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History of the Origin of the Chemical Elements and Their Discoverers

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INTRODUCTION

The origin of the chemical elements show a wide diversity with some of these elements having their origin in antiqutiy. Still other elements have been synthesized within the past fifty years via nuclear reactions on heavy elements, because these other elements are unstable and radioactive and do not exist in nature.

The names of the elements come from many sources including mythological concepts or characters; places, areas or countries; properties of the element or its compounds, such as color, smell or its inability to combine; and the names of scientists. There are also some miscellaneous names as well as some obscure names for particular elements.

The claim of discovery of an element has varied over the centuries. Many claims, e.g., the discovery of certain rare earth elements of the lanthanide series, involved the discovery of a mineral ore from which an element was later extracted. The honor of discovery has often been accorded not to the person who first isolated the element but to the person who discovered the original mineral itself, even when the ore was impure and contained many elements. The reason for this is that in the case of these rare earth elements, the "earth" now refers to oxides of a metal not to the metal itself. This fact was not realized at the time of their discovery, until the English chemist Humphry Davy showed that earths were compounds of oxygen and metals in 1808.

In the early discoveries, the atomic weight of an element and spectral analysis of the element were not available. Later both of these elemental properties would be required before discovery of the element would be accepted. In general, the requirements for discovery claims have tightened through the years and claims that were previously accepted would no longer meet the minimum constraints now imposed.

There are cases where the honor of discovery is not given to the first person to actually discover the element but to the first person to claim the discovery in print. If a publication was delayed, the discoverer has often historically been "scooped" by another scientist.

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CONTROVERSIAL ELEMENTS

In recent years, there have been opposing claims, which have taken on a nationalistic rivalry and a fight over when and where an element was "actually discovered" and who has the right to name that element. The International Union of Pure and Applied Chemistry (IUPAC) has taken the position that the name IUPAC proposes for an element carries no implication regarding the priority of the discovery but is merely related to the general usage of a name in the literature. There are elements where the accepted name was proposed on the basis of an erroneous discovery of the element but widespread usage has dictated the continued use of the original name, even after the error has been discovered. Historically, new elements have been proposed and accepted on the basis of evidence that would not meet the criteria of today.

There has been controversy about the first synthesis of a new chemical element in a number of cases over the last thirty-five years. Fortunately, IUPAC in conjunction with the International Union of Pure and Applied Physics (IUPAP) has completed an analysis of these controversial elements and resolved these differences in the past few years. The IUPAC Commission on the Nomenclature of Inorganic Chemistry has assigned names that appear to have been accepted internationally.

In the discussion below, I have relied on the IUPAC/IUPAP document to handle the elements up to the element $Z = 109$. For the higher Z elements above $Z = 109$, the analysis provided is strictly my own due to my reading of the literature. Unless the data in the published literature is later shown to be in error or is subsequently withdrawn by the authors, I do not think there is any controversy at the moment in the recommendatioins that I am making in this document.

INDIVIDUAL ELEMENT NAMES AND HISTORY

The following list is given alphabetically by element name and provides the origin of the names of the elements and information on their discoverers and/or isolaters.

Actinium - the name derives from the Greek, aktis or akinos for "beam or ray" because in equilibrium with its decay products, actinium is a powerful source of alpha radiation. It was originally thought to have been discovered by the French chemist Andre-Louis Debierne in 1899. It was discovered by the German chemist Friedrich Oskar Giesel in 1902, who called it emanium. Although Debierne's preparation actually consisted of two thorium isotopes, ^{227}Th and ^{230}Th, there was confusion in these early discoveries in radioactivity and Debierne's claim prevailed and his name of actinium has been retained to this day.

Aluminum - the name derives from the Latin, alum and alumen for "stringent", since the early Romans called any substance with a stringent taste alum. The element was known in prehistoric times. In 1825, the Danish physicist, Hans Christian Oersted, isolated impure aluminum. The pure metal was first isolated by the German chemist Friedrich Wöhler in 1827.

Americium - the name derives from "America" where it was first synthesized in successive neutron capture reactions in ^{239}Pu in a nuclear reactor in 1944 by American scientists under Glenn T. Seaborg at the University of California lab in Berkeley, California, using the nuclear reaction ^{239}Pu (n, γ) ^{240}Pu (n, γ) $^{241}Pu \Rightarrow \beta^- \Rightarrow {}^{241}Am$. Americium is the sixth element in the Actinide series of elements and is named in analogy to Europium, which is the sixth element in the Lanthanide series of elements.

Antimony - the name derives from the Greek, anti + monos for "not alone or not one" because it was found in many compounds. The chemical symbol, Sb, comes from stibium, which is derived from the Greek stibi for "mark", since it was used for blackening eyebrows and eyelashes. The minerals stibnite (Sb_2S_3) and stibine (Sb_2H_3) are two of more than one hundred mineral species, which were known in the ancient world.

Argon - the name is derived from the Greek argos for "lazy or inactive" because it did not combine with other elements. It was discovered in 1895 by the Scottish chemist William Ramsay and the English physicist Robert John Strutt (Lord Rayleigh) in liquified atmospheric air. Rayleigh's initial interest was generated when he followed up on a problem posed by the English physicist Henry Cavendish in 1785, i.e., when oxygen and nitrogen were removed from air, there was an unknown residual gas remaining.

Arsenic - the name derives from the Latin arsenicium and the Greek arsenikos for "masculine or male", since the ancients thought that metals were different sexes. It was known in prehistoric times for its poisonous sulfides. The German scientist and philosopher, Albert von Bollstadt (Albert the Great/Albertus Magnus) is thought to have obtained the metal around 1250.

