The Elements Go to the Movies

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The names of many common elements have found their way into the titles of feature films: gold, silver, iron, copper, and lead, for example, appear in hundreds of movie titles. Surprisingly, perhaps, more than two dozen other elements, including iodine, cadmium, zinc, calcium, argon, chlorine, and others, have also been used in film titles. In this article, we present a list of films (and a few "shorts") that contain the names of elements in their titles. In many cases, there is a direct chemical significance behind an element's use in the title. For example, in the 2004 film, *The Calcium Kid*, Orlando Bloom's character claims he developed strong bones due to a lifetime of milk consumption. In some instances, however, there is little or no scientific reason why an element appears in the title such as the 1998 Bruce Willis thriller *Mercury Rising*, in which the "mercury" has no chemical relevance to the film's plot. Nevertheless, movies are an extremely popular form of entertainment, and even if the link to chemistry is tenuous, these can provide interesting cultural examples of chemistry. Suggestions for integrating some titles into classroom lessons or lectures are provided. The source for all titles is the Internet Movie Database *(1)*, which contains a comprehensive listing of motion pictures. Documentaries, films currently in development, and television series have not been included. Because students are familiar with arrangement of elements by atomic number, the films are listed in the same order as the elements in the periodic table.

Helium

Helium (2005) is a short film centered on a crashed helium-filled blimp. The reporter and witnesses all speak in high-pitched voices as a result of inhaling the released gas. This almost certainly would not happen as the low-density helium would rapidly rise. Another film, *Big Helium Dog* (1999), derives its title from an expression that the film's writer−director overheard: "bite the big helium dog". The term, big helium dog, is a somewhat obscure, generic reference to any large, lighter-than-air inflatable object that, if punctured (or bitten) would collapse. Thus, "bite the big helium dog" refers to some unfortunate or unpleasant event. The director has stated *(2)* that he simply liked the title for this movie. Helium features prominently in any discussion of the inert gas group. Its unique discovery (first detected in 1868 in the sun during the observation of a solar eclipse, before large terrestrial reserves were discovered in the United States in 1903), properties, and uses make it an interesting element. When discussing helium, students should be reminded that some estimates have suggested U.S. sources of helium will be depleted within 1−2 decades *(3)*, a reminder that the plundering of our natural resources will eventually affect the availability of many elements.

Lithium

Although lakes and springs are sometimes named after minerals found in them, the chemical composition of the lithium springs of the film, *Lithium Springs* (2004), is not explained. In this story, the hero searches for the springs that supposedly are the "fountain of youth" once sought by Spanish explorer Ponce de Leon. In reality, Ponce de Leon had heard tales from Native Americans about a spring with powers to restore youth, and he sailed in search of the springs in 1513. Today, owners of Warm Mineral Springs in Florida claim their springs to be the original sought by the Spanish explorer *(4)*. With a total mineral content >17,000 ppm (one of the highest in the United States), the waters have a high density and therefore buoyancy, facilitating ease of movement for persons with some physical impairments. This feature, combined with a soothing constant temperature of 87 °F, would likely be the only source of health benefits from bathing in these waters. The Warm Mineral Springs Web site lists Na, Mg, K, and Ca as the major metals in the water. Lithium is probably present in trace quantities, as it is in many natural waters.

Carbon

In *Carbon Copy* (1981), George Segal plays a Caucasian, corporate executive who discovers he has an African-American teenage son, played by Denzel Washington in his first movie role; hence, the witty title of *Carbon Copy*. Users of e-mail will be familiar with the term used in its abbreviated form, cc, which refers to an e-mail copied and send to a second party. Most younger students will probably be unfamiliar with the origin of this term because it dates to the use of carbon as a copying material, specifically carbon paper, which has now been largely replaced by photocopiers and printers. In the era of typewriters, carbon paper was used to make "carbon copies" of documents. Early carbon paper was made by coating the paper with a mixture of carbon black (soot), oil, and naphtha, the old term for a liquid hydrocarbon mixture obtained from the distillation of coal tar or petroleum. Later, higher quality typewriter carbon designed to be reused many times was prepared from paper coated with ink made from carnauba wax (32%), mineral oil (26%), carbon black (12%), amber petrolatum (6%), beeswax (5%), ouricury wax (5%), ozokerite wax (5%), oleic acid (3%), pigmented purple toner (3%), crystal violet dye (2%), and Victoria blue base (1%) *(5)*.

Oxygen

The plot of the thriller *Oxygen* (1999) centers on a kidnapped woman who is buried alive and has only enough air to survive for 24 h, hence the title. Rescuers must find her in time.

