other metal to diminish the *Magnetic* property of *Iron.*

This Metal Suffers but little from Heat & Moisture but
n a White Heat it Oxydates & forms y$^{e}$ Argentine
lowers of Antimony. Contains by Davy 17 pr Cent
f Oxygen

Ant: dissolved by most Acids

Muriatic Acid acts Slowly on Antimony but
acts powerfully on it when its Oxydated forming
nt: Murias. or Butter of Antimony. Made from
rown Oxyde of Ant: & Common Salt with Sulph: Acid
Similar Comp$^{d}$ may be formed by the Connection
Oxymuriatic Acid with Antimony. it is highly
ustic when Concentrated. If the Butter of Ant:
exposed to air it absorbs Moisture & becomes
uid ,

Ant: Tart: of Lond: Ph: Sulph: Ant: 2 Nitre 1
Cream of Tart: 2 Acid. Sulph: 2 parts
The Acid mixt with 1/2 of Water & Gently Heated.

## Chemical Aff. in Ant: Tart:

The Sulph: Acid decomp: ye Nitre the Nitrous Acid set at liberty Oxyd. ye Ant: the excess of Acid then comb. with Oxyd. of Ant: & forms Sulph of Ant: which is decomposed by ye Water alone. by this process we have formed an Oxyd. of Antimony wh. is capable of uniting with ye Tartaric Acid which ye Supertartrate of Potash contains

Preparation now in use -

Ant: Oxydum which is a Peroxyde -
Ant: Sulphr: Præcipit:
Pulv: Antimonial Sulphuret of Ant: heated with Hart: horn shavings
Ant: Tart:

Ant: Tart: Liquor 2 gr in ½ ounce.

equal parts of Sulphuret of Antimony & Nitre deflag,
forms ye Crocus of Antimony

Calcined Ant: obtained from 1 part of ye Sulph. to three of Nitre. therefore very similar to the Above Crocu Antimony
The Crocus having been employed for ye diffr Antimonial preparations but now is in a great measure expelled.

Unites with *Sulphur* in all proportions, and forms with it a *grey striated* compound, *Antimony* of the shops.

This, when exposed for a continuance to a low heat, yields a *Grey Oxyd*, which by fusion is converted into a *yellowish Glass* (*Vitrum Antimonii* of the former Pharmac.;) this levigated and mixed with melted wax forms the *Vitrum Antimonii Ceratum* of the late P.E.

Roasted with *Hartshorn* and afterwards ignited, yields a *white Powder* (*Pulvis Antimonialis* of the late P.L.—*Oxydum Antimonii cum Phosphate calcis* P.E.)—When deflagrated with *Nitre*, is more or less decomposed according to the degree of combustion (*Antimonium Calcinatum—Antimonium Ustum cum Nitro—Crocus Antimonii* of the former P. L. and P. E.)

Reduced to powder and boiled in a solution of *Potash*, deposits, on cooling, an *orange* coloured precipitate (*Kermes Mineralis* Ph.Suec.); and on the addition of the Sulphuric Acid to the solution whilst hot, a *brownish red* precipitate, (*Antimonii Sulphuretum præcipitatum* P. L.) These *Hydro-sulphurated Oxyds of Antimony*.

A mixture of *Sulphuret of Antimony* and *Muriate of Quicksilver*, or of *Crocus of Antimony* and *common Salt*, with the addition of *Sulphuric Acid*, produces, by distillation, a butyraceous compound, (*Antimonium Muriatum* of the late P.L.), which appears to be an *Oxy-muriate of Antimony*, and which on the affusion of common water, or by the addition of Potash, furnishes a *white Oxyd*, or rather *Sub-oxy-muriate, (Powder of Algaroth.)* The combination of this with acidulous Tartrite of Potash, forms a triple salt (*Antimonium Tartarisatum* of the old P.E.)

A similar preparation obtained from *Glass* or *Crocus of Antimony* (*Antimonium Tartarisatum*), which, like the former, is soluble in different kinds of Wine (*Vinum Antimonii tartarisatum* of the old Pharm.)

The preparations retained in the present Pharm. of London are *Antimonii Oxydum, Antimonii Sulphuretum præcipitatum, Antimonium tartarisatum, Liquor Antimonii tartarisati.* Nature of these preparations.

Order of attraction in the moist way, *Sebacic Acid, Muriatic, Oxalic, Sulphuric, Nitric, Tartareous, Saccho-lactic, Phosphoric, Citric, Succinic, Fluoric, Arsenic, Formic, Lactic, Acetous, Boracic, Prussic* and *Carbonic*; in the dry way, *Iron, Copper, Tin, Lead, Nickel, Silver, Bismuth, Zinc, Gold, Platina, Quicksilver, Arsenic, Cobalt, Alkaline Sulphurets, Sulphur.*

The Muriate of Antimony used to be
used as a Caustic but it is now
xpelled from the Practice

Davy found the Muriate of Antimony Contain
o muriatic Acid but is a Compound
f Oxymuriatic Acid or Chlorine — an
ntimony

If filings of Ant.y be dropped into a Phia
ontaining Oxymuriatic Gas it will bur
nd of Muriate of Antimony will be
ormed.

When Muriate of Ant.y is Concentrated by
vaporation, it becomes a powerful
austic.

Both obtained by the action of Nitre on Antim
Simply by deflagration

The Crocus is made by mixing.–
qual part of

The Ant: Calcinat: is part.