Astatine - the name derives from the Greek astatos for "unstable" since it is an unstable element. It was first synthesized by the physicists Dale R. Corson, K. R. Mackenzie and Emilio Segre at the University of California lab in Berkeley, California in 1940 who bombarded bismuth with alpha particles, in the reaction ^{209}Bi (^4He, 2n) ^{211}At.

Barium - the name is derived from the Greek barys for "heavy" since it was found in the mineral heavy spar ($BaSO_4$). It was discovered by the Swedish pharmacist and chemist Carl Wilhelm Scheele in 1774 and first isolated by the British chemist and physicist Humphry Davy in 1808.

Berkelium - the name is derived from Berkeley, the town in California where the element was first synthesized in 1949 by the American scientific team under Glenn T. Seaborg, using the nuclear reaction ^{241}Am (^4He, 2n) ^{243}Bk. It is the eighth element in the Actinide series of the elements and was named in analogy with Terbium (for Ytterby the town in Sweden whose mine produced the ore), which is the eighth element in the Lanthanide series of the elements.

Beryllium - the name derives from the Greek word beryllos for "Beryl" ($3BeO.Al_2O_3.6SiO_2$) the gem-stone in which it is found. It was discovered by the French chemist and pharmacist Nicholas-Louis Vauquelin in beryl and emerald in 1797. The element was first separated in 1828 by the French chemist Antoine-Alexandre-Brutus Bussy and independently by the German chemist Friedrich Wöhler. Since the salts of beryllium have a sweet taste, the element was also known as glucinium from the Greek glykys for "sweet", until IUPAC selected the name beryllium in 1949.

Bismuth - the name derives from the German weisse masse for "white mass" from the color of its oxides. The ancients did not distinquish bismuth from lead. The French chemist Claude-Francois Geoffroy showed that bismuth was distinct from lead in 1753.

Bohrium - the name derives from the Danish physicist Niels Bohr, who developed the theory of the electronic structure of the atom. The first synthesis of this element is credited to the laboratory of the GSI (Center for Heavy-Ion Research) at Darmstadt, Germany in 1981, using the reaction ^{209}Bi (^{54}Cr, n) ^{262}Bh.

Boron - the name derives from the Arabic buraq for "white". Although its compounds were known for thousands of years, it was not isolated until 1808 by the French chemists Louis-Joseph Gay-Lussac and Louis-Jacques Thenard.

Bromine - the name derives from the Greek bromos for "stench or bad odor". It was first prepared by the German chemist Carl Löwig in 1825 but it was first publically announced in 1826 by Balard and so the discovery is therefore credited to the French chemist and pharmacist Antoine-Jérôme Balard.

Cadmium - the name derives from the Greek kadmeia for "calamine (zinc carbonate)" with which it was found as an impurity in nature. It may have been found in furnace flue dust in Thebes, a city in the Boeottia region of central Greece. The mythological king of Phoenicia, Cadmus, founded Thebes and would be a source for the name of the ore. The element was discovered and first isolated by the German physician Friedrich Stromeyer in 1817.

Calcium - the name derives from the Latin calx for "lime (CaO) or limestone ($CaCO_3$)" in which it was found. It was first isolated by the British chemist Humphry Davy in 1808 with help from the Swedish chemist Jöns Jacob Berzelius and the Swedish court physician M.M. af Pontin.

Californium - the name derives from the state and the university of California, where the element was first synthesized. An American scientific team at the University of California lab in Berkeley, California under Glenn T. Seaborg used the nuclear reaction ^{242}Cm (^{4}He, n) ^{245}Cf to first detect the element californium in 1950.

Carbon - the name derives from the Latin carbo for "charcoal". It was known in prehistoric times in the form of charcoal and soot. In 1797, the English chemist Smithson Tennant proved that diamond is pure carbon.

Cerium - the name derives from the planetoid Ceres, which was discovered by the Italian astronomer Guiseppe Piazzi in 1801 and named for Ceres, the Roman goddess of agriculture and harvest. Two years later, the element was discovered in 1803 by the German chemist Martin-Heinrich Klaproth, who called it ochroiterde because of its yellow color. It was independently discovered at the same time by the Swedish chemist Jöns Jacob Bezelius and the Swedish minerologist Wilhelm von Hisinger, who called it ceria. It was first isolated in 1875 by the American mineralogist and chemist William Frances Hillebrand and the American chemist Thomas H. Norton.

Cesium - the name derives from the Latin caesius for "sky blue color", which was the color of the cesium line in the spectroscope. It was discovered by the German chemist Robert Wilhelm Bunsen and the German physicist Gustav Robert Kirchhoff in 1860. It was first isolated by the German chemist Carl Setterberg in 1882.

Chlorine - the name derives from the Greek chloros for "pale green or greenish yellow color" of the element. It was discovered by the Swedish pharmacist and chemist Carl-Wilhelm Scheele in 1774. In 1810, the English chemist Humphry Davy proved it was an element.

Chromium - the name derives from the Greek chroma for "color", from the many colored compounds of chromium. It was discovered in 1797 by the French chemist and pharmacist Nicolas-Louis Vauquelin, who also isolated chromium in 1798.

Cobalt - the name derives from the German kobold for "evil spirits or goblins", who were superstitiously thought to cause trouble for miners, since the mineral contained arsenic which injured their health and the metallic ores did not yield metals when treated with the normal methods. It was discovered in 1735 by the Swedish chemist Georg Brandt.

