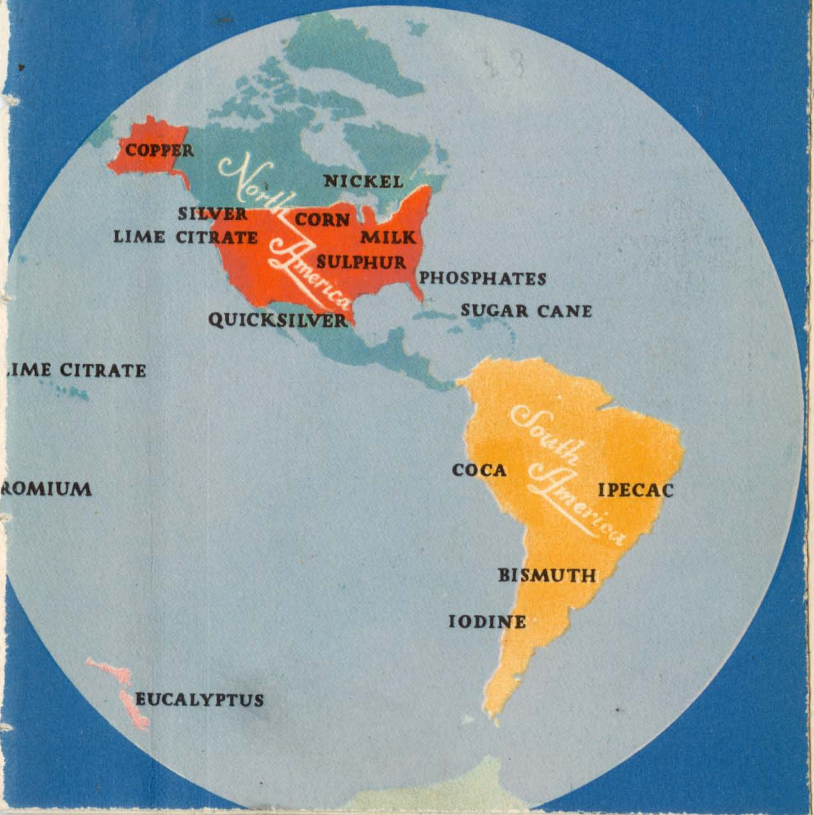
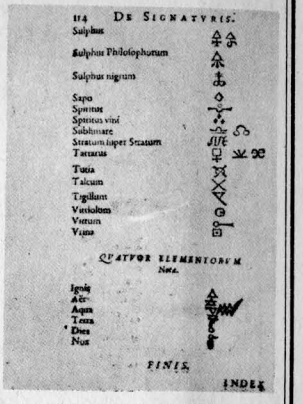
A CHEMICAL ALMANACK



Scientific Symbols and Their Origin

℞ symbol for the prescription or pharmaceutical recipe, is derived from the symbol for Jupiter ♃. The Chaldean physicians are reported to have used it as a form of propitiation to the king of the gods, that their compounds might not act unfavorably.



Alchemists' Symbols, from an old book

The RED CROSS, emblem of the society for succoring the sick and wounded, displays the arms of Switzerland reversed, and was adopted in honor of that country by the Geneva Convention of 1864, one of the greatest examples of international cooperation.

MERCK'S CHEMICALS are universally identified by this symbol, which is a combination of the design of the Red Cross and the standard symbol of the pharmaceutical prescription.

SHOW GLOBES or BOTTLES, known in England as *Carboys*, are of obscure origin. Varying conjectures as to their earliest use go as far back as Cæsar's invasion of Ireland and the Great Plague of London in 1665, where they served as a beacon or identifying mark. Redolent of the past, show bottles filled with colored liquid still decorate many a pharmacist's window.

The CADUCEUS, medical symbol, originated as the staff of Æsculapius, the Greek god of healing and the son of Apollo. In past centuries physicians were wont to place this symbol at the head of their prescriptions. Hippocrates, the father of medicine, was believed to be a direct descendant of Apollo and Æsculapius.

A

Chemical Almanack

Treating of

DIVERS CHEMICALS, where they are found, how they are made, also who prepares them:

BEING

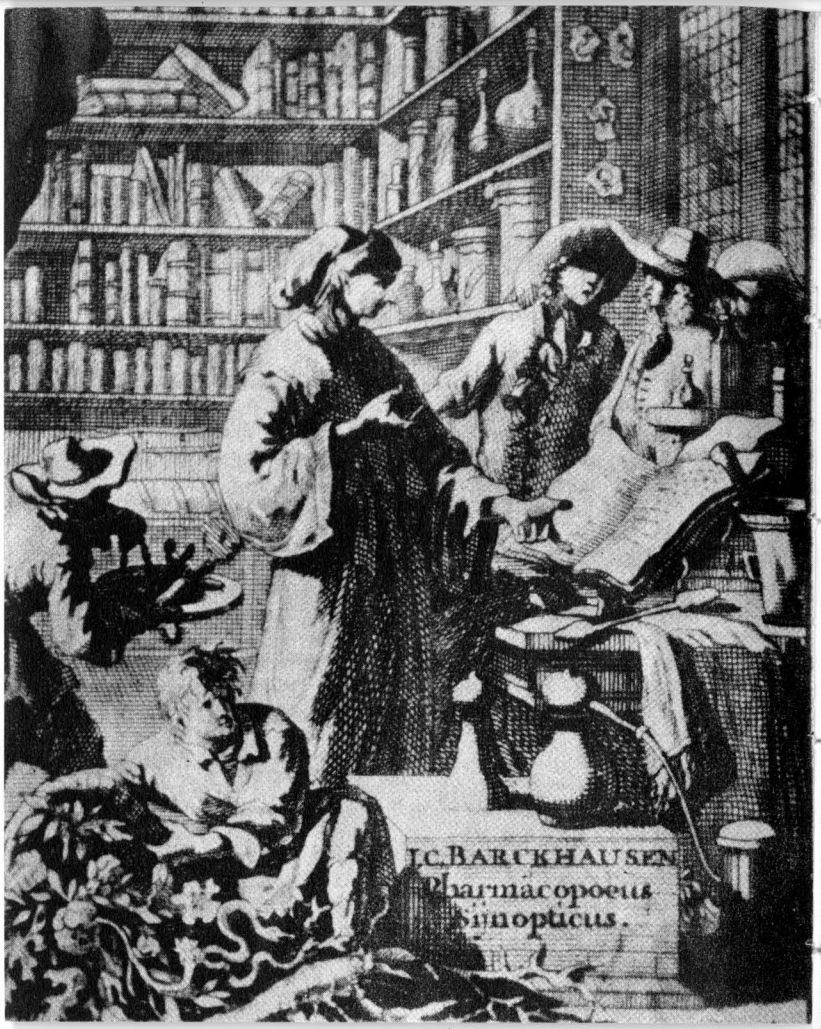
A short history of chemistry very proper for all who may be interested, including Apothecaries, Chirurgeons, students and other ingenious persons.

