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# Shakespeare

By Eric Rasmussen

Today, countries that need new enrichment services, including the United States, opt for the centrifuge method of enrichment, which separates materials out by spinning them in a cylinder. The heavier materials fly out from the center. The main advantage of the centrifuge over diffusion is that it consumes about one-tenth the energy.

But the centrifuge method is also a huge operation, both in terms of machinery size and space needed. It is not easy to hide (like, say, a laboratory to make chemical or biological weapons of mass destruction). And, again, you cannot obtain the enriched product overnight. It takes time — months, depending, of course, on the amount of effort devoted to such a project.

How can anyone tell whether a country is enriching uranium to make it useful for electricity generation (3-5 percent U-235) versus preparing it for use in weapons (more than 90 percent)? If the country allows inspectors to sample the product, it is relatively easy to determine the enrichment level. But from a distance, it is not possible to tell.

As mentioned above, U-235 is the only uranium isotope found in nature that can be used as fuel in a water-cooled reactor. But this is not the only fuel available to us. In today's reactors, only 3-5 percent of the fuel is U-235; the rest is U-238. As the heavier isotope absorbs neutrons, it eventually turns into plutonium. Plutonium is a perfectly good nuclear fuel. In fact, in today's reactors, about 15-20 percent of the reactor power is produced by the plutonium made in the reactor core by the U-238 taking on extra neutrons.

When most of the U-235 is used up, the fuel is discharged from the reactor. This is called "spent nuclear fuel." The process by which useful isotopes are extracted from spent nuclear fuel and repackaged for future use is called reprocessing. Reprocessing also has been used by the major nuclear powers to extract plutonium for weapons.

Apparently North Korea did the same thing: It reprocessed its spent power-plant fuel to obtain weapons-grade fuel instead of enriching uranium. [N](#)

**1.** Shakespeare invented nearly 2,000 words, including critic, exposure, fixture, housekeeping, hurry, laughable, lonely, Olympian, puke and road.

**2.** Shakespeare's wife was eight years older than the playwright — and three months pregnant when they got married.

**3.** Charles Jennens, an 18th century editor of Shakespeare's plays, wrote the libretto to Handel's *Messiah*.

**4.** Howard Staunton, another Shakespearean editor, invented the design of modern chess pieces.

**5.** Archeologists have found early clay pipe fragments near Shakespeare's house in Stratford-upon-Avon that show traces of marijuana and other hallucinogenic substances.

**6.** At a performance of *Macbeth* in 1672, the actor playing the title role apparently used a real dagger and murdered the actor playing Duncan.

**7.** The actors in Shakespeare's company didn't get a copy of the full script, just the lines spoken by their character written on a narrow strip of paper that could be rolled up, which became known as the actor's "role."

**8.** *King Lear*, with its portrayal of a mad king, was banned on the London stage from 1788 to 1820 because of the real insanity of the reigning monarch, King George III.

**9.** All of Uranus's 21 moons are named after Shakespearean characters.

**10.** In the 46th Psalm in the King James Bible, which was printed when Shakespeare was 46 years old, the 46th word is "shake" and the 46th word from the end is "spear." Proof positive, some argue, that Shakespeare wrote the Bible!

*Eric Rasmussen, English professor, University of Nevada, Reno, is one of two editors chosen by the Royal Shakespeare Company to edit The RSC Complete Works of Shakespeare as an official edition to accompany a Shakespeare stage extravaganza currently playing in Stratford-upon-Avon, England.*