Copper - the name derives from the Latin Cuprum for "Cyprus", the island where the Romans first obtained copper. The chemical symbol, Cu, also comes from the Latin cuprum. The element has been known since prehistoric times.

Curium - the name derives from "Pierre and Marie Curie", the French physicist and Polish-born French chemist, who discovered radium and polonium. It was first synthesized in 1944 by the American scientists at the University of California lab in Berkeley, California under Glenn T. Seaborg, using the nuclear reaction ^{239}Pu (^{4}He, n) ^{242}Cm. Since it is the ninth member of the actinide series, curium was named in analogy with its homologue the ninth member of the lanthanide series, gadolinium, which had been named after the Finnish rare earth chemist Johan Gadolin.

Dubnium - the name derives from the location of the Russian research center, the Joint Institute for Nuclear Research lab in "Dubna", Russia. The first synthesis of this element is jointly credited to the American scientific team at the University of California in Berkeley, California under Albert Ghiorso and the Russian scientific team at the JINR (Joint Institute for Nuclear Reactions) lab in Dubna, Russia, under Georgi N. Flerov in 1970.

Dysprosium - the name derives from the Greek dysprositos for "hard to get at", due to the difficulty in separating this rare earth element from a holmium mineral in which it was found. It was discovered by the Swiss chemist Marc Delafontaine in the mineral samarskite in 1878 and called philippia. Philippia was subsequently thought to be a mixture of terbium and yttrium. It was later rediscovered in a holmium sample by the French chemist Paul-Emile Lecoq de Boisbaudron in 1886, who was then credited with the discovery. It was first isolated by the French chemist George Urbain in 1906.

Einsteinium - the name derives from "Albert Einstein", the German born physicist who proposed the theory of relativity. A collaboration of American scientists from the Argonne National Laboratory near Chicago, Illinois, the Los Alamos Scientific Laboratory in Los Alamos, New Mexico and at the University of California lab in Berkeley, California first found ^{252}Es in the debris of thermonuclear weapons in 1952.

Element 110 - no name has been proposed or accepted by IUPAC for element 110. This element was first synthesized in a November 1994 experiment by a multi-national team of scientists working at the Gesellschaft für Schwerionenforschung (GSI) in Darmstadt, Germany. The scientific teams were from the GSI (Heavy Ion Research Center), Darmstadt, the Joint Institute for Nuclear Research (JINR), Dubna, Russia, Comenius University, Bratislava, Slovakia and the University of Jyväskylä, Finland. They used the nuclear reaction ^{208}Pb (^{62}Ni, n) ^{269}110.

Element 111 - no name has been proposed or accepted by IUPAC for element 111. This element was first synthesized in a December 1994 experiment by a multi-national team of scientists working at the GSI (Heavy Ion Research Center) in Darmstadt, Germany. The scientific teams were from GSI, Darmstadt, Germany, JINR, Dubna, Russia, the Comenius University in Bratislava, Slovakia and the University of Jyväskylä, Finland. They used the nuclear reaction ^{209}Bi (^{64}Ni, n) ^{271}111.

Element 112 - no name has been proposed or accepted by IUPAC for element 112. This element was first synthesized in a February 1996 experiment by a multi-national team of scientists working at the GSI (Heavy Ion Research Center) in Darmstadt, Germany. The scientific teams were from GSI, Darmstatdt, the Joint Institute for Nuclear Resedarch (JINR), Dubna, Russia, the Comenius University in Bratislava, Slovakia and the University of Jyväskylä, Finland. The teams used the nuclear reaction ^{208}Pb (^{70}Zn, n) ^{277}112.

Element 114 - no name has been proposed or accepted by IUPAC for element 114. This element was first synthesized in a November-December 1998 experiment by a multi-national team of scientists working at the Joint Institute for Nuclear Research (JINR), Dubna, Russia. The scientific teams were from JINR and the Lawrence Livermore Laboratory in Livermore, California, USA. The teams used the nuclear reaction ^{244}Pu (^{48}Ca, 3n) ^{289}114.

Element 116 - no name has been proposed or accepted by IUPAC for element 116. This element was first synthesized in an April 1999 experiment at the Lawrence Berkeley Laboratory (LBL) in Berkeley, California, USA by a group of American scientists from LBL, University of California at Berkeley and Oregon State University in Corvallis, Oregon. The group used the nuclear reaction ^{208}Pb (^{86}Kr, n) $^{293}118$. The $^{293}118$ decayed into $^{289}116$ via alpha decay.

Element 118 - no name has been proposed or accepted by IUPAC for element 118. This element was first synthesized in an April 1999 experiment at the Lawrence Berkeley Laboratory (LBL) in Berkeley, California, USA by a group of American scientists from LBL, University of California at Berkeley and Oregon State University in Corvallis, Oregon. The group used the nuclear reaction ^{208}Pb (^{86}Kr, n) $^{293}118$.

Erbium - the name derives from the Swedish town of "Ytterby", where the ore gadolinite (in which it was found) was first mined. It was discovered by the Swedish surgeon and chemist Carl-Gustav Mosander in 1843 in an yttrium sample. He separated the yttrium into yttrium, a rose colored salt he called terbium and a deep yellow peroxide that he called erbium. In 1860, an analysis of yttrium by the German chemist Berlin found only the yttrium and the rose colored salt, which was now called erbium not terbium. All subsequent workers followed Berlin in designating the rose colored earth as erbium.

Europium - the name derives from the continent of "Europe". It was separated from the mineral samaria in magnesium-samarium nitrate by the French chemist Eugène-Anatole Demarçay in 1896. It was also first isolated by Demarcay in 1901.