These three Oxydes were formerly used as ye bases of the different preparation of Ant y but now there is a new Oxyde introd by ye London College, which is considered Superior

Emetic Tart: a triple Combination of Antimony Pot & Tart. Acid

The most important preparation of Antimony is the Combination with ye Acid of Tartar, made by boiling the Supertartrate of Potash — with red brown Oxyde of Antimony — The Operation ~~of~~ very simple proportions, Oxid ℥j Chrys of Tart. ℥ij Water ℥x or filtered, boiled first and Chrystallized it is the Antimon: Tartarizati

The Jas's Powder, appears to Phosphoric Acid, antimony and Lime in Combination of these three things

1 Part of Sulphuret of Ant y and 2 parts of horn Shaving Calcined together in broad Pot.

Printing Types are Made by ye alloy of Ant: & Lead

If Sulphuret of Anty be boiled in a solution of Potash and Distilled Water allowing it to cool it forms ye Kermes Mineralis of old Pharmacopea.

Oxydes of Anty are in some degree soluble in wine it requires a tedious digestion nd after all the strength of different reparations will be by no means egular

Ant y forms alloys with other etals, but the only useful one

ings or Naples Yellow is Oxyde of Antimony (antimonous) nd Oxyde of Lead. This is greatly ministered in the practice of Medicine a Sudorific The antimon. ant: is the one most commonly sed, and certainly one of the best rms of it;

Ant: Calcinat. is a peroxyde and al. he oxyde which is obtained. nsequently inert comparatively with ther oxyde. Antimony is a gentle urgative.

# Manganese

Its a Metal which as a very strong action of Oxygen, that its only found in a State of Oxyde

There are 2 different kinds of it.

1 in which it is combined with Oxygen &

the other in which its combined with Carbonic Acid

The Native Oxyde found Part ? in England
The Carbonate Combined white found in England

The Purification of Mangan: is difficult on account of its infusibility & its great attract for Oxygen it Consists in exposing it to Heat Contact with Carb

The Silicious Manganese shewn combi~ with Quartz

Manganese neither Ductile or Malleable –

it is Soluble in Nitric Sulphuric & Muriat: Acid: which Solution may be decomposed by ye Alkalies & a White Precip: f

The action of Acid: Nit: or its forms Nitrate of

but the dilute Sulph: and. Muriat: Acid for Hydrogen Gas because the Water decomposed.

Used in the composition of *Printer's Types*, and of *Nails for Coppering Ships*, in *Medicine*, &c.

## *Of Manganese.*

Found 1*st*. *Native*; 2*d*, in union with Oxygen, *Native Oxyd*; and 3*d*. with Oxygen, Silex, Iron, and Alumine, *Siliceous Manganese*.—Said also to be contained in the ashes of most *Vegetables*.

Colour *dull* or *greyish white*. Texture, *granular*. Sp. Gr. from 6.850 to 7. Hardness next to *Iron*. *Very brittle*.

Next to Platina difficult to fuse; but *oxydates* more easily than any other metal: its *Oxyd* of different colours, *white*, *red* and *black*.

Soluble in the diluted *Sulphuric*, in the *Nitric*, *Muriatic* and several other acids.

In the state of *Oxyd*, occasions in the *Muriatic Acid* a striking change of properties, by imparting to it a portion of its *Oxygen*.

Its action on the *Alkalies* not yet ascertained.

When oxydated, decomposes both *Nitrate of Potash* and *Muriate of Ammonia*, in the dry way.

In this state unites by fusion with the *Earthy Bodies,* and when added to *Glass,* either renders it *colourless* or communicates a *violet* tinge, according to the degree of *Oxydation.*

Unites also, by fusion, with *Sulphur,* into a *yellowish-green* mass. By mixture with unctuous substances, sometimes occasions *Inflammation.*

Combines in the metallic state with most of the other *Metals,* rendering *Gold* and *Iron* more fusible, *Copper* less.

Order of attraction in the moist way, *Oxalic Acid, Citric, Phosphoric, Tartareous, Fluoric, Muriatic, Sulphuric, Nitric, Saccho-lactic, Succinic, Sebacic, Arsenic, Formic, Lactic, Acetous, Prussic,* and *Carbonic;* in the dry way, *Copper, Iron, Gold, Silver, Tin, Alkaline Sulphurets.*

Employed principally in *Glass-making* and *Bleaching.*

## *Of Tungsten*, or *Wolfram.*

Found 1*st.* in an *acid* form in combination with Lime, *Tungstate of Lime*; and 2*d.* with Oxyd of Manganese and of Iron, Silex, and Tin, *Wolfram.*

Colour *steel grey.* Texture *granular.* *Extremely hard.* Sp. Gr. 17.6.

f Sulphuric Acid: is applied to Bla Manganese and heat applied Oxyge Gas is evolved

n the Nitric Acid the Oxyde of Mang is not dissolved unless a portion of ugar then be added

he fixt Alkalis exert an action on *Black Oxyde of Mang*: they combine with it and form a Compound, soluble in water, and these Solutions will be of different Colors by adding diff^t propor-tions of Water or diff^t temperatures Distilled Water and Pump Water used the Pump Water will act more rapidly — Distilled Water on it very imperfectly; *Mineral Camelion*

ake of Black Oxyde and Dried Soda or Potash equal parts, expose it to heat (red)

he same Compound formed by deflagrating *Nitre* with *Black Oxyde of Manganese* in Crucible red hot

he Oxyde of Manganese is used in the Manufactory of lass — as it is able to destroy the green olor which the Iron is apt to cause

The Oxymuriatic Gas for Bleaching is Made fro
ye Black Oxyde of Manganese.