Neon

Many films (e.g., *Neon City*, 1991; *Rebels of the Neon God*, 1992; *Neon Signs*, 1996) contain neon in their titles and the

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reference usually relates to productions set in cities where the presence of neon lights is indicative of urban locations. The *Neon Ceiling* (1971), however, features an artist who creates neon sculptures attached to the ceiling. Neon art is a popular contemporary art form. New Orleans-based neon artist Eric Ehlenberger *(6)* creates colorful jellyfish lights from neon-filled glass tubes, and these can be referenced in lectures when discussing the inert gases.

Aluminum

Note to producers: beware using the word aluminum in a movie title. According to most published reviews, *Rancid Aluminum* (2000) and *The Aluminum Fowl* (2006) were, respectively, rancid and foul and have little to do with the metal. Although the short *Aluminum Man* (2008) is based on a boy who builds himself a metal-armored suit to battle bullies, more science can probably be found on the ingredients label of a soda can than in any of these "aluminum" films.

Silicon

References to silicon in movie titles, such as *Silicon Valley* (2005), almost always refer to the high-tech business area of northern California, which has historically been associated with companies that developed and utilized integrated circuits (silicon chips). The term, silicon valley, is generally considered a metonym, widely used in reference to the high-tech sectors of that region.

Sulfur

The Ghost of Sulphur Mountain (1912), a short black-and-white western film, dates from the silent era and deals with a mine-haunting ghost. The film is named after Sulphur Mountain, the 2,697 ft (822.05 m) summit where deposits of sulfur were known, near Ojai, California *(7)*. Many early films were shot in the area, and nearby Santa Paula was the early film capital of California.

Chlorine

Of all the worldly places a spirit could chose to live, in *Chlorine Dreams* (1998) a young girl finds a ghost haunting her swimming pool. This can be an interesting aside when talking about swimming pool chemistry, the details of which have been adequately covered in this *Journal (8)*.

Argon

In the *Argon Quest* (1990), two children discover a mysterious necklace that magically transports them to Blizzard Island, an island full of strange creatures. One of the creatures is a sleeping giant named Argon, which seems appropriate because argon (the element) is derived from the Greek meaning "inactive".

Calcium

There is no mystery behind the naming of *The Calcium Kid* (2004). The mockumentary comedy features Orlando Bloom playing Jimmy, a young milkman-turned-boxer. The film was made before Bloom starred as Will Turner in *The Pirates of the Caribbean* movies, but was released after the first *Pirates* film. Jimmy's line: "I've drank three pints of milk a day for as long as I can remember. Because of all the calcium, I've never had a filling or been knocked out, and my bones are as hard as rock!" clearly links the well-known association of calcium to bone development. It also suggests a unit conversion calculation for students. Does Jimmy exceed the recommended daily allowance (RDA) of calcium? Provide students with the following data: the calcium RDA for adults is 1000 mg, and 1 cup of milk contains 300 mg Ca. With the necessary conversion factor (1 pint = 2.0 cups) students should calculate that Jimmy drinks 1,800 mg of Ca a day. (The problem could be converted to metrics by saying Jimmy drinks 1.4 L of milk a day and providing the appropriate conversions.)

Chromium

Captain Hook may have been a figment of Scottish writer J. M. Barrie's imagination, but metal hooks were indeed introduced (in the 1600s) to replace lost hands *(9)*. Fortunately, modern prosthetics can produce much more efficient devices. Not so, however, in *The Chromium Hook* (2000). In this short film, a hook-handed escapee from a mental institution terrorizes a small town. Chromium, of course, is an ideal metal to plate many iron or steel objects including, presumably, a prosthetic hook. The hard, corrosion-resistant metal is also known for its brilliant luster, providing our deranged hero with a hook any pirate would be proud to own.

Iron

John Ford's *The Iron Horse* (1924) is named after the popular term initially adopted in the mid-19th century for steam-powered locomotives, and the movie is based on the construction of the railway to the West. *Iron Giant* (1999), *Iron Man* (2008), and hundreds of other movies also contain "iron" in their titles, which is usually either a symbolic or direct reference to the strength associated with the metal.

Cobalt

In *Cobalt Blue* (2009), three childhood friends grow up together on a Japanese island surrounded by deep blue seas and a rich blue sky. Set in this backdrop, the film takes its title from the blue pigment of the same name that can be prepared synthetically by heating CoO and Al_2O_3 to form cobalt aluminate, $CoAl_2O_4$. Historically, cobalt blue has been used to color glass, porcelain, and in art paint. Curiously, the cobalt blue is also a rather aggressive tarantula (*Haplopelma lividum*) that is native to Myanmar and Thailand. The tarantula is named for the color of the legs, which, in females, appear a brilliant iridescent electric blue.

