cine, as the Philosopher's Stone was called, and the Elixir of Life. Too many of these were crafty impostors, or their ignorant dupes, who added little to the stock of knowledge. A few great men, however, appeared amid the surrounding darkness, who brought to light some important chemical facts.

656. The illustrious Roger Bacon, a native of England, flourished in the thirteenth century. Among a variety of less important discoveries, he may claim the invention of gunpowder. "From saltpetre and other ingredients," says he, "we are able to form a fire which will burn to any distance." In another place he says, "a small portion of matter, about the size of the thumb, properly disposed, will make a tremendous sound and corruscation, by which cities and armies might be destroyed." The following curious passage is also found in his writings. "Sed tamen sales petre *luru mone cap urbe*, et sulphuris, et sic facies tonitrum si scias artificium." The words *luru mone cap urbe*, according to the fantastic fashion of the age, were an anagram of the words carbonum pulvere, framed to conceal his meaning from vulgar understandings; and there can be no doubt that they were designed to record, and yet to hide his acquaintance with the art of manufacturing gunpowder.

Friar Bacon

discovery of
Gunpowder

657. In the writings of Arnold, a native of Villa Nova in Provence, who was born in 1235, we meet with the first distinct notice of spirits of wine, a preparation, the extraordinary effects of which on the human system, and its qualities as a solvent, rendered it an acquisition of the greatest importance to the empirics and pretenders of the age.

Arnold 1235
first mentions
power of alcohol
on animal system

658. Raymond Lully, another alchemist of the L
same time, knew how to concentrate alcohol by distillation from alkali, and he prepared the volatile alkali by the destructive distillation of bones, and

Raymond Lully
Inventor Hartshorn

more particularly of the horns of the stag, which process is the origin of its ancient name of spirits of hartshorn.

659. To Basil Valentine, in the latter part of the fifteenth century, we are indebted for our knowledge of metallic antimony, and its principal preparations. Paracelsus was the boldest, and the most famous, of all these daring innovators. He trampled on all authority, he united in himself all the extravagances of all his predecessors, and he awakened the age from its slumbers, by calling every thing in question, by trying every thing, and innovating in every thing. Yet the writings of Paracelsus do not add much to our stock of chemical knowledge. We find that zinc and bismuth were known to him, and he has mentioned or discovered many combinations and salts not before noticed. But the discovery of alcohol; and its powers as a menstruum, had directed the attention of physicians to remedies from the vegetable kingdom, and the alcoholic tinctures which thus took the place of syrups and confections, constituted a great advance in the science of pharmacy, although they added little to the list of facts in chemistry.

660. Van Helmont, a German, who lived in the early part of the seventeenth century, is the first who appears to have suspected that there were different kinds of air, and who used the term gas. He knew that that which is given out in the fermentation of beer and wine, extinguished flame, and he asserted that it was identical with that found in the Grotto del Cane, near Naples. He knew that the air evolved during the putrefaction of animal bodies was inflammable, but it does not appear that he had noticed any other qualities of gases than those which relate to their action on flame.

661. Glauber, a German, who lived at Amsterdam about the middle of the seventeenth century,

Basil Valentine – powers of
metallic arsenic

Paracelsus

Van Helmont –
different kinds of air
Introduces word Gas

Grotto del Cane

Glauber – many practical
improvements – Spirit from
Sea Salt & oil from Green
Vitriol.

Friar Bacon

discovery of
Gunpowder

Arnold 1235
first mentions
power of alcohol
on animal system

Raymond Lully
Invents Hartshorn

Brandt & Kunkel discover Phosphorus & make it from Urine

The Thermometer by Fahrenheit

Boerhaave & Lemery write first formal treatises on Chemy was one of the most industrious experimenters of the age. He discovered many chemical compounds which bear his name, and was the first who prepared chlorohydric acid, which he called spirit of marine salt. He obtained sulphuric acid by distilling sulphate of iron, he greatly improved the process for preparing nitric acid, and added many new instruments and apparatus to the stock already in use.

662. To Brandt and Kunkel, two indefatigable chemists of the same age, we are indebted for the discovery of phosphorus. It was first obtained by the former, who was a chemist of Hamburg, in the vain attempt to extract from urine a liquid capable of converting silver into gold. He showed a specimen to Kunkel, but refused to tell him how he obtained it. Kunkel immediately set himself to work, and after three or four years of labour, discovered the process for making it. Among the most important inventions of the age, was that of the thermometer, which was originally contrived by the academicians of Florence, but was brought into notice by Fahrenheit, a Dutch merchant, who devoted himself to the making of philosophical instruments.

century

& ?