Nearly *infusible,* requiring a heat at least equal to 170° *Wedg.*

Yields a yellow *Oxyd, (Acid of Tungsten,)* which in close vessels becomes *blue* or *black.*

Insoluble in the *Sulphuric, Nitric,* and *Muriatic Acids.* Slightly soluble in the *Oxy-muriatic.*

Combines with the other *Metals.* Does not lessen the ductility of *Silver* or *Copper*; but renders *Iron, Tin, Bismuth, Antimony,* and *Manganese* harder.

Order of attraction in the moist way, *Lime, Potash, Ammonia*; in the dry way, *Potash, Lime, Iron, Manganese.*

Not as yet applied to any use.

## *Of Uranium.*

Found 1*st.* in combination with Sulphur, *Pechblende*; 2*d.* with *Oxygen,* (on the surface of the former,) *Yellow Oxyd*; and 3*d.* with Carbonic Acid and a little Copper, *Calcolite.*

Has been but imperfectly reduced.

Appears capable of uniting with several of the *Acids.*

Its *Oxyds* tinge glass of various colours, *brown, grey,* and *green.*

## *Of Molybdena.*

Found in combination with Sulphur. *Molybdena,* formerly confounded with *Plumbago.*

Hitherto obtained only in *agglutinated grains.*

Colour, externally *whitish yellow,* internally *grey.* Sp. Gr. 7.5. *Brittle.*

Less fusible than either *Platina* or *Manganese.*

According to the experiments of *Mr. Hatchett,* is capable of combining with four different portions of *Oxygen,* producing a *black,* a *blue,* a *green Oxyd,* (*Molybdous Acid,*) and a *yellow* or *white* (*Molybdic Acid.*)

When combined with *Iron, Copper* and *Silver,* renders them friable.

In union with *Sulphur* regenerates *Sulphuret of Molybdena.*

Order of attraction unknown.

Not yet applied to any use.

## *Of Titanium.*

Found combined with *Oxygen* in the *Red Schorl* of *Hungary*; and in *Manachanite.*

Of a colour somewhat resembling *Copper*. Appears to be *infusible*, but capable of being *volatilized*.

Difficultly *oxydated* by any of the acids.

With *Iron* forms a compound of a gold colour internally.

## *Of Tellurium.*

Found in several of the *Ores of Gold*; and in considerable proportion.

Of a *whitish-leaden* colour; *metallic lustre*; *laminated* texture; *very brittle*; Sp. Gr. 6.115.

Of all metallic substances the *most fusible* except *Quicksilver*, like which it may be *sublimed* in brilliant globules.

Burns with a *blueish-green* flame. Soluble in the *Nitric, Muriatic,* and *Sulphuric Acids*; from which it may be precipitated by *Alkaline Sulphurets* in the form of a powder, in appearance much resembling *Kermes Mineral*.

Said to be the only metal, except *Gold, Platina* and *Antimony*, which is not precipitated from its solutions by *Prussian Alkali*.

Its *Oxyds* so rapidly reduced on heated *Charcoal* as to occasion actual *detonation*.

## *Of Chrome.*

Found 1*st.* in an *Acid* form combined with Oxyd of Lead, *Red Lead of Siberia*; and in a similar acid form in the *pale red Ruby*; 2*d.* with Oxygen, in the *green Emerald of Peru*; 3*d.* in the *Meteoric Stones.*

May be obtained in a *concrete acid* state, and of a red colour, from the two first, by treatment with *Carbonate* of *Potash*; or in the form of a *green Oxyd* from the last by treatment with *Muriatic Acid.*

Has as yet been but imperfectly reduced.

Of a *greyish white* colour; *very hard*; *very brittle*; and *very difficult* of *fusion.*

Not soluble in the *Muriatic* or *Sulphuric Acids*; and difficultly in the *Nitric* and *Oxymuriatic.*

Combined, in its *Acid* state with *Muriatic Acid,* is capable of dissolving *Gold.*

## *Of Columbium.*

Discovered some years ago in an *Acid state* by *Mr. Hatchett,* in a dark grey mineral, sent with

some iron ore from *America,* and which appears to consist of more than three-fourths of this acid combined with iron. Its colour in this state is *white;* it *reddens* litmus paper; is insoluble in boiling *Nitric Acid,* but soluble in *Sulphuric Acid* when strongly heated, and also, when recently separated from Potash, in boiling *Muriatic Acid.*

It gives colourless solutions with *Acids* and *Alkalies;* is precipitated from its acid solutions by Alkalies in *white flocculi,* by Prussiate of Potash of an *olive green colour,* and by Tincture of Galls of a *deep orange.*

Is extremely difficult of reduction.

The supposed new metal called *Tantalium,* discovered by *Mr. Ekeberg* in the mineral called *Tantalite,* shewn by *Dr. Wollaston* to be identical with *Columbium.*

## *Of Cerium.*

Lately discovered in a *copper mine* in Sweden. May be obtained in the state of *white* or *red Oxyd.* Both these oxyds soluble in *Sulphuric*

*Acid.* The white oxyd most soluble in the *Nitric*, and the red oxyd most soluble in the *Muriatic Acid.* The *salts of Cerium* have a *Saccharine* taste. Can hardly be said to have been obtained in the reguline state. Appears to be volatile at high temperatures.

## ORGANISED BODIES.

Form two classes, *Vegetable* and *Animal*, consisting nearly of the same constituent principles or elements, but in different proportions.