A WORK of considerable Use and Curiosity.

The FIRST EDITION, carefully corrected.

Printed for *Merck & Co. Inc. Rahway, N.J., U.S.A.*

1933.



A Chronology of Chemistry and Allied Pursuits

(With appreciation to Professor Charles H. LaWall, author of "Four Thousand Years of Pharmacy")

B.C.

460 Hippocrates, the father of medicine.

A.D.

25 Scribonius Largus, physician to Tiberius and compiler of a pharmaceutical formulary.

60 Dioscorides, earliest authority on materia medica.

150 Galen, Rome's most celebrated pharmacist and physician.

150 Terra Sigillata, a kind of clay, and the earliest form of trade-marked article. Later a monopoly of the Turkish Sultan.

750 Geber, the father of alchemy.

1163 Edict of Tours, restricting surgery to barbers and mountebanks.

1233 First known apothecary shop—in Wetzlar, Germany.

1475 Guild of Grocers (England) given exclusive power of garbling drugs and spices and examining the wares of the apothecary.

1525 Paracelsus, great chemical, medical, and pharmaceutical reformer.

1546 First Pharmacopœia published in Nuremburg; author, Valerius Cordus.

1575 Elizabeth, Queen of England, takes lessons in alchemy from John Dee and, like her royal father, becomes an experimenter with pharmaceutical preparations.

1602 Mayerne expelled from France for prescribing calomel.

1624 The first patent medicine, Goddard's Drops, made from human bones.

A Pharmacy of the Late 17th Century

1627 Robert Boyle born, Father of Modern Chemistry.
1668 *Friedrich Jacob Merck takes over the pharmacy "At the Sign of the Angel," Darmstadt, Germany.*
1672 Seignette discovers Rochelle Salt and keeps compound a secret for 60 years.
1711 First patent medicine in America—a so-called consumption cure called "Tuscorora Rice."
1745 Barbers separated from surgeons in England.
1766 Cavendish discovers hydrogen.
1770 Oxygen discovered by Priestley and by Scheele.
1772 Nitrogen discovered by Rutherford.
1775 Place of oxygen in chemistry defined by Lavoisier.
1775 Louis XVI purchases tapeworm cure of Madam Nouffer for 18,000 livres (nearly $5,000).
1788 Castor Oil first given official recognition in revised London Pharmacopœia.
1804 Dalton publishes atomic theory.
1804 Sertürner, German apothecary, first prepares morphine.
1811 Courtois discovers iodine.
1816 *Heinrich Emanuel Merck adds chemical factory to Darmstadt pharmacy.*
1820 Pelletier and Caventou discover quinine.
1822 *Quinine first manufactured by Farr and Kunzi (Predecessors of Powers-Weightman-Rosengarten), founded 1818.*
1827 *Original manufacture of morphine on commercial scale, by Merck.*
1828 Wöhler synthesizes urea from ammonium cyanate and breaks down distinction between organic and inorganic chemistry.
1856 Perkin accidentally discovers first coal tar color while trying to synthesize quinine.
1862 *Original manufacture of cocaine on commercial scale, by Merck.*
1883 Knorr prepares antipyrin, one of the earliest coal tar synthetic remedies.
1891 *George Merck comes to America.*
1898 Radium discovered by the Curies, France.
1927 *Merger of Merck with Powers-Weightman-Rosengarten.*

In Which Are Related the Origins of Divers Chemicals

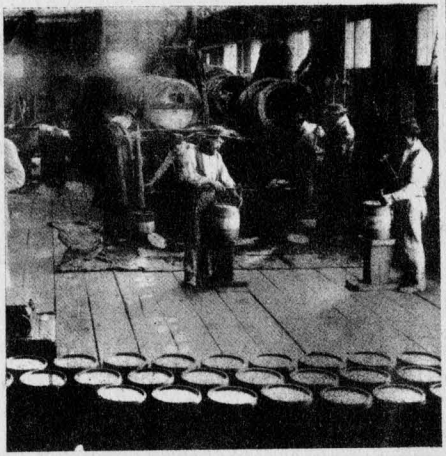
Iodine

¶Named by Sir Humphry Davy, but actually discovered in 1811 by the French pharmacist, Bernard Courtois, Iodine has taken its place among the indispensable antiseptics.

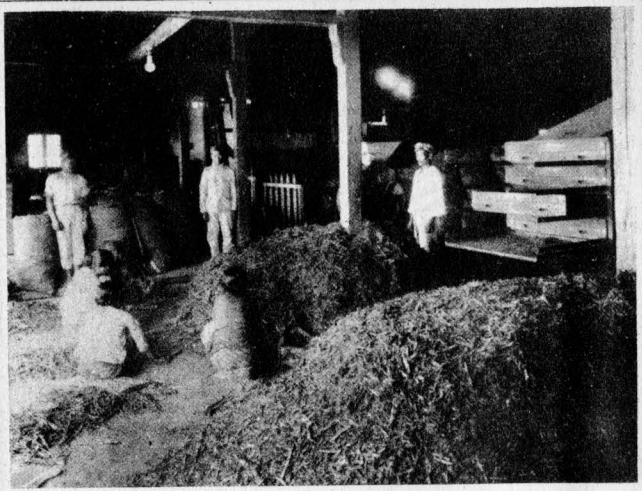
¶It occurs in nature in the caleche, or hard pan of the Chilean nitrate fields, and in the subterranean waters of Java and California; it is likewise derived from kelp, a seaweed found on the coasts of the Atlantic and the Pacific.

¶Iodine is used primarily in medicine, most frequently as Potassium Iodide, for a variety of purposes. It is of especial importance in the diet of man and animal, serving as it does to control particular types of goiter caused by a deficiency of Iodine in the food or water supply.

¶In industry, the chief function of Iodine lies in the manufacture of photographic emulsions.