663. The close of the seventeenth, and the early part of the eighteenth century, are the eras of the foundation of chemical science. The great accumulation of facts, rendered some classification of them necessary, and the works of Boerhaave, a learned Dutch physician, and of Lemery, an apothecary of Paris, the first formal treatises that have any claim to a philosophical spirit, were the results of this necessity.

CHAPTER III.

THE STAHLIAN THEORY.

664. The first attempt at a philosophical theory, which had any influence on the progress of the science, was by a German named Beecher, who furnished Ernest Stahl with the original ideas of the celebrated theory of Phlogiston. It was the genius of the latter which rendered this doctrine the creed of the science for nearly a century. He was a native of Anspach, and a physician of great eminence, but his chief merit is the attempt which he made, to explain the principal phenomena of chemistry by a simple and ingenious theory. Stahl found that the sulphurous and phosphoric acids, into which sulphur and phosphorus were converted by burning, were reconverted into sulphur and phosphorus, by being heated with inflammable bodies. He therefore inferred that combustible bodies contain a peculiar principle of inflammability, with which they part in the process of combustion. This principle he called phlogiston, and supposed that sulphur and phosphorus were compounds of phlogiston, with sulphurous and phosphoric acids. Admitting the existence of this principle, the proof from experiment seemed at the time to be complete. For all inflammable bodies are converted by combustion into substances incapable of being burnt, and have their inflammability restored by the action of another inflammable body, which thereby loses the property. The theory which explained these changes, by supposing that a principle of inflammability had been transferred from one body to the other, seemed the simplest and most beautiful that could be devised.

665. Unfortunately it had one fundamental error,

Becher & Stahl

The Phlogistic Hypothesis
wch was mainted above a century

Phlogistic Habits – Medicines &c
and Anti Phlogistic.

Calx – explained
and calcination
when burnt look like lime
or *Calx*.

1700 to 1780

which was even in that age detected, but the detection of which did not, in the infancy of science, attract the notice it deserved. If sulphur and phosphorus, in burning, part with a portion of their substance, the product of combustion should be less than the quantity burnt. Brun, an apothecary at Bergerac, in France, melted two pounds six ounces of tin, and converted it into a calx, which weighed 7oz more than the tin employed. This experiment was performed as early as the year 1626, a century before the publication of the theory of Stahl. Surprised at this circumstance, he communicated it to John Rey, a physician of Perigord, who made it the subject of a tract published in 1630, in which he ascribes the increase of the weight, to the solidification of the air. Had this fact presented itself in the same lights, to a mind as bold and comprehensive as that of Stahl, how much would the progress of Chemistry have been accelerated! for it is the key to some of the greatest mysteries of the science.

That the calcination of the metals was a phenomenon of the same kind as the combustion of inflammable bodies, was soon perceived: for many metals burn with a brilliant flame when calcined at a great heat. The celebrated Robert Boyle attributed the increased weight of the burnt or calcined body, to the solidification of the matter of heat, with which he supposed the metal to have combined; but his opinion does not appear to have gained much attention. When the difficulty struck the phlogistic philosophers, they were driven to the necessity of supposing their phlogiston to possess a principle of levity, so that by its union with bodies it actually lessened their weight; and this opinion, absurd as it now seems, satisfied for a time the disciples of Stahl.

Brafferton

founder of the
Brafferton House

thought Phlogiston
had power of Levity

666. It was the great merit of the phlogistic theory, that it provided a principle of classification, according to real distinctions in nature; the changes which