The chemical affinities of the constituent principles of both, influenced by the *living principles.*

*Carbon, Hydrogen* and *Oxygen,* the *ultimate* constituent parts of *Vegetables,* as furnished by *Analysis.* *Air* and *Water* the principal sources of these. They also contain *Saline, Earthy* and *Metallic* matter, the latter in small quantity.

Manures, How they promote vegetation.

Circumstances in which *Vegetable* substances differ from *Animal.*

The Supply of Carbon is derived from y Atmosp

The agency of Light is necessary for ye welfare of
egetation

When [illegible] the Substances are used as Ma
act in different Ways Some merely Mech
nical. Lime for Instance is usefu
hastening the process of Putrefaction –
If it be the Carbonate of Lime it is usef
on account of the Carbonic Acid Gas it
yields —

# Vegetable Substances

These are formed naturally without any decomposition

Cork the bark of the Quercus Suber grow in the South of Europe like wood in its chemical Features a Light Spongy Substance, inflammable afford a little Ammonia by distillation it affords when acted on by y Nitric A it yields the Suberic Acid.

Lignin may be considered as bases of all other vegetables. naturally often Propert of Taste and Color. they are easy to form [illegible] Acid.

The Strong Acids act powerfully on its the Acid. Sulphur: will completely char it. Carbon is the Principal of

The Astringent quality of Substances was once thought to exist in y existence of Gallic A Tan contained in large quantities in Gall nuts also in Cort. Quercus; and the inspissated juice of y Mimosa or Catechu. If you macerate the oak bark in Water the Tan and Gallic Acid are dissolved by the Wa if you Put into this Solution a little jelly a flocculent precipitate takes pl which is a Compound of Gelatine & Tan an the Gallic Acid set at Liberty

## *Vegetable Substances.*

Their *proximate* parts, or immediate productions are, *Cork*, *Woody-fibre*, *Tan*, *Colouring Matter*, *Extract*, *Oils*, *Resins*, *Wax* and *Tallow*, *Camphor*, *Gum*, *Jelly*, *Gluten*, *Albumen*, *Caoutchouc*, *Starch*, *Sugar*, *Native Salts* and *Earth*.

Several of these already spoken of.

*Cork*,—the exterior part of the *Quercus Suber*, a substance *sui generis*. Yields *Suberic Acid* by treatment with the *Nitric Acid*.

*Woody-fibre*,—that which is left after the digestion of ligneous matter in *Water* and *Alcohol*.

*Tan*,—contained in all astringent vegetable substances, but most plentifully in *Catechu* and the *Gall Nut*, from the concentrated infusions of which it may be precipitated by *Carbonate of Potash* or by *Acids*. When dry is of a brown colour, brittle, of a very astringent taste, very soluble in *Water*, and still more so in *Alcohol*.—Forms an insoluble compound with *Glue*, and produces a deep blue precipitate when added to the solution of *Oxy-sulphate of Iron*. On distillation yields an *Acid Liquor*, a small proportion of *Empyreumatic Oil* and about *one-thirty-eighth* its quantity of *Charcoal*.

*Colouring Matter*,—that part of *Vegetable Substances* which is attracted by the fibres of *Silk*, *Linen*, *Wool*, &c. in the act of dying.—*Mordants*; their nature and use explained. Differs in its other properties according to the subject from which it is obtained.

*Extract*,—obtained from the watery infusion of *Saffron*, and many other plants, by evaporating it to dryness. Distinguishable from all other vegetable substances by being soluble both in *Water* and in *Alcohol*, but not in *Sulphuric Æther*.

*Gum*,—procured most plentifully from certain species of *Mimosa*. When pure, colourless, insipid, soluble in *Water* but not in *Alcohol* or *Oils*.—Not prone to decomposition by keeping. —Soluble in the *Vegetable Acids* without alteration, but decomposed by the *Mineral*. 100 parts said to consist of 65.38 *Oxygen*, 23.08 *Carbon*, and 11.54 *Hydrogen*.—An article of the *Materia Medica*; useful also in divers manufactures, particularly in *Calico Printing*.

*Jelly*,—obtained from the expressed juice of *Currants*, and many other fruits, in the form of *Coagulum*, by allowing the juice to remain for some time at rest, decanting off the thinner part, and washing the remainder in a small

an Infusion of Galls ever form the Sam
result

Tannin may be obtained by precipitating
a Solution of by Lime Water the
precipitate is Tannin mixed with
Lime which last may be got rid of
by Acid: Muriatic:

Tannin Soluble in Water also slightly
in Alcohol

The most characteristic character of it is its
property of combining with Gelatin
then the formation of Leather
This effect on Leather ascribed to an astrin
ent power exerted on the Leather a sort
contractility. Mr Seguin first took this view
the Subject. — The Tanning of Leather consist
effecting a Combination of Tannin and
latin: The Common Way is to keep the Ski
immersed in a Solution of the Bark for
long time —

The operation of Tannin may be very much
accelerated by putting the Leather into a
very strong Tannin rather than of oak
Bark. but Leather prepared in this Way
is not found good, its only the outer
part of it that is affected — In Tannin
Morocco Leather, they only tan one side by
the Sumach: The Russia Leather is tanne
by a very peculiar means, the color is give
by Lignum Campechium: it Always Abl

Coloring Matter - Certain kinds of Wood as Log Wood Madder .. In the Coloring Matter is given out to an Aqueous fluid, the Coloring matter thus formed has an affinity to atta itself to Linen.-

But the Coloring Matter as a much greater attraction for certain Mineral Substances therefore a common practice, to impregnate the Cloth be Dyed with some of these before the Color is applied. These are called <u>Mord</u> When a Mordant is used you can't wa the Color out which of course is an advantage

Indigo a Beautiful blue Dye

It is not Soluble in Water but is in dilu Sulphuric Acid: which is used as a D and which acts at the same time a a <u>Mordant</u>

The Vegetable Colors called <u>Lakes</u>

Carmine thus is also prepared by the same process, from <u>Cochineal</u>.