Nickel

Over 20 films, mostly shorts (e.g., *On the Nickel*, 1980) contain nickel in their titles. The reference is usually to the United States 5-cent coin, often a symbol of poverty or hard times. Because of the rising copper prices in 2008, nickel coins (which are 75% Cu, 25% Ni) *(10)* were actually worth over 6 cents each. Copper prices dropped in early 2009, making the value of the metal content less than 4 cents a coin. The fluctuation in raw metal prices is likely to continue indefinitely

as mining and manufacturing costs increase, worldwide demand for metals increases, and some metal resources become depleted. In addition to copper, students could research the prices history of metals such as gold, silver, platinum, palladium, indium, and rhodium.

Copper

Many old western movies contain copper in their titles, in reference to mining towns, such as *Copper Canyon* (1950), that focuses on the troubles of a group of copper miners. The term "copper" is also applied to policemen and in that context is used in several films such as *Spare a Copper* (1941). Students are often told that the term copper (cop) as applied to police is derived from the copper buttons on early police uniforms. Although this makes a good story, it is more likely that copper in this context is derived from the Latin word *capere*, meaning "to seize".

Zinc

In *My Zinc Bed* (2008), three characters dominate this story about addictions. When one of them dies, he is dispatched to lie forever in his "zinc bed". Coffins destined for burial, rather than cremation, are often lined with zinc (or copper) and hermetically sealed to help preserve the body. Zinc is also an antimicrobial metal, which further slows down decay of tissues. Pope John Paul II was buried in a triple coffin *(11)*, one layer being composed of zinc.

Arsenic

Cary Grant is not amused when he discovers his two, sweet, elderly aunts have been bumping off lonely old men and burying them in the cellar in *Arsenic and Old Lace* (1944). The aunts' method was arsenic-tainted elderberry wine. Students could be given the following problem: Given that arsenic concentrations of greater than 60 ppm *(12)* are lethal, how much As_2O_3 would have to be added to a 1 L bottle of elderberry wine for the beverage to produce a concentration of 60 ppm As? Arsenic poisoning dates from the Middle Ages and often went undetected as the symptoms were similar to cholera, a common disease of the period. Arsenic compounds were also used in many commercial products leading to accidental poisoning. For instance, emerald green was a paint pigment once popular with artists and contained copper(II) acetoarsenate. It is likely that impressionist painters (such as Monet and Van Gogh) suffered illnesses from arsenic ingestion from this source.

Krypton

In 1938, Superman creators Jerry Siegel and Joe Shuster named the superhero's home planet Krypton, after the inert gas that was discovered 40 years earlier. Because of the difficulty isolating the element from air and the mysterious location of the mythical planet, *Superman: The Last Son of Krypton* (1996) seems suitably named from the Greek, *kryptos*, meaning "hidden".

Silver

Numerous films contain silver in their title. Similar to *Silver City* (1951), many are western films set around mining towns. Others movie titles, such as *The Silver Chalice* (1954), focus on the metal, which is a symbol of beauty and purity.

Cadmium

In the short film *Cadmium Deep Green* (2008), a girl develops a relationship with colored pencils that talk to her. The title is named after the color of a green pencil and, specifically, the cadmium deep green pigment used by artists. Cadmium deep green is composed of cadmium sulfide, mixed with chromium and copper compounds. CdS is commonly found in paint pigments and its color can be altered by varying the quantity of selenium.

Tin

The word "tin" is often misused to represent common shiny metals, such as aluminum and steel. Thus, in *The Tin Star*, 1955 (a reference to a sheriff's metal badge), *The Tin Drum* (1979), *Cat on a Hot Tin Roof* (1958), *Tin Men* (1987), and many others, the reference to tin does not pertain to the element itself.

Iodine

The film *Little Iodine* (1946) was based on a comic strip of the same name that ran for over 40 years, beginning in 1943. Though her father was quiet and easy going, young Iodine was a female forerunner to Dennis the Menace, somewhat likeable but an extremely mischievous, bratty, and irritating little girl. What better name to give a character with such a "volatile" personality, because iodine (the element) readily undergoes sublimation. Quite possibly the name was given to the character because iodine, in the form of an iodine/iodide mixture in aqueous ethanol, has long been used as an antiseptic that can briefly sting and irritate when applied to a wound.

Tungsten

Tungsten has always been a metal that symbolizes strength. In pure form, it has the highest melting point of any metallic element, and it is required for enzyme function in some bacteria. However, its high density would make it an unlikely metal to use to create robots having mobility as in the movie *Tommy the Tungsten Robot* (2008).