bodies undergo by combustion, being in fact the foundation on which the true science of Chemistry is now built. The simplicity and comprehensiveness of the doctrine attracted numerous labourers into the vast field of chemical research, and the first eighty years of the eighteenth century were illustrated by the labours of men who must ever be regarded as the patriarchs of experimental research, and whose labours and works still retain their value. Some of the most illustrious of these men were Germans, attracted to Berlin by the fame of Stahl, and of the school which he there established. Scheele, Neuman, Margraaf, Bergman, Klaproth, and Pott, in that country; Reaumur, Hellot, Macquer, Du Hamel, and Baumè, in France; Mayow, Hales, Rutherford, Black, Cavendish, and Priestly, in Great Britain, were the most distinguished of these philosophers. Neuman laboured chiefly in the examination of organic substances; Bergman and Klaproth in the analysis of minerals. The researches of Scheele fill a large space in the history of Chemistry. He discovered, and carefully examined the properties of fluoric acid, in 1771; he ascertained the nature of black oxide of manganese, the peculiar character of baryta, the existence of nitrogen as an element of ammonia, and was the first who obtained, and examined the properties of chlorine. In conformity with the Stahlian theory, he called this gas dephlogisticated marine acid; for it was obtained from this acid by a process, analogous to that by which inflammable bodies are deprived of their plogiston. He was one of the discoverers of azote and oxygen; he ascertained the composition of prussian blue, and the properties of cyanhydric, or, as it was then called, the prussic acid. He examined the acids evolved in various fruits and vegetables, and his essays will bear a comparison with the best productions of our own times, in accuracy, skill, and ingenuity.

first 80 years of 18th centy or from 1700 to 1780
distinguished by learned men who
pursued chemy.

researches of Scheele very
copious & important.

founder of the
Brafferton House

thought Phlogiston
had power of Levity

Dr. Rutherford find that air is
spoiled by being breathed
& discovers Oxygen gas

Dr. Black discovers fixed air

and capacity for heat

Vital air

667. Dr. Rutherford, of Edinburgh, discovered in 1772, that atmospheric air which has been breathed, acquires new properties, and announced the existence of a new species of air, which did not precipitate lime water, and yet was incapable of supporting life or combustion. The greatest advance made at that period, in chemical science, was due to Dr. Black of Edinburgh. By a series of ingenious experiments, this philosopher, in investigating the changes which chalk and magnesia undergo in the fire, discovered that they lost weight, and that this loss of weight was occasioned, like their effervescence with acids, by the escape of an aeriform substance. He announced that chalk and magnesia consisted of a caustic earth, rendered mild by combination with this air, and which he therefore called *fixed air*, and which he afterwards proved to exist in all the mild alkalies. Dr. Black's greatest service to science was the discovery of the fact, that a quantity of heat combines with solids in becoming liquids, and with liquids in becoming vapours, and that it is given out by them when they return to their former state. He also discovered that bodies differ in the quantity of heat requisite to effect equal changes of temperature. These two capital discoveries of the nature of latent, and of specific caloric, may be regarded as laying the first sure foundations of the philosophy of heat, and they were demonstrated by Dr. Black in the most forcible and beautiful manner.

668. The great chemical discoveries of the eighteenth century, those of the nature and properties of oxygen gas, and of the composition of water, were claimed by several individuals. Scheele, in Germany, and Priestley, in England, obtained the vital air, as it was first called, independently of each other. The account which the latter gives of his discovery is worth recording. He had filled a glass jar with mercury, and inverted it in a basin of the same;

Gas

some *red precipitate of quicksilver* was then introduced and floated upon the quicksilver in the jar; heat was applied in this situation by a burning lens, "I presently found that air was expelled from it very readily. Having got three or four times as much as the bulk of my materials, I admitted water into it, and found that it was not imbibed by it. But what surprised me more than I can well express, was that a candle burned in this air with a remarkably vigorous flame, very much like that enlarged flame with which a candle burns in nitrous air exposed to iron or liver of sulphur; but as I had got nothing like this remarkable appearance from any kind of air besides this peculiar modification of nitrous air, and I knew no nitrous air was used in the preparation of mercurius calcinatus, I was utterly at a loss how to account for it."—Exp. and Obs. on different kinds of Air, &c., vol. ii. p. 107. Birmingham, 1790.

Priestley, in conformity with the doctrine of Stahl, supposed that this air owed its remarkable properties as a supporter of combustion, to its being deprived of phlogiston, and that the phenomenon of combustion was occasioned by the transfer of phlogiston from the burning body to this "dephlogisticated air." We owe to Dr. Priestley the perfection of the pneumatic apparatus, the use of the mercurial bath, a knowledge of the properties of the protoxide and deutoxide of nitrogen, the discovery of chlorohydric acid gas and ammoniacal gas, besides a vast number of experiments and observations, that embraced the whole range of chemistry as it then extended.