Extracts.. distinguished from all other vegetable Substances in being Soluble in Water

its general properties are when Pure are Soluble in Water and Alcohol affinity particular) for the Oxygen

Gum is contained in many Plants but particularly in the Mimosa exudes sometimes from the Bark n semitransparent globules - insipid oluble in Water either Cold or hot pirits separates gum from a Solution it. Gum differs from sugar only in ontaining only a smaller portion Oxygen

egetable Jelly. somewhat resembles nimal Gelatine in its tremulous motion.

Gluten, contained bountifully in Wheat.

When dried it is Semitransparent resembling Glue, it is on account of the Gluten that it is so conveniently used in Making bread.

Albumen

Coagulable by heat, also in Acids

quantity of water.—In this state is nearly colourless, and of a tremulous consistence.—Soluble in hot water, but again coagulated in cooling.—When dried becomes transparent.—Combines readily with *Alkalies,* and by the *Nitric Acid* is converted into *Oxalic.*

*Gluten,*—the grey coloured tenacious and insipid substance which is left behind in washing the paste of *Wheaten Flour* in repeated portions of *Water.* In its *moist* state much disposed to putrify.—When dried resembles *Glue.*—In boiling water loses its tenacity. Soluble in all the acids, and in solutions of the *Alkalies* by the assistance of heat.—Insoluble in *Water, Alcohol, Æthers* and *Oils.*—Differs from most other *Vegetable* substances, and resembles *Animal* in containing *Azote.*

*Albumen,*—so called from its resemblance to white of egg.—Obtained by exposing to a boiling heat, the water employed in the preparation of *Starch* from flour, or the depurated expressed juice of *Scurvy-grass, Cresses, Cabbages,* and most other cruciform plants.—Separates at this temperature in the form of *Coagulated Flakes.*—Is also precipitated from its water solutions by *Alcohol* and *Acids.*—When dried resembles *Glue,* and is then readily soluble in *Alkalies.*—In distillation yields *Carbonate of Ammonia,* and consequently contains *Azote.*

*Caoutchouc,*—the inspissated milky juice of certain trees, the *Hævea Caoutchouc, Iatropha Elastica,* and others growing chiefly in *South America.* When fresh is of an ash colour; without taste or smell.—Very elastic.—Sp. Gr. 0.933.—Not altered by *Air.*—Perfectly insoluble in *Water.*—Soluble in *rectified Petroleum.*—*Volatile Oils,* and in pure *Æther,* but not in *Alcohol.*—Is decomposed by the assistance of heat both by the *Sulphuric* and *Nitric Acids,* but not affected by *Alkalies.*—Melts readily when heated, yields *Ammonia* in distillation, and in the open fire burns with a white flame.

*Starch,*—the grey or white sediment deposited by *Wheaten Flour, Potatoes,* and various other vegetable substances, after diffusion in water.—Has scarcely any smell, and but little taste; though insoluble in *cold Water,* combines with it by *boiling* into a kind of *Mucilage.*—Altogether insoluble in *Alcohol,* and not readily acted on by *diluted Acids;* but soluble without decomposition by *Alkalies,* unless when they are concentrated and assisted by heat. By destructive distillation yields a large proportion of

Is a Concrete Vegetable juice

The juice is received into a Vessel from
wounds made into the tree that produces

and moulds of Clay in form of a little
ottle, the Mould is dipped into the Juice which
dheres to it. The Natives make Shoes
y the same process .. very elastic ... and a
e property of its when Cut is for
he Cut edges to adhere firmly its is very
seful in Chemical experiments

**Starch** applied to a Substance existing in
Vegetables like Gum - procured by the
rocess for the Separation of Gluten, ..
Totally insoluble in Cold water but readily
Converted into a Jelly by Boiling -
Sago Saloop & Lichen: Island: Potatoe
ice Wheat

It is considered the result of Saccharine fermentation

It abounds in great abundance in man vegetables but the Sugar Cane is the on thing which is planted for its selection obtained by pressure – and in the impure state it undergoes a Process for purifying it and forms the loaf Sugar. Blood contains a large portion of Saccharine Matter

Mr Howard as lately invented a new Method of improvement.–

a Saturated Solution of Syrup be use for this purpose

Sugar may be considered a vegetable Oxy

Take 100 of Starch 400 Water 6 of Acid Sulphur digest for 12 hours, filter and evaporate leave it alone, and it will harden. –

*Carbon*. Supposed to be converted into *Sugar* in the process of *Malting*.

*Sugar*,—the produce of the *Arundo Saccharifera* or *Sugar Cane, Sugar Maple, Beet, Carrot, Grape*, and many other vegetables.—When purified, of a white colour, sweet, inodorous, not subject to alteration *by exposure to Air*; *very soluble* in water, and *crystallizable*; soluble also in *Alcohol*, but not in so large a proportion.—Readily decomposed both by the *Sulphuric* and *Nitric Acids*; in the *weaker Acids* merely soluble.—Forms with *Potash* a bitter astringent compound, insoluble in *Alcohol*; forms a similar one with *Lime*. On decomposition by heat yields *Water, Carbonic Acid, Carbonated Hydrogen Gas, Empyreumatic Oil, Acetous Acid*, and *Charcoal*.—100 parts consist, according to *Lavoisier*, of 64 *Oxygen*, 28 *Carbon*, and 8 *Hydrogen*.

