

Timeline: The Discovery of Elements

Assigning credit for the discovery of a new element is often a difficult and complicated process. First, many elements were in use well before recorded history. In some cases, these elements were known in the form of their compounds, but not as pure elements. Elements that fall into this category include carbon, copper, gold, iron, lead, mercury, silver, sulfur, tin, and, perhaps, zinc.

In addition, the discovery of an element has seldom been a single, clear-cut event that occurs in such a way that everyone agrees that “X” should receive credit for discovering the element. Instead, the first step in the process of discovery is often the recognition that a new substance has been found—a new mineral, rock, compound, or other material—that has properties different from anything previously known. This discovery may lead a chemist (or a number of chemists) to suspect the existence of a new element.

The next step may be to isolate the element, either in its pure form or, more commonly, as a compound, such as the oxide or sulfide of the new element. Finally, someone is able to prepare a pure sample of the element, which the world then sees for the first time. An example of this sequence of events can be seen in the elements that make up groups 1 and 2 of the periodic table. Most of those elements were known in one form or another for centuries. But it was not until the early 1800s that Sir Humphry Davy found a method for isolating the pure elements from their oxides.

The process becomes even more complicated when a truly new element is discovered which, sometime later, is found not to be a single element, but a mixture of two or more new elements. The story of the discovery of the rare earth elements is probably the best example of this process.

This sequence of events often takes place over an extended period of time, many years or even decades. For that reason, assigning a specific date to the discovery of an element can also be difficult. Does one choose the date and person when a new compound of the element is discovered, when the pure element itself is prepared, when the discoverer publicly announces his or her discovery, or when official confirmation of the discovery is announced?

For all these reasons, the dates and names listed below must be considered as somewhat ambiguous. For more detailed information about the discovery of each element, the reader should refer to the entry for that element in the main body of this set of books.

About 800 CE Persian natural philosopher Abu Musa Jābir ibn Hayyān al azdi (better known as Geber) is credited with discovering **antimony**, **arsenic**, and **bismuth**.

About 800 CE Indian metallurgist Rasaratna Samuchaya is perhaps the first person to recognize **zinc** as an element.

1250 German natural philosopher Albertus Magnus is credited as being the first European to discover **arsenic**.

About 1450 The apocryphal Basilius Valentinus (Basil Valentine) is the first European to mention elemental **antimony** and **bismuth**.

1526 Swiss physician Aureoleus Phillipus Theostratus Bombastus von Hohenheim (Paracelsus) is acknowledged as the modern discoverer of **zinc**.

1669 German physician Hennig Brand discovers **phosphorus**.

1735 Swedish chemist Georg Brandt discovers **cobalt**.

1735–1748 Spanish military Leader Don Antonio de Ulloa discovers **platinum**.

1751 Swedish mineralogist Axel Fredrik Cronstedt discovers **nickel**.

1755 Scottish physician and chemist Joseph Black recognizes the presence of a new element in magnesia alba, later found to be **magnesium**.

1766 English chemist and physicist Henry Cavendish discovers **hydrogen**.

- 1771 Swedish chemist Carl Wilhelm Scheele discovers **oxygen**, but does not publish his discovery until 1777.
- 1772 Scottish physician and chemist Daniel Rutherford discovers **nitrogen**.
- 1774 Swedish chemist Carl Wilhelm Scheele discovers **chlorine**.
- 1774 Swedish mineralogist Johann Gottlieb Gahn discovers **manganese**.
- 1774 English chemist Joseph Priestley discovers **oxygen** and, because he announces his results almost immediately, is often credited as the discoverer of the element.
- 1781 Swedish chemist Peter Jacob Hjelm discovers **molybdenum**.
- 1782 Austrian mineralogist Baron Franz Joseph Müller von Reichenstein discovers **tellurium**.
- 1783 Spanish scientists Don Fausto D'Elhuyard and Don Juan José D'Elhuyard and Swedish chemist Carl Wilhelm Scheele discover **tungsten**.
- 1787 Scottish military surgeon William Cruikshank and Irish chemist and physicist Adair Crawford independently announce the probable existence of a new element, later found to be **strontium**.
- 1789 German chemist Martin Klaproth recognizes the presence of **uranium** in pitchblende, but does not isolate the element.
- 1789 German chemist Martin Klaproth discovers **zirconium**. The element is not isolated until 1824.
- 1791 English clergyman William Gregor discovers an oxide of **titanium**. German chemist Martin Klaproth makes a similar discovery four years later. The element is not isolated until 1910.
- 1794 Finnish chemist Johan Gadolin discovers **yttrium**.
- 1797 French chemist Louis-Nicolas Vauquelin discovers **chromium**.
- 1798 French chemist Louis-Nicolas Vauquelin discovers **beryllium**.
- 1801 English chemist Charles Hatchett discovers **niobium**.
- 1801 Spanish-Mexican metallurgist Andrés Manuel del Río discovers **vanadium**.