669. About the same time, Henry Cavendish, an English nobleman of a recluse and studious life, devoted a singularly acute and patient mind to these researches. He was the first (A. D. 1766) who obtained hydrogen gas by the action of dilute acids

Priestlys method of obtaining Vital air

called dephlogisticated air

invents Pneumatic appt

Cavendish obtains Hydrogen Gas
or inflammable air.

upon the metals, and who examined its properties. He also first noticed the formation of moisture, when this inflammable air is burned in a tube. It has been asserted, that the discovery of the composition of water is fairly to be added to the trophies which render the great name of James Watt illustrious; but the recent publication of his original manuscripts, prove that we owe both the first hint, and the complete demonstration of this capital discovery to Cavendish.

CHAPTER IV.

THE LAVOISIERIAN CHEMISTRY.

670. While the chemists of England and Germany, were thus extending the bounds of knowledge by the rapid accumulation of facts, a school was arising in France, which, guided by more profound and philosophical views, soon changed the aspect of the whole science, and laid the foundations anew in a juster and more skilful induction.

Antoine Laurent Lavoisier, who is placed by common consent at the head of these celebrated men, was an opulent French gentleman, who devoted the leisure which he could draw from the duties of a public station to the pursuits of science. In 1774, he entered the field of chemical research, in which, although he did not add so many new facts to our stock of knowledge as some of his cotemporaries, he surpassed them all in comprehensive views and sagacious theory. The virtue and mildness of his private character, and the munificence with which he patronized science and the arts, exposed him to the suspicions and hatred of the madmen who rode upon the storm of the revolution, and he perished on the scaffold in the prime of life. His only request to the officer who arrested him was, that he might be allowed to complete an important experimental investigation in which he was engaged, and it was heard, like the prayer of Archimedes to the Roman soldier, with disregard and contempt.

671. The first great service which Lavoisier rendered to the science was his proof of the real nature of combustion. He demonstrated, in an extensive and beautiful series of experiments, that combustion is the union of the burning body with the vital air of the atmosphere, and that the calcination of the metals is another case of the same combination. He recovered the air from the bodies with which it had united, and showed that the weight of the product is in all cases equal to that of the air and of the body which has been consumed. He made Dr. Black' doctrine of latent heat the foundation of his theory of combustion, and contended that the heat and light given out in the process, are due to the latent h of the vital air with which it parts in becom solidified. The explanation was ingenious and p sible, and was generally received at the time, subsequent researches have shown it to be ins cient to account for their evolution in many cases combustion.

672. The researches of Lavoisier, even when n marked by strict originality, are masterly specimens of philosophical skill. It was thus that he pursued the investigation into the composition of water an of fixed air. He showed that the latter is always a compound of charcoal and vital air, that it is always produced when that substance is burned, that its weight is equal to that of the charcoal and the vital air consumed, and that it can be again converted into charcoal. He was the first who examined the nature of the change which the diamond undergoes when it is dissipated by exposure to an intense heat, and astonished the world by announcing, as the

startling result of his researches, the identity of diamond and charcoal.

673. The name of Lavoisier is associated with that of Guyton Morveau, Berthollet, and Fourcroy, in the reformation of chemical nomenclature. They found the science overloaded with barbarous synonyms, with names either without meaning, or conveying erroneous notions of the substances they designated; framed according to the caprice of the inventor, and embarrassing the student by the false impressions they created. They therefore undertook to frame a strictly philosophical language of chemistry, every term of which should have a precise signification, expressing, if it belonged to a simple body, some peculiar property, and if it were the name of a compound, designating the composition of the substance. They executed this novel project with consummate sagacity and success, and the beauty and simplicity of its new nomenclature, contributed greatly to render chemistry, what it soon became, the most popular science of the day. Even where their premature generalizations involved them in theoretical error, which vitiated the correctness of their language, there is no difficulty in adapting the nomenclature to the new discoveries without impairing its symmetry.