Iodine Extraction in Chile



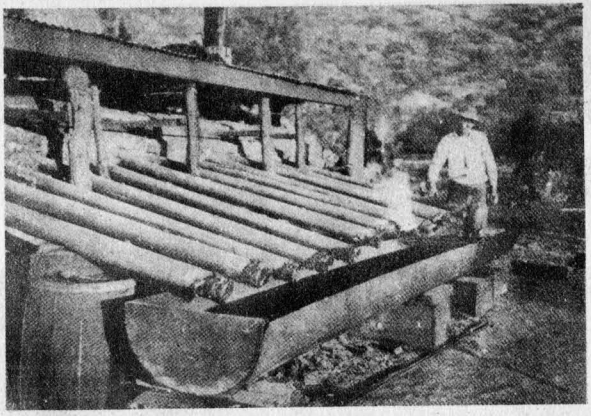
Scene at Cinchona Plantation in Java

Cinchona

¶Cured of an intermittent fever by its use, the wife of Count Chinchon, Viceroy of Peru, first brought Cinchona to Europe in 1638.

¶Originally indigenous to the high eastern slopes of the Andes in South America, Cinchona, the dried bark of the Cinchona tree, is now almost wholly supplied by the Dutch colony of Java, where climatic conditions are suitable for its commercial propagation and cultivation.

¶When treated with sulphuric acid, Cinchona bark yields important alkaloids, such as Quinine, universally employed in the treatment of malaria and other fevers.



Crude Quicksilver Condenser in California

Quicksilver

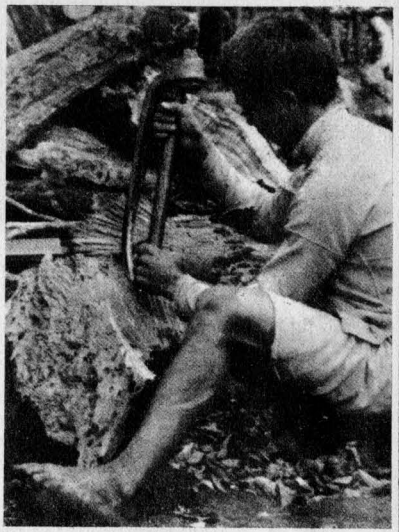
¶In the alchemist's coupling of deities and metals, Quicksilver was ascribed to Mercury, the messenger of the gods. It occupies a unique position as the only metal which is liquid at normal temperatures.

¶Found in deposits of cinnabar and other ores in Spain, Mexico, Italy and the United States, its uses are widespread—for thermometers, barometers, automatic electric switches, mirror plating, and in gold and silver mining.

¶When treated with chlorine gas, Quicksilver produces the Chlorides of Mercury—Bichloride of Mercury and Calomel. There are many other salts and preparations of Mercury which are common to the practice of medicine and to the uses of industry.

¶*In spite of the old belief that chemistry owes its name to "Shem" or "Chem," the son of Noah, its root is "Khem," the native word for Egypt.*

Camphor



Chipping the Wood of the Camphor Laurel

¶"A compound with a penetrating fragrant odor," saith Messrs. Funk & Wagnalls.

¶Obtained principally from Formosa and Japan, Camphor is likewise found in other tropical countries. Crude Camphor is obtained by distilling the wood of the Camphor laurel, and is refined by treatment with quicklime and charcoal.

¶In industry its principal use is in the manufacture of celluloid, explosives and lacquers.

¶Medicinally, Camphor serves as a heart stimulant, counter-irritant and local anesthetic. It is used internally in the treatment of typhoid fever and cholera.

Wool

¶Australia and the Argentine vie for honors as the world's leading sheep-raising territory. The soft, curly hair of the sheep—wool—has a thousand uses. Notable among the products of wool is wool fat, known as Lanum, or Lanolin, obtained by purification of the brown grease which is extracted from the raw wool in the process of preparing it for spinning.

¶Lanum is widely used as the base for ointments and creams, because it readily penetrates the skin and is capable of forming perfect emulsions and absorbing large quantities of water.

Llama Pack Train Carrying Bismuth Ore

Bismuth

¶Originally confused with other metals, Bismuth was isolated in the 18th Century by researches of Pott, Geoffroy and others.

¶Bismuth ore occurs in its richest form in Bolivia. Bismuth metal is also found in combination with other elements in many parts of the world. Its medicinal uses in the form of Bismuth Subnitrate, Bismuth Subcarbonate, and Bismuth Subgallate, and other derivatives, make it one of the metals indispensable in the practice of medicine.

¶Owing to its low melting point, Bismuth is widely used in the making of fusible alloys used for links on fire-doors and automatic sprinkler systems in fire-prevention work.

Ox-teams Hauling Wagons Loaded with Wool

Source of Citric Acid. Lemon Grove in California

Citric Acid

¶ From the juice of a lemon the Swedish apothecary, Karl Wilhelm Scheele, first extracted Citric Acid in 1784.

¶ Countless are the uses which this acid serves:

In commerce, for printing calico, electroplating and confectionery, and, in especial, in the manufacture of beverages.

In combinations, such as Potassium Citrate and Sodium Citrate, for many medicinal and industrial uses.

Familiar to all is Citrate of Magnesia, famed as a purge.

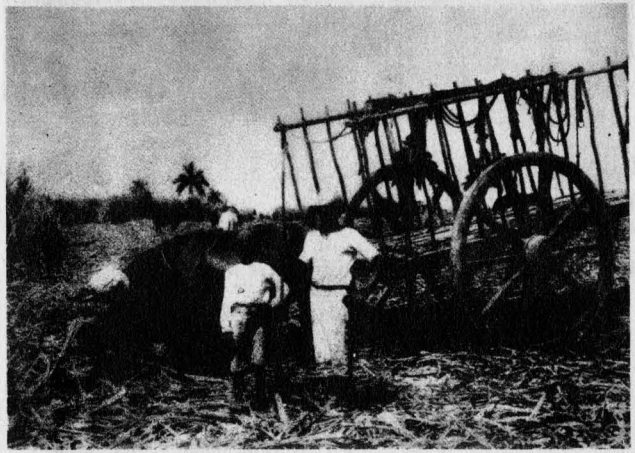
Sugar

¶ Because of its scarcity, Sugar was first used in Europe as a medicine and not for the delectation of the palate.

¶ Derived chiefly from the sugar-cane, which is grown in semi-tropical countries throughout the world, Sugar is now one of the most common of foodstuffs. Its chief by-product is molasses, which in turn yields Alcohol by fermentation.

¶ Strangely enough, the use of Alcohol as a stimulant is not its most significant function. Indispensable as a solvent in the chemical industry, Alcohol is used for making tinctures, extracts and perfumes.

¶ From the medical standpoint, the primary service of Alcohol is in the manufacture of Ether, without which the progress in medical surgery would hardly have been possible.