Fermium - the name derives from the Italian born physicist "Enrico Fermi", who built the first man made nuclear reactor. The nuclide ^{255}Fm was found in the debris of a thermonuclear weapon's explosion in 1952 by a collaboration of American scientists from the Argonne National Laboratory near Chicago, Illinois, the Los Alamos Scientific Laboratory in Los Alamos, New Mexico and the University of California lab at Berkeley, California.

Fluorine - the name derives from the Latin fluere for "flow or flux" since fluorspar (CaF_2) was used as a flux in metallurgy because of its low melting point. It was discovered in hydrofluoric acid by the Swedish pharmacist and chemist Carl-Wilhelm Scheele in 1771 but it was not isolated until 1886 by the French pharmacist and chemist Ferdinand-Frederic-Henri Moisson.

Francium - the name derives from the country "France", where the French physicist Marguerite Perey from the Curie Institute in Paris, France discovered it in 1939 in the alpha particle decay of actinium, $^{227}Ac \Rightarrow {}^{4}He \Rightarrow {}^{223}Fr$. (21.8 minute half-life).

Gadolinium - the name derives from the mineral gadolinite, in which it was found, and which had been named for the Finnish rare earth chemist "Johan Gadolin". It was discovered by the Swiss chemist Jean-Charles Galissard de Marignac in 1886, who produced a white oxide he called Y_α in a samarskite mineral. In 1886, the French chemist Paul-Emile Lecoq de Boisbaudran gave the name gadolinium to Y_α.

Gallium - the name derives from the Latin gallia for "France" or perhaps from the Latin gallus for "le coq or cock", since it was discovered in zinc blende by the French chemist Paul-Emile Lecoq de Boisbaudan in 1875. It was first isolated in 1878 by Lecoq de Boisbaudran and the French chemist Émile-Clément Jungflesch.

Germanium - the name derives from the Latin germania for "Germany". It was discovered and isolated by the German chemist, Clemens-Alexander Winkler in 1886 in the mineral argyrodite ($GeS_2.4Ag_2S$).

Gold - the name derives from the Sanskit jval to shine, the Teutonic word gulth for shining metal and the Anglo-Saxon gold of unknown origin. The chemical symbol Au derives from the Latin aurum, for Aurora the Goddess of dawn. It was known and highly valued in prehistoric times.

Hafnium - the name derives from the Latin hafnia for "Copenhagen". An element named celtium was erroneously claimed to have been discovered in 1911 by the French chemist George Urbain in rare earth samples, until the Danish physicist Nils Bohr, predicted hafnium's properties using his theory of electronic configuration of the elements. Bohr argued that hafnium would not be a rare earth element but would be found in zirconium ore. It was discovered by the Dutch physicist Dirk Coster and the Hungarian physicist Georg von Hevesy in 1923, while working at Bohr's institute in Copenhagen, Denmark.

Helium - the name derives from the Greek helios for "sun". The element was discovered by spectroscopy during a solar eclipse in the sun's chromosphere by the French astronomer Pierre-Jules-Cesar Janssen in 1868. It was independently discovered and named helium by the English astronomer Joseph Norman Lockyer. It was thought to be only a solar constituent until it was later found to be identical to the helium in the uranium ore cleveite by the Scottish chemist William Ramsay in 1895. Ramsay originally called his gas kypton, until it was identified as helium. The Swedish chemists Per Theodore Cleve and Nils Abraham Langet independently found helium in cleveite at about the same time.

Hassium - the name derives from the Latin Hassia for the German "state of Hesse", whose former capital was Darmstadt. The element was first synthesized by German physicists at the GSI (Center for Heavy-Ion Research) Lab at Darmstadt, Germany in 1984 using the nuclear reaction ^{208}Pb (^{58}Fe, n) ^{265}Hs.

Holmium - the name derives from the Latin holmia for "Stockholm". It was discovered in erbia earth by the Swiss chemist J. L. Soret in 1878, who referred to it as element X. It was later independently discovered by the Swedish chemist Per Theodor Cleve in 1879. It was first isolated in 1911 by Holmberg, who proposed the name holmium either to recognize the discoverer Per Cleve, who was from Stockholm or perhaps to establish his own name in history.

Hydrogen - the name derives from the Greek hydro for "water" and genes for "forming", since it burned in air to form water. It was discovered by the English physicist Henry Cavendish in 1766.

Indium - the name derives from indigo for the "indigo-blue" line in the element's spark spectrum. It was discovered in 1863 by the German physicist Ferdinand Reich and the German metallurgist Hieronymus Theodor Richter, while examining zinc blende. They isolated indium in 1867.

Iodine - the name derives from the Greek iodes for "violet" because of its violet vapors. It was discovered in sea weed by the French chemist Bernard Courtois in 1811. It was named by the French chemist Louis-Joseph Gay-Lussac, when he proved it was an element in 1814.

Iridium - the name derives from the Latin Iris, the greek goddess of rainbows because of the "variety of colors in the element's salt solutions". Iridium and osmium were both discovered in a crude platinum ore in 1803 by the English chemist Smithson Tennant. Iridium was discovered independently by the French chemist H. V. Collet-Descotils also in 1803. Descotils actually published one month before Tennant but Tennent is given credit for the discovery, perhaps because he alone also found osmium in the ore.

Iron - the name derives from the Anglo-Saxon "iron" of unknown origin. The element has been known from prehistoric times. The chemical symbol Fe is derived from the Latin ferrum for "firmness".