## *Animal Substances.*

Yield in general, by analysis, more *Azote* than *Vegetables*.

Their principal constituent parts and productions are, *Fibrine, Albumen, Gelatine, Mu-*

*cilage, Urea, Sugar, Oils, Resins, Sulphur, Phosphorus, Acids, Alkalies, Earths, Metals.*

Those not already treated of are,

*Fibrine,*—commonly called coagulable lymph, is that which remains on washing the crassamentum of blood in successive portions of water, till it cease to give out any colour. Bears a strong resemblance to muscular fibre ; is white, tasteless, soft, ductile, elastic, insoluble either in *Water* or *Alcohol* ; in boiling water becomes hard and inelastic ; in its soft state much disposed to putrify; by long digestion in water is converted into a particular species of tallow.—Soluble in most of the *Acids,* and in the stronger solutions of both the *fixed Alkalies,* with which, by the assistance of heat, it forms a viscid bitter soap. In distillation yields a large proportion of *Ammonia.*

*Albumen,*—contained in the serum of blood, and in various other animal substances; most abundantly in white of egg. In its moist and fresh state is nearly without colour, taste or smell—viscid—readily soluble in cold water—distinguishable from other animal fluids by coagulating at a temperature of 165 *Farenh.*—*Acids* and *Alcohol* produce on it a similar effect. When coagulated is insoluble in water.—*Tan*

The presence of Azote in Animal Matter
nstitutes the difference between Animal
nd vegetable Compounds.

Hence it happens that vegetable Matter is so
iable to go into a Vinous fermentation
nd animal Matter into the putrefactive
rocess.

Fibrine If blood be removed from bo
its homogeneous look is soon destroyed a
separates

if this Coagulum be inclosed in a linen bag and
exposed to a Stream of water, it will become colo

The Crassamentum is perfectly red.

The substance left after washing was forme
called Gluten but now it is called Fibrin
When the blood is inflamed the Crassam
tum is covered with a Coat of Coagu
Lymph the Cause of this Separation is unkn
The Fibrine appears to form only 3 parts in 10
When Dried it is a solid white substance
tasteless and without Smell insoluble in
water and Alcohol when moistened an
disposed to Putrefy. Unites with ye Alkal
and forms a kind of Soap. -
The Liquid separated from ye blood by spontan
decomposition is Commonly Called Seru
but in chemical Language it is Called
Albumen at a heat of 165 the fluid will b
even opaque and hard like the whit
of an egg - Albumen is Soluble in wat
and can be separated by Coagulation -
which is another striking character of Albu
Alcohol and Acids and Several Metallic
Salts will coagulate Albumen. a Solutio
of Hyd: Oxymuriat: is by far the most delicate te
for Albumen Dr Boston was ye 1st who pointed
a Solution of Tannin slowly thrown down from
albumen a yellow precipitate

Albumen is Soluble in Alkalies

A very Considerable excess of Acid has the power after precipitating it of dissolving it. Acid. Nit. evidently decomposes it: it not only exists in blood by according to Mr Hatchett's experimen it exists in Lig^t Cartilage &c

its Specific Gravity is various in different Specime of it but in the greater number of Specime Dr Marcet examined

If Albumen which has been coagulated by heat is cut a fluid is seen to exude from it which is called Serosity and which is not at all susceptible of Coagulation. - This was gener supposed to be Gelatine - but now it appeat that it possesses none of y^e properties of Gelatine - and that it resembles Mucus more than any other Substance

Consist of Muriate of Potash and Soda. -

The whole of Saline contents of Serum of blood is 1 grain of Saline Matter to 100 parts of Serum 00 gr of these Salts bd: 7 z g - of Muriat of Soda 5 or 20 gr of Sod. Subcarb: 5 or 10 gr of Potass. Sulph Phosphate of Lime Iron and Magnesia.
The Sulphate of Potash is not found until it has undergo incineration

The Alkali found in State of Subcarbonate

The Quantity of Animal Matter in Serum about
8 Cent when reduced to a dry brittle Mass.
The different Specific Gravity of Serum does not
depend on variation in quantity of Salts, it depends
entirely on the Quantity of Animal Matter or
[illegible] Coloring Matter of ye blood, or that part
which may be washed off has been Called
the Red Globules, consisting of Albumen unit
with Iron in a state of Subphosphate to this it owes it red. Color
Brande says the red Particles don't Contain a
greater portion of ~~[illegible]~~ Iron than ye other Con-
stituent parts of it, they Dr Marcet doubts

Gelatine or Jelly can't be considered as immed
produced by Animal Substances
chiefly obtained from Skin by Tendons Cartilag
ligt. &c, when the Solution is allowed to
cool it becomes tremulous - and is
known & when Deprived its watery
parts driven off it is Called in [illegible] D
the Name of Glue. It is quite hard & semitrans
This was long believed to exist in the blood Dr Bostock showed satis
torily this is not the Case but it appears its the result of a Chemical pr
Gelatine is insoluble in Alcohol - but a
mixture of it with Water will partially dissolve it
a Solution of Isinglass in Gin produces a
very good Paste for making various vessels
but it will not bear heat. The Best test
for Gelatine is Tannin this is the best.
Dr Bostock says 1 Part of jelly in 5000 parts of Water may
detected with facility

added to its aqueous solution, forms with it a copious yellow coloured tenacious precipitate, which, when dried, is brittle, and not susceptible of putrefaction.—*Albumen* soluble in *Alkalies* and *Alkaline Earths*.—In distillation yields the same products as *Fibrine*, but with a less proportion of *Ammonia*. *Tests* of the presence of *Albumen*. The fluid called *Serosity*, essentially different from *Albumen*.