674. The details of this system have already been given, from which it is easy to see the errors into which they fell in regard to certain general laws. The only acids, the composition of which was known to them, were those formed in the process of combustion, or proved by analysis to contain vital air. They therefore inferred that this air was the principle to which all acids owed their peculiar properties, and they called it oxygen gas. The error consisted in too hasty a generalization, and long misled the investigations of philosophers. The first exception that was discovered to this rule, was by Scheele, who could find no oxygen in a careful analysis of

prussic acid. An error more material in its consequences was the supposed constitution of the substance formed by the addition of oxygen gas to muriatic acid. Supposing the resulting body to be a compound of the two, it was inferred that the muriatic acid was a combination of oxygen and an unknown base, which was capable of a still higher degree of oxygenation. This second compound was therefore called oxygenated, or oxymuriatic acid, and its supposed constitution was for many years unquestioned. Its properties were so peculiar, as reasonably to excite doubt of its being in any respect an acid; but these did not lead to any suspicions of its real nature, until, in the year 1809, Gay Lussac and Thenard announced that its formation was explicable on the supposition of its being an elementary substance. Sir Humphrey Davy, about the same time, subjected this body to the action of the most powerful decomposing agents, without its undergoing any change, and arrived at the conclusion that it must be regarded as a simple undecompounded body. On this view, muriatic acid was formed by the combination of hydrogen with oxymuriatic acid, and, when the former is converted into the latter by the addition of oxygen, water is always formed. These views were established by careful experiment, and strict induction, and they entirely changed the face of the science, and soon received a powerful confirmation by the discovery of the closely allied elements of iodine and bromine. Chemists no longer regarded oxygen as the sole acidifier, but reckoned chlorine, as the oxymuriatic acid was now called, iodine, bromine, sulphur, and even certain compound bodies, such as cyanogen, in the same class.

675. To Sir Humphrey Davy we are also indebted for the great discovery of the metallic properties of the bases of the alkalies and earths, and for a long series of successful researches in every depart-

ment of the science. He seized hold of the electricity evolved in the voltaic circuit, and showed it to be the most powerful agent of decomposition that had hitherto been known. The researches to which the powers of the voltaic pile had given rise, brought to light the fact, that when compound bodies were decomposed by the electric current, acids were constantly evolved at one pole, and alkalies at the other. The idea was natural, that the attraction which held bodies together, and which was thus neutralized by the electrical fluids, must be the antagonist force to that which destroyed or suspended it, and that all bodies in nature are endued with resinous or with vitreous electricity, forces which are therefore identical with the cause of chemical attraction. The most subtle and profound investigations that science has witnessed since the optical researches of Newton, I mean those detailed in the electrical papers of Faraday, have given to this theory a solidity and an importance, which make it at the present time the central point of interest in the science of chemistry.

Faraday

CHAPTER V.

THE ATOMIC THEORY.

676. While Chemistry was thus advancing with rapid strides towards the point to which we have conducted its history, the facts had been slowly accumulating, which became the data for the most important generalization that had yet been attempted. Although Ernest Stahl had seen the necessity of supposing that bodies are endued with different degrees of attraction, in order to explain the changes which take place; the law was first laid down with precision by Geoffroy, in 1718. "In all cases," says he, "where two substances which have any

disposition to combine, are united, if there approaches them a third, which has more affinity with one of the two, this one unites with the third and lets the other go." Geoffroy exhibited the degrees of this affinity, as respected the then known acids and bases, in the form of a table, placing that substance at the head of the column of affinities, which separated the substance whose affinities were thus given from all other bodies; and ranking the others in the order of their power of decomposition. These tables were the result of numerous experiments, and formed the most valuable body of facts that had as yet been published in the science.

677. In 1775, Torbern Bergman published his celebrated work on elective attractions, in which he extended and confirmed the law of Geoffroy, corrected his tables and entered into extensive investigations to ascertain the proportions in which bodies combine. Two years afterwards a German, named Wenzel, published a treatise on the doctrine of the affinities of bodies, which contained many accurate analyses. He found that when two neutral salts decompose each other, the resulting salts are also neutral, and he announced the law, that the elements of bodies combine in definite proportions, and that they combine reciprocally, so as always to neutralize each other. The work of Wenzel attracted little attention, but Richter, in 1792, adopted the views it had developed, pushing the investigations further, and determining by analysis, the numerical quantities of the common bases, and of the acids that would neutralize each other. In the mean time, 1789, an Irish chemist, named Higgins, had advanced the position, that in volatile vitriolic acid, a single ultimat particl of sulphur is united only to a single particl of dephlogisticated air; and that in perfect vitriolic acid, every single particle of sulphur is united to two of dephlogisticated air, being the quantity necessary to saturation.