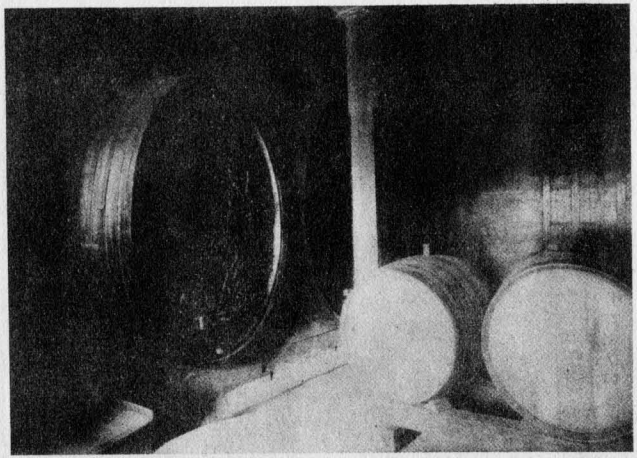


Sugar-Cane Plantation in Cuba

Argol

¶ Straight from the wine cellar comes crude Tartar, technically known as Argol, a semi-crystalline deposit which forms in wine vats during fermentation. Argols are obtained in all countries where quantities of wine are made, in particular the vintage areas of Algeria and France.

¶ Tartaric Acid, which is derived from Argol, has many industrial uses—in wool dyeing, in photographic processes, and, in the form of Cream of Tartar, as an important component of Baking Powder. Medicinally it is used in Seidlitz mixtures and other effervescent powders, and in saline and cooling drinks.



Wine Cellar Where Argols Are Formed

¶ *"Paraminobenzoyldiethylaminoethanol Hydrochloride" and "Diethylaminoethylparaminobenzoate Hydrochloride" are the chemical names for procaine, a local anesthetic used in dentistry.*

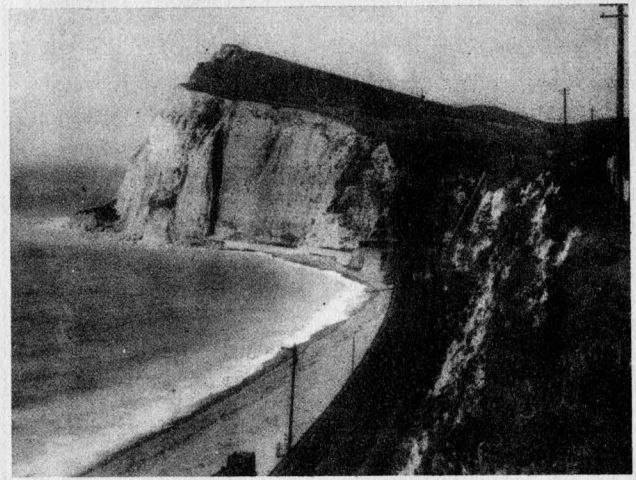
Chalk

¶ Found in scattered deposits in many parts of the world, Chalk comes principally from the cliffs of Kent, Yorkshire and Devonshire in England. In its purest form it contains as much as ninety-nine per cent Calcium Carbonate.

¶ In commerce Chalk has many uses—in the manufacture of mortar, cement, plaster, polishing powder, ceramics, glass, as a fertilizer, and as crayons.

¶ Medicinally, it has several functions, being indicated in the treatment of delayed tooth formation, various intestinal disorders and skin conditions.

¶ Nor must we neglect to mention that Chalk serves as the base for practically all tooth powders.



Chalk Cliffs of Dover, England

Concerning Some Chemical Processes

¶Slowly man has acquired familiarity with a number of chemicals, their curative values in disease and their utility in the arts. Still more slowly he has developed the knowledge of obtaining and making these chemicals suitable for divers purposes.

¶Many processes, some very simple, others highly complicated, are today employed in the production of fine chemicals.

¶A brief account of some of these processes and their origins is given herewith:

Sublimation

¶More than a hundred years ago, while engaged in the crude process of burning seaweed to obtain Sodium Carbonate, the French pharmacist Courtois discovered traces of what is now known as Iodine.

¶In the form in which it was first isolated, Iodine contained many other substances which reduced its value in medicine.

¶Today crude Iodine—a metal-like, blackish material with violet lustre—is placed for purification in earthen crocks over coal fires. When heated, the Iodine vaporizes; violet vapors form a coating of crystals on the upper, inner surfaces of the crock. This process is known as Sublimation. The violet-hued crystals are re-sublimed to obtain the desired purity of Iodine.

¶When combined with Potassium or Sodium, the Iodine becomes the Potassium Iodide or Sodium Iodide of the fine chemical trade.

Evaporation and Crystallization

¶Natives of maritime countries have, since the beginning of history, caught the sea in puddles, watched the sea water evaporate in the sun, and observed white crystals form to make their supplies of life-preserving salt.

¶Today, salt, or Sodium Chloride, is made by evaporating salt water from deep wells under controlled conditions, removing the impurities by suitable chemical means, and collecting and drying the resulting crystals.

Distillation

¶Taking advantage of the fact that liquids evaporate at different temperatures, the chemist has learned to heat a mixture of liquids to a temperature high enough to evaporate one of the constituent liquids but not high enough to evaporate the other. By thus changing one liquid into vapor or gas while the other element retains its liquid state, the two substances are easily separated.

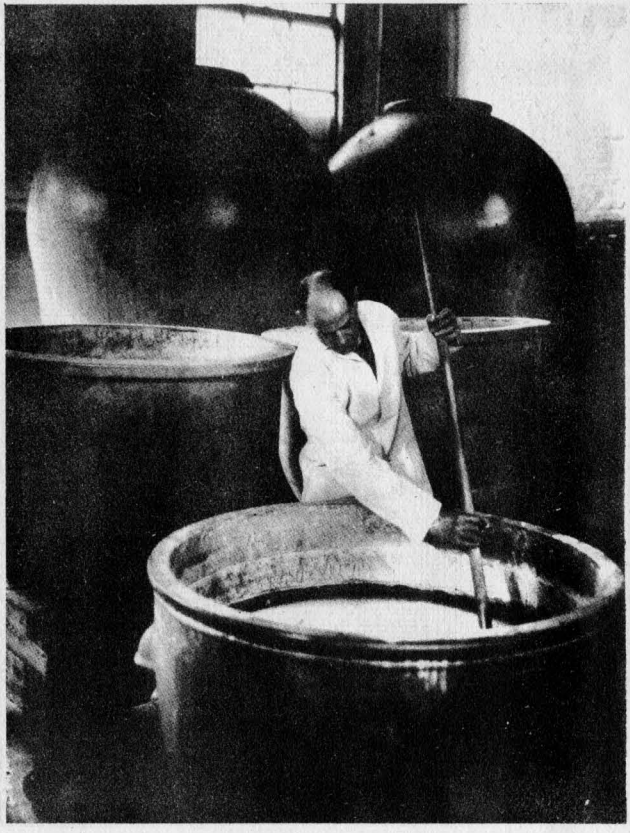
Extraction

¶A native of the Andes, suffering from fever, once drank from a pool in which the limb of a fallen tree happened to lie and, miraculously enough, found relief. The tree, later named Cinchona, became the source of Quinine.