Platinum

Often described as a silvery-white metal, platinum has long lent its name to individuals with low levels of hair pigmentation. In the film *Platinum Blond* (1931), the title refers to legendary actress Jean Harlow's extremely white hair.

Gold

Hundreds of films have gold in the title. Usually, the titles refer to the metal itself and the attainment of wealth is frequently the theme. But gold can also symbolize love, marriage, prestige, greed, success (e.g., in business or athletics), and human achievement in general. These are themes commonly found in gold-titled films. Though it dates to the silent period, Charlie Chaplin's *The Gold Rush* (1925) is a charming film that embraces many of these themes. An interesting calculation for students is to determine the volume of 1 tonne of gold. Because of its high density, this quantity of gold would occupy a cube with sides just 15 in. (~37 cm) long *(13)*.

Mercury

At first glance, Mercury Rising (1998) would seem to be an excellent title for a Bruce Willis thriller, which are often characterized by tense plot themes and a "heating up of the action" that could be linked to thermometers. *Mercury Rising* (1998), however, is the name of a cryptographic code that is the focus of the story. Instructors should never miss the opportunity to explain *(14)* why mercury is a liquid at room temperature.

Lead

Lead is popular in western and crime film titles, for example, *Hot Lead* (1951), because it is immediately associated with bullets and firearms. Although elemental lead occurs in nature, it is rare, and more commonly found as PbS (galena). But its low melting point made it relatively easy to extract, and it has been known since before 6000 B.C.E.

Radium

The short film *The Radium Follies* (2006) is described as "a fictional farce through the real-life world of 1920s 'radium parties'", at which the newly discovered, glow-in-the-dark, radioactive element was drunk and acclaimed for its "healthful properties" *(15)*. Radium was, in fact, used in many early 20th century consumer products including watch dials, bath salts, toothpaste, cosmetics, and even suppositories.

Uranium

Mining is the obvious theme found in the few films with uranium in their titles, including *Dig That Uranium* (1955), *Uranium Boom* (1956), and *Uranium Blues* (1956). It is not just coincidence that all three films were produced in the 1950s, a period when nuclear testing was prolific.

Plutonium

The line, "don't pay any attention to that radioactive symbol, just put your beer in there", probably sets the tone for the film *Plutonium Baby* (1987). Exposure to radiation in the entertainment world can lead to the creation of fictional heroes, such as the Incredible Hulk. But then there's the plutonium baby, in which a woman contaminated by radiation poisoning gives birth to a child who later becomes a mass murderer. Depending on dosage, exposure to radiation produces a range of symptoms including fever, hair loss, headache, fatigue, dizziness, disorientation, low blood pressure, vomiting, diarrhea, or nausea. Metamorphosis into a rampaging killer is a relatively rare symptom of radiation poisoning, except in Hollywood!

Literature Cited

1. Internet Movie Database. http://www.imdb.com (accessed Jul 2010).
2. View Askew Productions. http://www.viewaskew.com/interviews/lynch (accessed Jul 2010).
3. Science Daily. http://www.sciencedaily.com/releases/2008/01/080102093943.htm (accessed Jul 2010).
4. Warm Mineral Springs. http://www.warmmineralsprings.com (accessed Jul 2010).
5. How Products Are Made: http://www.madehow.com/Volume-1/Carbon-Paper.html (accessed Jul 2010).
6. Eric Ehlenberger Art Gallery. http://www.ehlenberger.com (accessed Jul 2010).
7. Minerals of California: Centennial Volume, 1866−1966. http://www.archive.org/stream/centenniamineral00murdrich/centenniamineral00murdrich_djvu.txt (accessed Jul 2010).
8. Salter, C.; Langhus, D. L. *J. Chem. Educ.* **2007**, *84*, 1124.
9. U.S. Department of Defense. http://www.defenselink.mil/news/newsarticle.aspx?id=48987 (accessed Jul 2010).
10. United States Mint. http://www.usmint.gov/mint_programs/circulatingCoins/index.cfm?action=CircNickel (accessed Jul 2010).
11. St. Peters Basilica. http://www.saintpetersbasilica.org/Grottoes/JPII/Tomb%20of%20John%20Paul%20II.htm (accessed Jul 2010).
12. The Arsenic Foundation. http://phys4.harvard.edu/~wilson/arsenic/arsenic_project_introduction.html (accessed Jul 2010).
13. World Gold Council. http://www.gold.org/faq (accessed Jul 2010).
14. Norrby, L. J. *J. Chem. Educ.* **1991**, *68*, 110.
15. Silver Lake Film Festival. http://www.silverlakefilmfestival.org/slffShorts.htm (accessed Jul 2010).