*Gelatine*,—or Jelly, obtained by boiling certain animal substances, particularly skin, in common water, evaporating the decoction to the necessary degree of consistence, and allowing it to cool.—When pure, transparent and colourless. Soluble both in cold and hot water, very readily in the latter, even at a temperature of 90 *Farenh.* By drying becomes semi-transparent, hard, brittle, and of a vitreous fracture, *Glue*.—Is insoluble in *Alcohol; Alkalies* require the assistance of heat, but *Acids* dissolve it with great facility, even when diluted.—With *Tan* it forms, like *Albumen*, a yellowish coloured plastic compound, insoluble in water, and not susceptible of putrefaction; hence the theory of *Tanning*.—Heat decomposes it like other animal substances.

*Mucus*,—nature of this substance not yet well understood. Is distinguished by *negative* rather

It has been often confused with Lymph
[It] is with difficulty distinguished from other animal
substances.

than by positive chemical properties. When exposed to the action of a voltaic pile, gives out Alkali at one pole, and a coagulated substance at the other.

*Urea,*—procured from fresh *Urine* in the form of small crystalline plates, by evaporating it to the consistence of syrup, digesting this when cold in *Alcohol,* distilling the solution so as to separate and collect the spirit, and allowing the residuum to crystallize by cooling. Thus obtained, its colour is *yellowish white,* smell *alliaceous,* taste *strong* and *ammoniacal,* consistence *viscid,* extremely soluble in *Water,* somewhat less so in *Alcohol,* soluble also in the aqueous solutions of both the *Fixed Alkalies* and in *Marine Acid.*—By the *Sulphuric* and *Nitric Acids* it is decomposed, as it is likewise very easily by exposure to *heat,* even to that of boiling water. According to *Vauquelin,* 100 parts yield in distillation 92.02 *Carbonate of Ammonia,* 4.60 *Carbonated Hydrogen Gas,* and 3.22 *Charcoal.*

First [illegible] by French Chymists

*Urea* bears no resemblance to *Uric Acid,* a substance which constitutes the most common species of urinary calculus.—Conclusion of the Course.

THE END.

Perhaps there is no Substance that has been
incorrectly defined as Mucus: it is now
applied to a fluid secreted by a peculiar
set of Glands to lubricate the Part
to which it is applied as the Urethra Nose &c inso-
-ble in Alcohol soluble in water.
Mr Brande has inferred that Mucus and
Albumen are only modifications of y Same thi

much more acid is required to coagulate
Albumen, than is required to neutralize
alkali which it Contains.

The fluid of y Nostrils is an instance &c they al
consists of Mucus dissolved in Water: if you wo
evaporate a quantity of Tears you will have
a Solid Substance, it can't be precipitated by
Tannin Coagulable (not by Heat. &c
Urea may be obtained by evaporating a quantity
of Urine; until reduced to a thick Syrup when
when allowed to cool Crystallizes Confusedly

Obtained in this Method, it will crystallize

4 times its weight of Alcohol will dissolve it when this
is evaporated you will obtain Crystalls of it
less Soluble in Alcohol than Water but the Spi
Solution yields Crystalls more readily than the wat
when dissolved in Water in diff. proporti
it has the property of giving the various
smells of different kinds of urine &c

If urine be saturated with Muriat of Soda and
the Solution crystallized, it will not form
its own regular crystalls.

Pus there is no genuine test for it it is a Compound —

D$^r$ Pearson distinguishes diff$^t$ kinds Pus but has not afforded us a test for it

Calculi are forming in the Kidneys particularly in y$^e$ Pelvis and Infundibula

The Symptoms indicating Calculus in the Kidney or in y$^e$ Ureter going to y$^e$ Bladder, are very much alike

Generally a considerable quantity of thick Mucus is discharged with y$^e$ urine

The Presence of Stone in Bladder is principally indicat by a Pain at the end of ye Penis when the urine is flowing a free Stream it will suddenly Stop. there is also a continual inclination to make Water When the urine Stops by the Stone stopping up the Passage it may be relieved by change of postur all these Symptoms are increased by exercise.

Stone in ye Ureter—

When in the Prostrate Gland it is sometimes giving rise to difficulty of passing ye Urine but Calculi may exist for a long time without giving rise to very urgent Symptoms.