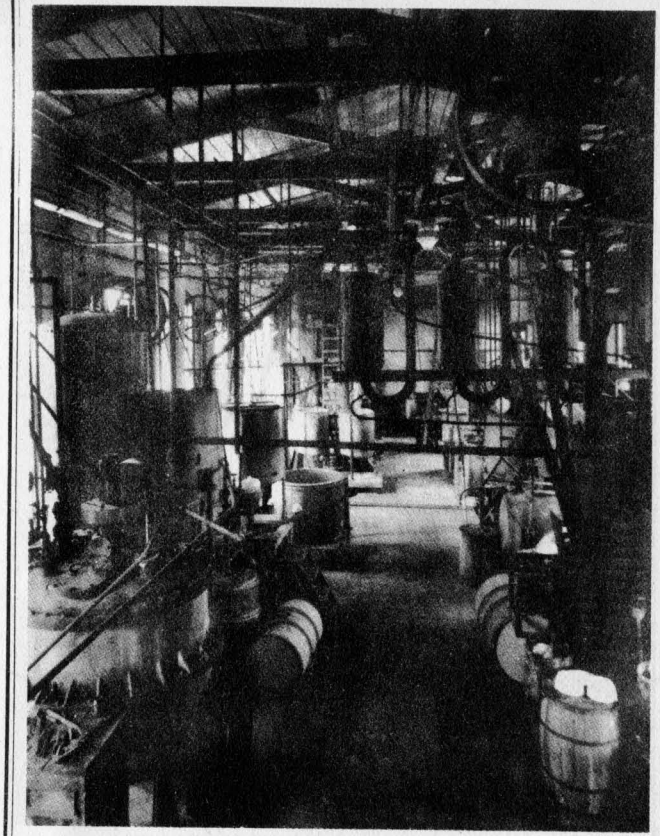
¶Now, when the bark of the Cinchona tree is dried, finely ground and treated with sulphuric acid, the active principles of the Cinchona are dissolved out of the bark pulp and are then in solution with the acid. The Quinine is removed from the solution, after which it is dried and made ready for use.

Calcination

¶In many parts of our country are the remains of the lime-kilns in which the limestone underlying the local terrain was



Some Processes Are Simple



Some Processes Are Complex

"burned" with local cord-wood to form lime—or Calcium Oxide.

¶ The same process of burning, with modification, of course, is employed today in the making of Magnesium Oxide. When Magnesium Carbonate is burned or heated in a furnace a residue is left. The residue is Magnesium Oxide, a white powder, useful in medicine as a laxative, and in tooth powders. Combined with water (hydrated), it is the well known Milk of Magnesia.

Synthesis

¶ In fine chemical production many articles are made through synthesis—the combination of separate substances or elements into new forms. The processes are in general long and complicated, requiring a high degree of technical skill on the part of the chemist and varying with each product.

Catalysis

¶ Many chemicals combine readily with other chemicals, but others do so only when stimulus is applied. The stimulant, known as the catalyst, does not become part of the combination.

¶ As an example of catalysis, Hydrogen and Nitrogen when subjected to heat and pressure in the presence of Iron, serving as the catalyst, combine to form Ammonia.

¶ *Robert Boyle, the father of modern chemistry, had his weak moments, as evidenced by the following recipe from his own hand:*

> *"Against Epilepsies or the Falling Sickness. Take of the powder of the true mistletoe of the oak, as much as will lie upon a sixpence, early in the morning, in black cherry water, for some days near the full moon."*

Being Some Random Notes on the History of Chemistry

Pre-Historic Times

¶ Man discovers fire and opens the door to the mysteries of nature.

Ancient Times

¶ The beginnings of chemistry are closely interlaced with the arts of ancient Egypt, India and China. Something is known of metallurgy, glassmaking and dyeing.

¶ Philosophers of Greece theorize and speculate about the elements of which the world is made. Later, strangely enough, some of these speculations are established in fact.

The Middle Ages

¶ Alchemy becomes the fashion of the time. Its two-fold function of medicine and transmutation Roger Bacon describes thus:

> "Alchymie is the art or science of teaching how to make or generate a certain kind of medicine which is called the elixir. It teaches how to transmute all kinds of metals one with the other, and this by a proper medicine."

¶ Science makes little progress. The Arabs carry Alexandrian learning into Spain, thus preserving for future generations the scientific discoveries of the past.

ROBERT BOYLE (1627-1691)

The 13th Century, et seq.

¶ Albertus Magnus, of the blood royal, collects and arranges the known material of science. His contemporary, Roger Bacon (1214-1292), called "The Universal Doctor," is the first great experimenter.

¶ Paracelsus, born a year after the discovery of America, shares honors with Bacon in ushering in the experimental period in science. Said to have discovered the Philosopher's Stone, he later condemns the search for it.

The Father of Chemistry

¶ Leader in early chemistry is Robert Boyle (1627-1691). First to determine the density of air, he reveals that bodies change in weight according to the buoyancy of the atmosphere. Likewise he devises a method for extracting phosphorus and makes many experiments on air and other gases. (See page 18 for one of his mistakes.)

SIR HENRY CAVENDISH (1731-1810)

Phlogiston Exploded

¶ The 18th Century is remarkable for numerous and sundry positive discoveries, and for the disproof of various long-established errors. The century commences unpromisingly with the phlogiston theory, sired by Stahl (1660-1734). This is a glorified belief that a special kind of fire-matter (phlogiston) is given off in combustion.

¶ Several discoveries soon disprove this fanciful theory. Priestley (1733-1804), nonconformist minister whose laboratory was destroyed by religious fanatics, and Scheele (1742-1786), the illustrious Swedish pharmacist, independent one from the other, discover the gas, oxygen. This discovery leads Lavoisier (1743-1794) to the theory that in combustion the combustible matter combines with oxygen.