678. These scattered observations and unconnected researches, like the occasional notices and insulated experiments which preceded the Newtonian era, indicated the approach of the science towards a new generalization, the full development of which was reserved for an illustrious Englishman. In 1803, John Dalton, of Manchester, turned to this subject the attention of a mind remarkable for its power of accomplishing great ends by simple means; for its philosophical moderation, for its acuteness and patience, no less than for its comprehensive grasp and faculty of vivid conception. In the course of an analysis of olefiant gas and of dicarburetted hydrogen, he was struck with the fact, that the carbon in the former was double the quantity contained in the latter. Reasoning from the few facts of the kind which readily presented themselves to his mind, he saw at once the real conditions of chemical combination, and did not hesitate to proclaim the doctrine, that bodies combine by their ultimate particles, and that when more than one combination of two bodies exist, they must be in proportions which are multiples one of the other.

The clearness and simplicity of the notion were irresistible recommendations in its favour; and he pursued the researches to which it led him, with an ardour and success that soon raised it from the rank of a plausible theory, to that of a profound and wide generalization. In 1804, he explained his theory to Dr. Thomas Thomson, of Edinburg, who adopted it in his Treatise on Chemistry, published in 1807. Dalton himself gave his own researches to the public in a short system of Chemistry printed in 1808. Dr. Wollaston was one of the earliest advocates of the new views, which he defended in a memoir on the super-acid and sub-acid salts, published in the year last mentioned. The doctrine soon became firmly established over the whole chemical world, and received a striking confirmation from the researches of

Gay Lussac, who discovered that gases unite by volume in simple, definite, multiple proportions, and that the bulk of the resulting compound, when it differs from that of its elements, always bears a simple definite proportion thereto. Dr. Thomson advanced the position that the atomic numbers of all bodies are exact multiples of the atomic weight of hydrogen. This law, if true, would be a simplification of great beauty and convenience; but we are not perhaps able to pronounce positively on the point; for the unavoidable imperfections of our finest analyses, will always leave a slight shade of doubt around the numerical result of every experiment. It seems safer, therefore, to avoid a supposition however convenient, which may lead into error, and strictly to abide by our experiments, leaving their verification and correction to more careful inquirers.

679. The language in which Dalton expressed his doctrine has been much criticised. Wollaston used the phrase *chemical equivalents.* Davy chose to speak of *chemical proportions*, and others have preferred *combining numbers*, as avoiding a theoretical and unproved assumption; but the language of Dalton has the merit of conveying clearly to the mind, a great and simple conception, that reaches to the ultimate principles of the science; and if we admit that the chemical atoms by which bodies combine, may be groups of the ultimate physical atoms, the doubts of the most scrupulous as to the use of his phraseology may be satisfied.

The atomic theory of Dalton was the precursor of the still wider generalization, already alluded to, of
p 309 Michael Faraday, and the two discoveries may be said to have given to the science a new impulse, more powerful than any which it has felt since the invention of the nomenclature of Lavoisier.

THE END.

Many Farmers waste their Manure for want of chemical knowledge. & sometimes produce decided injury by their use.

Animal substance such as Dung urine & even Dead animals themselves contain the largest quantity of Nitrogen; and all the grains such as Wheat Rye corn oats Barley & Buckwheat need large quantities of this & wheat most of all for forming the gluten which renders its flour so nutritious.

Potatoes Turnips Beets Pumpkins Cabbages Peas Beans Carrots – Clover, herd grass Timothy and other grasses need very little of it, therefore animal Manure wo.d be wasted on such crops but cotton Hay, Leaves saw dust, Swamp muck & such things as contain most carbon are to them the richest Manure.

Guano is often injudiciously used – its constituents being suited to the Grains only – on some vegetables it is prejudicial.

Saby Cowan May 23. 1846

State the causes which in the last half century have raised chemistry from a practical art, to the rank of an exact Science.

—

Explain Simple affinity, Elective affinity and double elective affinity.

—

How is affinity accounted for.

—

In what way is electricity useful to the chemist

Is alcohol a natural product?

What substance or elements neceſsary for its production?

What are the general Proximate principles of Plants

What chemical character are they remarkable for?

What Natural operation neceſsary to produce alcohol?

What takes place in it

What artificl. proceſs neceſsary to separate alcohol?

What its characters & properties when produced

absolute – Rectified Proof &c. –

How does alcohol differ from Ether

How do alcoholic fluids become acid –