The Symptoms of Calculus Concretions are in Wome exciting Symptoms similar to those of ye Male

We are indebted to Scheele for ye discovery of the part of Calculi Lithic Acid — and he conceived that all of them met with was Lythic Acid. Fourqueor Vouclay. & have brought the State of improvement in the knowledge that we now possess—

Those found in the kidneys are generally pure Lythic Calculi, on being cut thro they appear to be made up of various Lamellæ with a distinc Nucleus. But the kidney has sometimes forming in its the Mulberry Calculus The Phosphat of Lime. Triple Phosphate—

Calculus in the Bladder are formed by varia means, sometimes they consist of fine particles cemented together by Mucus — any extraneou body getting into ye body will be liable to become a Nucleus of a Stone

They are sometimes becoming of [illegible]

The Shape and Color also vary considerably
Some of them are Smooth Some rough
Some are white others Brown like the
olor of Mahogany;
Lythic Acid is disting by being Soluble in fixed
lkalies by applying gentle heat and may be precipitated from
the Solution by an Acid; if heated by
blow Pipe its entirely destroyed emitting
a peculiar Smell. If Nitric Acid is drop
on it and heated to dryness a beautiful pu
~~rple~~ Crimson Color is developed which if you
add a little water a ~~purple Color~~ Crimson solution will
be ~~imparted to it~~ formed when it is entirely
dissolved. Lythic Acid is very Commonly met with
in the Urinary Bladder but not in a State
of Purity. The is most Commonly met with within bod

Oxalate of Lime or Mulberry Calculus
When heated it smells like Semen.
Insoluble in Alkalies, difficultly in Acids
When urged by the Blow Pipe it swells and
crackles which is a test for it. The
Oxalic Acid is burnt out by the heat and the
Lime remains in its pure State & will turn Turmeric
If it is finely Pulverized and by the applicat
of heat is Soluble in Acids.

Phosphate of Lime is a Compact structure
Laminated and is radiated likewise whi
may be seen by Close examination &
by heat it remains unaltered excepting whit
-ening it a little. Pure Phosphate of Lime is
which is not acted upon by heats soluble in acids &c

The Fusible Calculus, when heated runs into a Globule
Consists of an Ammoniacal: Magnesian Salt
and Phosphate of Lime when these are separa
they have peculiar properties. This Triple Salt
when heat is applied emits an Ammoniacal Gas

There is also found a Stone which ~~[illegible]~~ Dr Wollaston has named Cystic Oxyde resembling very much the Lithic Acid — Solutions of Acids injected into y Bladder has been tried but not with any good effect. — Opium has also been dissolved in y same Solution to allay the irritation of y Bladder if used. right the Patient should void for urine prior to y injection being used.

# A VIEW
## OF THE
# SIMPLE BODIES.*

## CLASS I.

*(Comprehending the Imponderable Agents, viz.)*

CALORIC, or HEAT,
LIGHT,
ELECTRICITY.

## CLASS II.

*(Comprehending the Agents capable of uniting with Inflammable Bodies, and in most instances of effecting their Combustion, viz.)*

OXYGEN,
OXY-MURIATIC ACID, or CHLORIC GAS.

Sometimes the diff. kinds of Calculi are alternate together. There is an unfortunate [illegible]

## CLASS III.

*(Comprehending the Simple Combustible Bodies, or Bodies capable of combining both with Oxygen, and with Chloric Gas, viz.)*

HYDROGEN, ...... *or basis of Water.*
NITROGEN, ...... *basis of Nitric Acid.*
CARBON, ........ *basis of Carbonic Acid.*
SULPHUR, ....... *basis of Sulphuric Acid.*
PHOSPHORUS, .... *basis of Phosphoric Acid.*
BORACIUM, ...... *basis of Boracic Acid.*
FLUORIUM, ...... *basis of Fluoric Acid.*

POTASSIUM, .....
SODIUM, ........
AMMONIUM,† ....
} *Metallic Bases of the Alkalies.*

CALCIUM,
MAGNIUM,
STRONTIUM,
SILICIUM,
ALUMIUM,
YTTRIUM,
GLUCIUM,
ZIRCONIUM,
BARIUM,
} *Metallic Bases of the Earths.*

PLATINA,
GOLD,
PALLADIUM,
SILVER,
MERCURY,
LEAD,
COPPER,
IRON,
TIN,
BISMUTH,
NICKEL,
ARSENIC,
COBALT,
ZINC,
ANTIMONY,
MANGANESE,
TUNGSTEN,
URANIUM,
MOLYBDENUM,
TITANIUM,
TELLURIUM,
CHROMIUM,
COLUMBIUM,
CERIUM,
OSMIUM,
IRIDIUM,
RHODIUM.
} *Metals.*

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* By denominating bodies *Simple*, it is not meant to express that they are so in reality, but only that we are not able, by any chemical means with which we are acquainted, to decompose them into simpler parts.

† Ammonium is strongly suspected of being a compound; but as its nature has not yet been positively ascertained, it may still be classed amongst the simple bodies. The same may be said of sulphur and phosphorus.

## ERRATA.

Page vii, Preface, line 8, instead of the word *occasionally*, read *usually.*

Page 37, line 3, from the bottom, dele the words, *soluble also in Spirit (Spiritus Ammoniæ* P. L.)

Page 81, line 5, from the bottom, for *Wolfram*, read *Tungsten.*

*Ibid.* line 4, from the bottom, et passim, for *Chrome*, read *Chromium;* and after the word *Columbium*, add the words, *Cerium, Palladium, Osmium, Iridium*, and *Rhodium.*

Page 95, line 4, after the word *Quicksilver*, add, *or Calomel.*

Page 101, first line from the bottom, instead of *Cuprum Vitriol.*, read *Cupri Sulphas*, and add, *Triturated with Carbonat of Ammonia, forms the Cuprum Ammoniatum* P.L.

Page 108, lines 9 and 10, from the bottom, dele the words, *thrown into Muriatic Acid, burns with a blue flame.*

Page 119, line 8, from the bottom, for *præpartum*, read *præparatum.*

Page 125, at the end of the page, after the word *Charcoal*, add, *Mr. Hatchett's Artificial Tannin.*

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