Krypton - the name derives from the Greek kryptos for "concealed or hidden". It was discovered in liquified atmospheric air by the Scottish chemist William Ramsay and the English chemist Morris William Travers in 1898.

Lanthanum - the name derives from the Greek lanthanein for "to be hidden or to escape notice" because it hid in cerium ore and was difficult to separate from that rare earth mineral. It was discovered by the Swedish surgeon and chemist Carl-Gustav Mosander in 1839. In 1842, Mosander separated his lanthanium sample into two oxides; for one of these he retained the name lanthanum and for the other he gave the name didymium (or twin).

Lawrencium - the name derives from the American physicist "Ernest O. Lawrence", who developed the cyclotron. Credit for the first synthesis of this element in 1971 is given jointly to American chemists from the University of California laboratory in Berkeley, California under Albert Ghiorso and the Russian scientific team at the JINR (Joint Institute for Nuclear Reactions) lab in Dubna, Russia under Georgi N. Flerov, after a series of preliminary papers presented over a decade.

Lead - the name derives from the Angol-Saxon lead, which is of unknown origin. The element was known from prehistoric times. The chemical symbol Pb is derived from the Latin plumbum for "lead".

Lithium - the name derives from the Latin lithos for "stone" because lithium was thought to exist only in minerals at that time. It was discovered by the Swedish mineralogist Johan August Arfwedson in 1818 in the mineral petalite $LiAl(Si_2O_5)_2$. It was isolated in 1855 by the German chemist Robert Wilhelm Bunsen and Augustus Matthiessen.

Lutetium - the name derives from lutetia, the ancient name for the city of "Paris". The discovery is credited to the French chemist George Urbain in 1907 although it had been separated earlier and independently by the Austrian chemist Carl Auer von Welsbach from an ytterbium sample. Von Welsbach had named the element cassiopeium after the constellation "Cassiopeia". However since Urbain published his results before Auer, his name for the element has been adopted by IUPAC in 1949.

Magnesium - the name derives from magnesia, a district in the northeastern region of Greece called Thessalia. The Scottish chemist Joseph Black recognized it as a separate element in 1755, In 1808, the English chemist Humphry Davy obtained the impure metal and in 1831 the French pharmacist and chemist Antoine-Alexandre Brutus Bussy isolated the metal in the pure state.

Manganese - the name derives from the Latin magnes for "magnet" since pyrolusite (MnO_2) has magnetic properties. It was discovered by the Swedish pharmacist and chemist Carl-Wilhelm Scheele in 1774. Also in 1774, the Swedish chemist Johan Gottlieb Gahn first isolated the metal.

Meitnerium - the name derives from the Austrian physicist "Lise Meitner", who had discovered the element, protactinium. The first synthesis of the element Meitnerium is credited to German physicists from the GSI (Center for Heavy-Ion Research) lab at Darmstadt, Germany under Gunther Munzenberg, in 1982 using the nuclear reaction ^{209}Bi (^{58}Fe, n) ^{266}Mt.

Mendelevium - the name derives from the Russian chemist "Dimitrii Mendeleev" who developed the Periodic Table of the chemical elements. Credit for the first synthesis of this element is given American chemists at the University of California lab in Berkeley, California under Glenn T. Seaborg in 1958, who used the nuclear reaction ^{253}Es (^{4}He, 2n) ^{255}Md and the nuclear reaction ^{253}Es (^{4}He, n) ^{256}Md.

Mercury - the name derives from the Roman god "Mercury", the nimble messenger of the gods, since the ancients used that name for the element, which was known from prehistoric times. The chemical symbol, Hg, derives from the Greek hydragyrium for "liquid silver" or quick silver.

Molybdenum - the name derives from the Greek molybdos for "lead". The ancients used the term lead for any black mineral which leaves a mark on paper. It was discovered by the Swedish pharmacist and chemist Carl Wilhelm Scheele in 1778. It was first isolated by the Swedish chemist Peter-Jacob Hjelm in 1781.

Neodymium - the name derives from the Greek neos for "new" and didymos for "twin". It was discovered by the Swedish surgeon and chemist Carl Gustav Mosander in 1841 , who called it didymium (or twin) because of its similarity to lanthanium which he had previously discovered two years earlier. In 1885, the Austrian chemist Carl Auer von Welsbach separated didymium into two elements. One of which he called neodymium (or new twin).

Neon - the name derives from the Greek neos for "new". It was discovered from its bright red spectral lines by the Scottish chemist William Ramsay and the English chemist Morris William Travers in 1898 from a liquified air sample.

Neptunium - the name derives from the planet "Neptune" (the Roman god of the sea), since it is the next outer-most planet beyond the planet uranus in the solar system and this element is the next one beyond uranium in the periodic table.It was first synthesized by Edwin M. McMillan and Philip H. Abelson in 1940 via the nuclear reaction $^{238}U(n, \gamma)\ ^{239}U \Rightarrow \beta^{-} \Rightarrow\ ^{239}Np$.

Nickel - the name derives from the German nickel for "deceptive little spirit", since miners called mineral niccolite (NiAs) by the name kupfernickel (false copper) because it resembled copper ores in appearance but no copper was found in the ore. It was discovered by the Swedish metallurgist Axel-Fredrik Cronstedt in 1751.