ANTOINE LAURENT LAVOISIER (1743-1794)

Atoms

¶ Wonders anew!

¶ John Dalton (1766-1844), who made chemistry a science, shows that each element consists of a special type of atom. Further, that each type of atom has a special weight. Taking the atomic weight of hydrogen as his unit, he establishes the table of the atomic weights of the elements.

¶ The Swedish chemist, Berzelius (1779-1848), waxes enthusiastic over Dalton's theory and produces substantial support for the calculation of his contemporary. The disciples of Berzelius carry his theories and his methods into all the known parts of the continent of Europe.

¶ Contributing toward the clarification of the puzzle over atoms and molecules is Italy's Avogadro, who concludes that equal volumes of gases contain the same number of molecules, provided temperature and pressure are the same.

The Periodic Law

¶ Added to the accumulating knowledge of the chemists is the "Periodic Law," based on a discovery by the Muscovite, Mendeleeff. By means of this periodic table he is able to predict the

properties of elements which were then unknown to man but which have subsequently been discovered.

¶By producing organic substances from inorganic materials, in 1828 Wöhler puts an end to the mysterious "vital force" which wise men thought was responsible for producing organic substances from carbon, hydrogen, oxygen and nitrogen.

Justus von Liebig

¶Wöhler's associate, Justus von Liebig, born in Darmstadt in 1803, invents the condenser. Furthering precise chemical methods in the practice of medicine, he describes an improved method for the manufacture of potassium cyanide. This proves of enormous value in metallurgy and the arts. (Von Liebig is the friend and collaborator of Heinrich Emanuel Merck.)

A 15th Century Pharmaceutical Laboratory. From Peters' "Pictorial History of Ancient Pharmacy and Medicine"

¶Perkin (1838-1907), English enthusiast, inspired by Hofmann of the Liebig school, seeks in vain for synthetic quinine and instead obtains the first dye from coal tar. This discovery contributes largely to the development of the chemical industry at the beginning of the 20th Century.

Century of Progress

¶Discovered by Arrhenius and championed by Ostwald is the new theory of electrolytic dissociation which takes rank with Dalton's Atomic Theory and Mendeleeff's Periodic Classification of the Elements in its contribution to the development of chemical progress.

¶The Curies, struggling and dreaming together, discover radioactivity, radium and polonium, and again revolutionize chemistry.

¶The German, Haber, finds a way to make ammonia from the hydrogen and nitrogen of the air. Ammonia, converted into fertilizer, has been a blessing. Converted into nitric acid and the nitric compounds of explosives, it has provided the sinews of modern warfare.

Commentary

¶Industry here and in foreign parts depends upon chemical principles.

¶Coal is no longer merely a fuel. Chemistry has converted it into coke, gas, tar, fuel oils, benzol, solvents, ammonium sulphate, drugs and dyes.

¶Crude petroleum is converted not only into gasoline and lubricating oils, but also into many fine chemicals.

¶Iron becomes steel.

¶Cellulose, most characteristic and most common constituent of plants, is transformed into rayon, gun-cotton and paper.

¶Electricity applied to chemical processes makes possible vast industries never envisioned in the olden days.

¶Chemistry now preserves health, prevents disease, adds to comfort. Chemistry reigns. No obstacle can narrow the horizon of its future. Nature has only begun to reveal herself.

Being a Brief Chronicle of a Maker of Chemicals

Beginnings

¶"Work as if you were to live one hundred years," says Poor Richard.

¶Here is the tale of a house which has worked and lived for nearly three hundred years.

¶On a quiet corner in Darmstadt, Germany, stands the ancient pharmacy "At the Sign of the Angel."

¶There in 1668, Friederich Jacob Merck dusts his shelves of jars and bottles, and ministers to the simple medicinal wants of his neighbors.

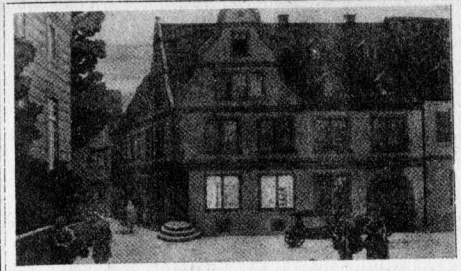
¶In the early 19th Century, Heinrich Emanuel Merck, intimate friend and collaborator of the great chemist, Justus von Liebig, inherits the pharmacy "At the Sign of the Ängel."

¶Encouraged and assisted by Liebig, Heinrich Emanuel Merck expands his interest beyond the pharmacy and founds a factory for the preparation of pure alkaloids. He becomes the first to manufacture morphine, codeine and cocaine on a commercial scale. The enterprise is known as E. Merck.

In America

¶Toward the end of the nineteenth century, George Merck, grandson of Heinrich Emanuel Merck, assumes the management of the company's American branch in New York.

¶Carrying on in a new land the traditions of the old concern, George Merck establishes the entirely independent American house of Merck & Co. His plant at Rahway, N. J., develops rapidly. The quality of its products is recognized by customer and competitor alike.



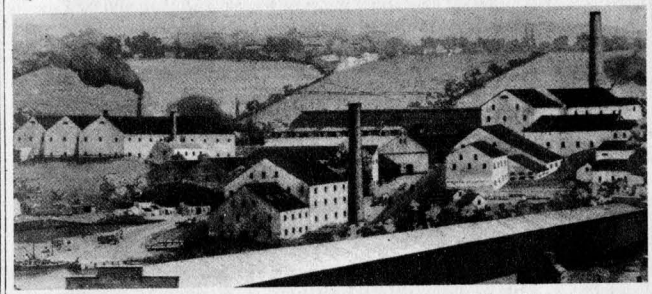
The Darmstadt Pharmacy "At the Sign of the Angel."

¶1818 . . . two chemists on this side of the Atlantic Ocean form the partnership of Farr and Kunzi at Philadelphia, Pa. Farr devotes himself to investigation of the cinchona alkaloids. When the Frenchmen Pelletier and Caventou discover quinine, Farr and Kunzi accomplish its commercial preparation.

¶1857 . . . the firm becomes Powers and Weightman, named for Farr's nephews.

¶1905 . . . Powers and Weightman merge with the fine old chemical firm of Rosengarten & Sons, Inc., forming the Powers-Weightman-Rosengarten Company.