- 1802** Swedish chemist and mineralogist Anders Gustaf Ekeberg discovers **tantalum**.
- 1803** English chemist and physicist William Hyde Wollaston discovers **palladium**.
- 1803** Swedish chemists Jöns Jakob Berzelius and Wilhelm Hisinger and German chemist Martin Klaproth discover the black rock of Bastnas, Sweden, which led to the discovery of several elements. Berzelius and Hisinger originally assume the rock is a new element, which they name **cerium**.
- 1803** English chemist Smithson Tennant discovers **osmium** and **iridium**.
- 1804** English chemist and physicist William Hyde Wollaston discovers **rhodium**.
- 1807–1808** English chemist Sir Humphry Davy isolates a number of elements in a pure form for the first time, including **potassium**, **sodium**, **magnesium**, **barium**, **calcium**, and **strontium**.
- 1808** French chemists Louis Jacques Thénard and Joseph Louis Gay-Lussac discover **boron**. Davy isolates the element a few days after its discovery has been announced.
- 1811** French chemist Bernard Courtois discovers **iodine**.
- 1817** Swedish chemist Johan August Arfwedson discovers **lithium**.
- 1817** German chemists Friedrich Stromeyer, Karl Samuel Leberecht Hermann, and J. C. H. Roloff independently discover **cadmium**, a name chosen by Stromeyer.
- 1818** Swedish chemists Jöns Jakob Berzelius and J. G. Gahn discover **selenium**.
- 1823** Swedish chemist Jöns Jakob Berzelius discovers **silicon**.
- 1825** Danish chemist and physicist Hans Christian Oersted discovers **aluminum**.
- 1825** French chemist Antoine-Jérôme Balard and German chemist Leopold Gmelin independently discover **bromine**.
- 1829** Swedish chemist Jöns Jakob Berzelius discovers **thorium**.
- 1830** Swedish chemist Nils Gabriel Sefström rediscovers **vanadium**.

- 1838** Swedish chemist Carl Gustav Mosander discovers that **cerium** contains a new element, which he names **lanthanum**. His lanthanum is later found to consist of four new elements.
- 1842** Swedish chemist Carl Gustav Mosander discovers that the earth called yttria actually consists of two new elements, **erbium** and **terbium**.
- 1844** Russian chemist Carl Ernst Claus discovers **ruthenium**.
- 1860** German chemists Robert Bunsen and Gustav Kirchhoff discover **cesium**.
- 1861** German chemists Robert Bunsen and Gustav Kirchhoff discover **rubidium**.
- 1861** British physicist Sir William Crookes discovers **thallium**.
- 1863** German chemists Ferdinand Reich and Hieronymus Theodor Richter discover **indium**.
- 1868** Pierre Janssen and Norman Lockyer discover **helium** in the spectrum of the sun.
- 1875** Paul-Émile Lecoq de Boisbaudran discovers **gallium**.
- 1878** Swiss chemist Jean-Charles-Galissard de Marignac, Swedish chemist Lars Fredrik Nilson, and French chemist Georges Urbain all receive partial credit for the discovery of **ytterbium**.
- 1878–1879** Swedish chemist Per Teodor Cleve discovers **holmium** and **thulium**.
- 1879** Swedish chemist Lars Fredrik Nilson discovers **scandium**.
- 1880** French chemist Paul-Émile Lecoq de Boisbaudran discovers **samarium**.
- 1880** French chemist Jean-Charles-Galissard de Marignac discovers **gadolinium**.
- 1885** Austrian chemist Carl Auer von Welsbach discovers **praseodymium** and **neodymium**.
- 1885** German chemist Clemens Alexander Winkler discovers **germanium**.
- 1886** French chemist Henri Moissan discovers **fluorine**.