Niobium - the name derives from the Greek mythological character "Niobe", who was the daughter of Tantalus (see the element tantalum), since the elements niobium and tantalum were originally thought to be identical elements. Niobium was discovered in a black mineral from America called columbite by the British chemist and manufacturer Charles Hatchett in 1801 and he called the element columbium. In 1809, the English chemist William Hyde Wollaston claimed that columbium and tantalum were identical. Forty years later, the German chemist and pharmacist, Heinrich Rose, determined that they were two different elements in 1846 and gave the name niobium because it was so difficult to distinguish it from tantalum. Finally, in 1866, the Swiss chemist Jean-Charles Galissard de Marignac separated these elements. The name columbium continued to be used in America and niobium in Europe until IUPAC adopted the name niobium in 1949. Niobium was first isolated by the chemist C. W. Blomstrand in 1846.

Nitrogen - the name derives from the Latin nitrum and Greek nitron for "native soda" and genes for "forming". It was discovered by the Scottish physician and chemist Daniel Rutherford in 1772.

Nobelium - the name derives from "Alfred Nobel", the discoverer of dynamite and founder of the Nobel prizes. It was first synthesized in 1966 by the Russian scientists from the JINR (Joint Institute for Nuclear Research) lab in Dubna, Russia under Georgi Flerov. Earlier claims to have synthesized "Nobelium" beginning in 1957 were shown to be erroneous but the original name was retained because of its widespread use throughout the scientific literature.

Osmium - the name derives from the Greek osme for "smell" because of the sharp odor of the volatile oxide. Both osmium and iridium were discovered simultaneously in a crude platinum ore by the English chemist Smithson Tennant in 1803.

Oxygen - the name derives from the Greek oxys for "acid" and genes for "forming", since the French chemist Antoine-Laurent Lavoisier originally thought that oxygen was an acid producer because burning phosphorus and sulfur and dissolving them in water produced acids. Oxygen was discovered independently by the Swedish pharmacist and chemist Carl-Wilhelm Scheele in 1771 and the English clergman and chemist Joseph Priestly in 1774. Scheele's "Chemical Treatise on Air and Fire" was delayed in publication until 1777, so Priestly is credited with the discovery, since he published first.

Palladium - the name derives from the second largest asteroid of the solar system Pallas (named after the goddess of wisdom and arts - Pallas Athene). The element was discovered by the English chemist and physicist William Hyde Wollaston in 1803, one year after the discovery of Pallas by the German astronomer H. W. M. Olbers in 1802. The discovery was originally published anonymously by Wollaston to obtain priority, while not disclosing any details about his preparation.

Phosphorus - the name derives from the Greek phosphoros for "bringing light", since it has the property of glowing in the dark. This was also the ancient name for the planet Venus, when it appears before sunrise. It was discovered by the German merchant Hennig Brand in 1669.

Platinum - the name derives from the Spanish platina for "silver". In 1735, the Spanish mathematician Don Antonio de Ulloa found platinum in Peru, South America. In 1741, the English metallurgist Charles Wood found platinum from Columbia, South America. In 1750, the English physician William Brownrigg prepared purified platinum metal.

Plutonium - the name derives from the planet Pluto, (the Roman god of the underworld). Pluto was selected because it is the next planet in the solar system beyond the planet Neptune and the element plutonium is the next element in the period table beyond neptunium. It was first synthesized in 1940 by Glenn T. Seaborg, Edwin M. McMillan, Joseph W. Kennedy and Arthur C. Wahl in the nuclear reaction $^{238}U(\,^{2}H, 2n)\,^{238}Np \Rightarrow \beta^{-} \Rightarrow {}^{238}Pu$.

Polonium - the name derives from "Poland", the native country of Marie Sklodowska Curie. It was discovered by Pierre and Marie Curie in 1898, from its radioactivity. It was independently found by the German chemist Willy Marckwald in 1902 and called radio-tellurium.

Potassium - the name derives from the English "potash or pot ashes" since it is found in caustic potash (KOH). The chemical symbol K derives from the Latin kalium via the Arabic qali for alkali. It was first isolated by Humphry Davy in 1807 from electrolyosis of potash (KOH).

Praseodymium - the name derives from the Greek prasios for "green" and didymos for "twin" because of the pale green salts it forms. It was discovered by the Austrian chemist Carl Auer von Welsbach in 1885, who separated it and the element neodymium from a didymium sample. Didymium had previously been thought to be a separate element.

Promethium - the name derives from "Prometheus" who stole fire from heaven and gave it to the human race, since it was found by the harnessing of nuclear energy which also provides a dangerous threat of punishment. It was first synthesized in fission products from the the thermal neutron fission of ^{235}U at the Clinton (later Oak Ridge National Laboratory) lab by the American chemists, J. A. Marinsky, L. E. Glendenin and Charles D. Coryell in 1947, using chemical separation by ion exchange chromotography. The fission products, ^{147}Pm and ^{149}Pm were also identified in the slow neutron activation of neodymium.

Protactinium - the name derives from the Greek protos for "first" and actinium, since it was found to be the parent of actinium. An isotope of protactinium, ^{234}Pa, was first identified by the German chemists Kasimir Fajans and O. H. Göhring in 1913. They named the element "Brevium" because of its short half-life. The longer half-lived isotope, ^{231}Pa, was identified by the German chemist Otto Hahn and the Austrian physicist Lise Meitner in 1918, while Hahn was away in military service. It was first isolated by the German chemist Aristid V. Grosse in 1927. Actinium was accepted as the name for the element because it was preferred to use the name of the longer-lived isotope.

Radium - the name derives from the Latin radius for "beam or ray" because of its tremendous ray-emitting power. It was discovered by the French physicist Pierre Curie and the Polish-born, French chemist Marie Sklodowska Curie in 1898. It was independently discovered by the British chemists Frederick Soddy and John A. Cranston. It was first isolated in 1910 by Marie Curie and the French chemist Andre-Louis Debierne.