¶1927 . . . George W. Merck and Frederic Rosengarten agree



Chemical Works of Powers and Weightman, About Eighty Years Ago

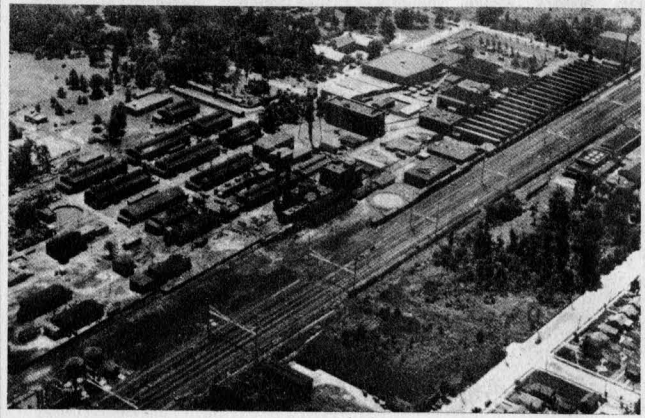
that there are important benefits to be gained by merging their production facilities.

Today

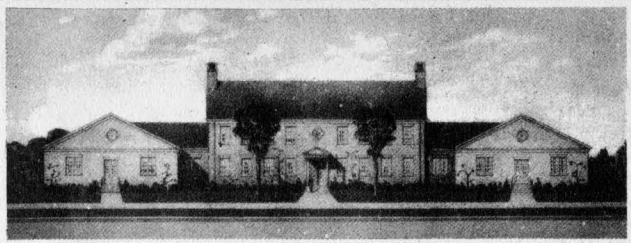
¶ Thus Merck & Co. Inc. comes into being with George W. Merck as president, and Frederic Rosengarten as Chairman of the Board. Behind it are the finest traditions of old and new world science—traditions held in highest respect by the present management—traditions which actively govern the present-day policies of the House of Merck.

¶ Close by the tracks of great railroads, in Rahway and Philadelphia, stand the vast plants housing the dozens of divisions of Merck & Co. Inc., manufacturing chemists.

¶ Here more than a thousand employees are engaged in supplying 3,000 chemicals in various forms to manufacturers, laboratories, physicians, pharmacists, chemists and the general public.

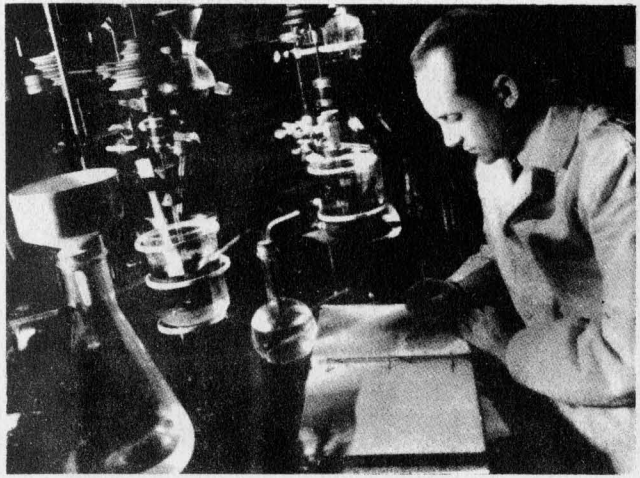


Airplane View of Plant of Merck & Co. Inc., Rahway, N. J.



The Merck Research Laboratory at Rahway

¶ The property at Rahway alone includes more than 150 acres. More than 35 acres are occupied by modern buildings filled with equipment of latest design.



In the Merck Research Laboratory

¶To Merck come raw materials from all parts of the world—crude iodine from Chile, coca leaves from the East Indies, opium from the near East, mercury from Spain, potash from Germany, chalk from England, sulphur from Louisiana, chlorine from Niagara Falls—innumerable materials from far and near places.

¶Research sponsored and carried on in the Merck plants has made many noteworthy contributions in the fields of fine chemicals, medicinals and industrial chemicals.

¶To provide modern facilities for scientific investigations as well as for applied research, the Merck Research Laboratory is established at Rahway—one of the most advanced chemical laboratories in the world. From the humble beginnings of the little pharmacy "At the Sign of the Angel," and the little chemical works in Philadelphia, have risen the huge plants of Merck & Co. Inc., at Rahway, Philadelphia and St. Louis, and of Merck & Co. Limited, in Montreal.

Sublimation of Iodine

Treating of an Exhibit in the Hall of Science

Location

¶In the Century of Progress Exposition, on the ground floor of the great Hall of Science, almost directly below the Basic Science demonstrations, is the exhibit of Merck & Co. Inc.

¶Expressing the achievements of chemistry, the exhibit conforms with the modern architectural theme of the exposition.

¶Units of the Merck exhibit suggest various methods employed in the making of fine chemicals.

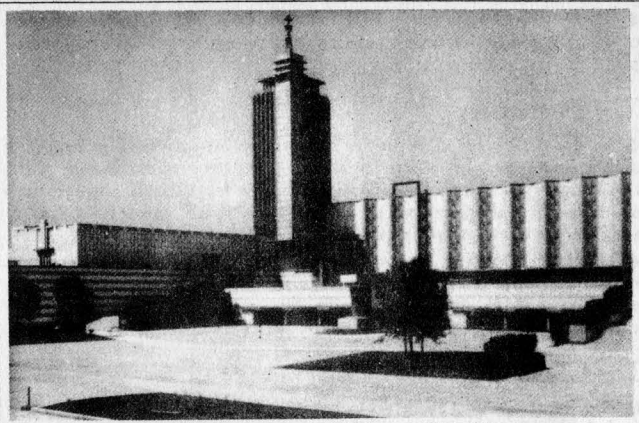
The Iodine Exhibit

¶It is not inappropriate that Iodine, discovered in the ashes of seaweed by the French pharmacist, Courtois, in 1811, should be featured, inasmuch as Merck is the leading producer in this country of Iodine preparations.

¶Heat applied to the crude Iodine in the bottom of a large glass globe causes the Iodine to give off its characteristic violet vapor. When it comes in contact with the cooler walls of the globe, this vapor forms beautiful crystals which adhere to the walls as well as to the rotating spiral.

¶This process, technically known as sublimation, is the first step in the process of manufacturing the many salts of Iodine—the Iodides—such as Potassium Iodide, Sodium Iodide, Iodoform and Ammonium Iodide.

¶Iodine has uses aside from medicine, such as in the photographic arts, and in animal husbandry, where it is employed in rations normally deficient in Iodine. (Iodine Suspensoid Merck and Iodine Vermicide Merck have been found of aid to the poultry raiser in controlling intestinal parasites.)



Hall of Science, Century of Progress Exposition

The Silver Crystal Exhibit

¶ The Silver Crystals formed in a large glass globe, similar to that of the Iodine exhibit, are produced by passing an electric current through a solution of Silver Nitrate.

¶ Silver Nitrate is an important silver salt, which is widely used in making photographic film. It is also utilized extensively in the silvering of mirrors instead of quicksilver. The mirrors surrounding this display are made by the patented Arcoloy process, using Merck's Silver Nitrate.

Chemography

¶ A modern lesson in chemical geography is provided by this revolving map of the world, which locates many world sources of chemicals and drugs. The cut-out pictures set into the map depict scenes typical of the source of many minerals, herbs and agricultural products which later find their way into the production of chemicals.

¶ Lifeless names of unfamiliar chemicals are translated into views of distant countries, each chemical taking on a new significance of pictured interest.

The Pharmacist

¶ At the pharmacy desk in the exhibit, an experienced pharmacist demonstrates the art of his profession in the preparation of pills, the weighing of small quantities of powders, the filling of capsules and the preparation of other types of pharmaceutical products required on prescriptions.

¶ Merck & Co. Inc. manufactures the fine chemicals and drugs which the pharmacist utilizes, as well as many articles which he sells the public, packaged ready for use—such as boric acid, sodium perborate, and other medicine cabinet requisites.

The Chemist

¶ The chemist at the Merck exhibit is engaged in performing varied simple experiments of interest to the layman, yet sufficiently scientific to demonstrate the requirements for purity of chemicals, maintenance of controlled conditions, accuracy in technique and careful observation of results.

¶ The chemicals employed in these experiments are of the Merck Laboratory specifications, which are standard for laboratory work in both academic and industrial use.

The Nososcope

¶ A nososcope is a device for demonstrating visually facts about disease. The Merck Nososcope permits a brief view of a few diseases of general interest, and suggests the constant battle that is waged by science against disease. Chemistry has played an important part in the struggle, and much of the success of the battle is attributable to the close cooperation between chemistry and medicine.

¶ Malaria, syphilis and heart failure, the diseases treated in the Nososcope, are three scourges against which Merck chemicals have battled with unceasing vigor.

Diorama

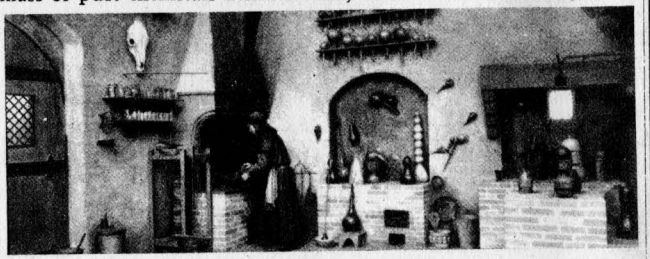
¶ The Diorama of the Merck plant—a three dimensional picture in which the foreground is in modeled perspective—presents the extensive works, offices and laboratories at Rahway, New Jersey.

¶ Adjacent to the diorama are cut-out pictures of the Merck pharmacy in the 17th Century and the old factory of Powers and Weightman built in the 1850's at the East Falls of the Schuylkill near Philadelphia.

¶ The shelves of bottled chemicals on the east and north sides of the exhibit are representative of the extensive list of chemical products manufactured and sold by Merck. Nearly 900 different forms and kinds of chemicals make up this display, yet these are only a small part of the Merck "line," which comprises more than 3,000 different chemicals.

Prismatic Columns

¶ Standing along the west aisle and forming a quiet corner in the exhibit are eight prismatic columns of plate glass and chromium, nine feet high and two feet wide, filled with the most colorful chemicals of Merck manufacture. They suggest something of the mass of pure chemicals utilized today in science and industry.



A 16th Century Alchemist's Laboratory
Diorama Sponsored by Merck & Co. Inc., in the Basic Science Exhibit

INTERNATIONAL ATOMIC WEIGHTS
1933

	Symbol	Atomic Weight
Aluminum	Al	26.97
Antimony	Sb	121.77
Argon	A	39.91
Arsenic	As	74.96
Barium	Ba	137.37
Beryllium	Be	9.02
Bismuth	Bi	209.00
Boron	B	10.82
Bromine	Br	79.916
Cadmium	Cd	112.41
Calcium	Ca	40.07
Carbon	C	12.000
Cerium	Ce	140.25
Cesium	Cs	132.81
Chlorine	Cl	35.457
Chromium	Cr	52.01
Cobalt	Co	58.94
Columbium	Cb	93.1
Copper	Cu	63.57
Dysprosium	Dy	162.52
Erbium	Er	167.7
Europium	Eu	152.0
Fluorine	F	19.00
Gadolinium	Gd	157.26
Gallium	Ga	69.72
Germanium	Ge	72.60
Gold	Au	197.2
Helium	He	4.00
Holmium	Ho	163.4
Hydrogen	H	1.008
Indium	In	114.8
Iodine	I	126.92
Iiridium	Ir	193.1
Iron	Fe	55.84
Krypton	Kr	82.9
Lanthanum	La	138.92
Lead	Pb	207.20
Lithium	Li	6.940
Lutecium	Lu	175.0
Magnesium	Mg	24.32
Manganese	Mn	54.93
Mercury	Hg	200.61

	Symbol	Atomic Weight
Molybdenum	Mo	96.0
Neodymium	Nd	144.27
Neon	Ne	20.2
Nickel	Ni	58.69
Nitrogen	N	14.008
Osmium	Os	190.8
Oxygen	O	16.000
Palladium	Pd	106.7
Phosphorus	P	31.027
Platinum	Pt	195.23
Potassium	K	39.096
Praseodymium	Pr	140.92
Radium	Ra	225.95
Radon	Rn	222.
Rhodium	Rh	102.91
Rubidium	Rb	85.44
Ruthenium	Ru	101.7
Samarium	Sa	150.43
Scandium	Sc	45.10
Selenium	Se	79.2
Silicon	Si	28.06
Silver	Ag	107.880
Sodium	Na	22.997
Strontium	Sr	87.63
Sulphur	S	32.064
Tantalum	Ta	181.5
Tellurium	Te	127.2
Terbium	Tb	159.2
Thallium	Tl	204.39
Thorium	Th	232.15
Thulium	Tm	169.4
Tin	Sn	118.70
Titanium	Ti	48.1
Tungsten	W	184.0
Uranium	U	238.17
Vanadium	V	50.96
Xenon	Xe	130.2
Ytterbium	Yb	173.6
Yttrium	Yt	88.9
Zinc	Zn	65.38
Zirconium	Zr	91.

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CHEMICALS