Radon - the name derives from radium. It had first been called radium emanation or niton (Latin for shining). It was discovered in 1900 by the German chemist Friedrich Ernst Dorn and it was first isolated in 1910 by the Scottish chemist William Ramsay and the English chemist Robert Whytlaw-Gray.

Rhenium - the name derives from the Latin rhenus for "the Rhine in Germany". It was discovered by x-ray spectroscopy in 1925 by the German chemists, Walter Noddack, Ida Tacke and Otto Berg.

Rhodium - the name derives from the Greek rhodon for rose because of the "rose color of dilute solutions of its salts". It was discovered by the English chemist and physicist William Hyde Wollaston in 1803 in a crude platinum ore.

Rubidium - tha name derives from the Latin rubidus for deepest red because of the two "deep red lines" in its spectra. It was discovered in the mineral lepidolite by the German chemist Robert Wilhelm Bunsen and the German physicist Gustav-Robert Kirchoff in 1861. Bunsen isolated rubidium in 1863.

Ruthenium - the name derives from the Latin ruthenia for the "old name of Russia". It was discovered in a crude platinum ore by the Russian chemist Gottfried Wilhelm Osann in 1828. Osann thought that he had found three new metals in the sample, pluranium, ruthenium and polinium. In 1844 the Russian chemist Karl Karlovich Klaus was able to show that Osann's mistake was due to the impurity of the sample but Klaus was able to isolate the ruthenium metal.

Rutherfordium - the name derives from the English physicist "Ernest Rutherford" who won the Nobel prize for developing the theory of radioactive transformations. Credit for the first synthesis of this element is jointly shared by American scientist at the University of California lab in Berkeley, California under Albert Ghiorso and by Russian scientists at the JINR (Joint Institute for Nuclear Reactions) lab in Dubna, Russia under Georgi N. Flerov.

Samarium - the name derives from the mineral Samarskite, in which it was found and which had been named for "Colonel Samarski", a Russian mine official. It was originally discovered in 1878 by the Swiss chemist Marc Delafontaine, who called it decipium. It was also discovered by the French chemist Paul-Emile Lecoq de Boisbaudran in 1879. In 1881, Delafontaine determined that his decipium could be resolved into two elements, one of which was identical to Boisbaudran's samarium. In 1901, the French chemist Eugene-Anatole Demarçay showed that this samarium earth also contained europium.

Scandium - the name derives from the Latin scandia for "Scandinavia", where the mineral were found. It was discovered by the Swedish chemist Lars-Fredrik Nilson in 1879 from an ytterbium sample. In the same year, the Swedish chemist Per Theodore Cleve proved that scandium was Mendeleev's hypothetical element "eka-boron".

Seaborgium - the name derives from the American chemist "Glenn Theodore Seaborg", who led a team that first synthesized a number of transuranium elements. The element Seaborgium was first synthesized by American scientists from the University of California lab in Berkeley, California under Albert Ghiorso, who used the nuclear reaction ^{249}Cf (^{18}O, 4n) ^{263}Sg.

Selenium - the name derives from the Greek Selene, who was the Greek goddess of the moon because the element is chemically found with tellurium (Tellus - the Roman goddess of the earth). It was discovered by the Swedish chemist Jöns Jacob Berzelius in 1817, while trying to isolate tellurium in an impure sample.

Silicon - the name derives from the Latin silex and silicis for "flint". Amorphous silicon was discovered by the Swedish chemist Jöns Jacob Berzelius in 1824. Crystalline silicon was first prepared by the French chemist Henri Sainte-Claire Deville in 1854.

Silver - the name derives from the Anglo-Saxon seofor and siolfur, which is of unknown origin. The chemical symbol, Ag, derives from the Latin argentum and Sanskrit argunas for "bright". The element was known in prehistoric times.

Sodium - the name derives from the English soda and Latin sodanum for "headache remedy". The chemical symbol Na derives from the Latin natrium for "natron (soda in english)". It was discovered in 1807 by the English chemist Humphry Davy from electrolyosis of caustic soda (NaOH).

Strontium - the name derives from Strontian, "a town in Scotland". The mineral strontianite is found in mines in Strontian. The element was discovered by the Scottish chemist and physician Thomas Charles Hope in 1792 observing the brilliant red flame color of strontium. It was first isolated by the English chemist Humphry Davy in 1808.

Sulfur - the name derives from the Latin sulphurium and the Sanskrit sulveri. Sulfur was known as brenne stone for "combustible stone" from which brim-stone is derived. It was known from prehistoric times and thought to contain hydrogen and oxygen. In 1809, the French chemists, Louis-Joseph Gay-Lussac and Louis-Jacques Thenard proved the elemental nature of sulfur.

Tantalum - the name derives from the Greek "Tantalus", for the mythological character who was banished to Hades, the region of lost souls where he was placed up to his chin in water, which receded whenever he tried to drink it and under branches of fruit, which drew back whenever he tried to pick their fruit. This name was selected because of the insoluability of tantalum in acids, thus when placed in the midst of acids it is incapable of taking any of them up. It was discovered by the Swedish chemist and mineralogist Anders-Gustav Ekeberg in 1802 (see Niobium).

Technetium - the name derives from the Greek technetos for "artificial". It was first synthesized in 1937 by Italian physicists C. Perrier and Emilio Segre from the Royal University of Palermo in a molybdenum sample bombarded with deuterons (^{2}H) to produce 6 hour ^{99m}Tc.

Tellurium - the name derives from the Latin Tellus, who was the "Roman goddess of the earth". It was discovered by the Roumanian mine director Franz Joseph Müller von Reichenstein in 1782 and overlooked for fifteen years until it was first isolated by German chemist Martin-Heinrich Klaproth in 1798. The Hungarian chemist Paul Kitaibel independently discovered tellurium in 1789, prior to Klaproth's work but after von Reichenstein.

Terbium - the name derives from the "village of Ytterby" in Sweden, where the mineral ytterbite (the source of terbium) was first found. It was discovered by the Swedish surgeon and chemist Carl-Gustav Mosander in 1843 in an yttrium salt, which he resolved into three elements. He called one yttrium, a rose colored salt he called terbium and a deep yellow peroxide he called erbium. The chemist Berlin detected only two earths in yttrium, i.e., yttrium and the rose colored oxide he called erbium. In 1862, the Swiss chemist Marc Delafontaine reexamined yttrium and found the yellow peroxide. Since the name erbium had now been assigned to the rose colored oxide, he reintroduced the name terbium for the yellow peroxide. Thus the original names given to erbium and terbium samples are now switched.

Thallium - the name derives from the Greek thallos for "green shoot or twig" because of the bright green line in its spectrum. It was discovered by the English physicist and chemist William Crookes in 1861. The metal was first isolated by the French chemist Claude-Auguste Lamy in 1862.

Thorium - the name derives from Thor, the "Scandanavian god of thunder". It was discovered in the mineral thorite ($ThSiO_4$) by the Swedish chemist Jöns Jacob Berzelius in 1828. It was first isolated by the chemists D. Lely Jr. and L. Hamburger in 1914.

Thulium - the name derives from Thule, the earliest name for the northern most part of the civilized world - "Scandanavia (Norway, Sweden and Iceland)". It was discovered in 1879 by the Swedish chemist Per Theodor Cleve in a sample of erbium mineral. It was first isolated by the American chemist Charles James in 1911.

Tin - the name derives from the Anglo-Saxon tin of unknown origin. The chemical symbol, Sn, is derived from the Latin stannum for alloys containing lead. The element was known in prehistoric times.

Titanium - the name derives from the Latin titans, who were the mythological "first sons of the earth". It was originally discovered by the English clergyman William Gregor in the mineral ilmenite ($FeTiO_3$) in 1791. He called this iron titanite menachanite for the Menachan parish where it was found and the element menachin. It was rediscovered in 1795 by the German chemist Martin Heinrich Klaproth, who called it titanium because it had no characteristic properties to use as a name. Titanium metal was first isolated by the Swedish chemists Sven Otto Pettersson and Lars Fredrik Nilson.

Tungsten - the name derives from the Swedish tung sten for "heavy stone". The chemical symbol, W, derives from the German wolfram, which was found with tin and interferred with the smelting of tin. It was said to eat up tin like a wolf eats up sheep. The element was discovered by the Swedish pharmacist and chemist Carl-Wilhelm Scheele in 1781. Tungsten metal was first isolated by the Spanish chemists Don Fausto d'Elhuyar and his brother Don Juan Jose d'Elhuyar in 1783.

Uranium - the name derives from the planet Uranus, which in Roman mythology was "Father Heaven". The German chemist Martin-Heinrich Klaproth discovered the element in 1789, following the German/English astronomer William Hershel's discovery of the planet in 1781. The metal was first isolated by the French chemist Eugène-Melchior Peligot in 1841.

Vanadium - the name derives from the "Scandanavian goddess of love and beauty", Freyja Vanadis, because of its many beautiful multicolored compounds. It was discovered by the Swedish physician and chemist Nils-Gabriel Sefström in 1830. It had originally been discovered by the Spanish mineralogist Andres Manuel del Rio y Fernandez in 1801, who named it erythronium, after the plant of that name whose flowers have many beautiful colors. Del Rio later decided that it was really chromium in his lead sample. Vanadium metal was first isolated by the English chemist Henry Enfield Roscoe in 1869.

Xenon - the name derives from the Greek xenos for "the stranger". It was discovered by the Scottish chemist William Ramsay and the English chemist Morris William Travers in 1898 in a liquified air sample.

Ytterbium - the name derives from the "Swedish village of Ytterby", where the mineral ytterbite (the source of ytterbium) was originally found. It was discovered by the Swiss chemist Jean-Charles Galissard de Marignac in 1878 in erbium nitrate from gadolinite (ytterbite renamed).

Yttrium - the name derives from the "Swedish village of Ytterby", where the mineral gadolinite was found. In 1794, the Finnish chemist Johan Gadolin discovered yttrium in the mineral ytterbite, which was later renamed gadolinite for Gadolin. Gadolin originally called the element ytterbium after ytterbite. The name was subsequently shortened to yttrium and later another element was given the name ytterbium. The Swedish surgeon and chemist Carl-Gustav Mosander separated the element in 1843.

Zinc - the name derives from the German zink of unknown origin. It was first used in prehistoric times, where its compounds were used for healing wounds and sore eyes and for making brass. It was recognized as a metal as early as 1374.

Zirconium - the name derives from the Arabic zargun for "gold-like". It was discovered in zirconia by the German chemist Martin-Heinrich Klaproth in 1789. Zirconium was first isolated by the Swedish chemist Jöns Jacob Berzelius in 1824 in an impure state and finally by the chemists D. Lely Jr. and L. Hamburger in a pure state in 1914.

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