A Critical Mass

You don't hear much about nuclear radiation deaths anymore. Partly because the government tries not to alarm us. But partly because physicists have learned from their mistakes, and now use certain protocols and safeguards to keep these accidents from happening.

Radioactive materials are radioactive because the atoms spontaneously split, giving off a burst of neutrons or gamma rays or other things, and leaving behind smaller atoms of a different element.

Some things are very mildly radioactive; the atoms only rarely decay, or don't give off powerful particles. Such is the tiny fleck of Americium-241, with a half-life of 430 years, which sits at the center of most smoke detectors. Or the thin film of Radium-226, with a half-life of about 1,600 years, that is painted on the glowing hands of wristwatches made between 1910 and 1960. (If you happen to have one, it has not stopped glowing because the radium has worn off, but because the radium has frizzled away the glowing paint!)

Some things are quite radioactive, such as the chunk of fluorine-18, with a half-life of about two hours, which used to sit inside the x-ray machine in your dentist's office (though that is now outdated technology).

Some things are very dangerously radioactive, such as a small lump of plutonium-239, with a half-life of almost 25,000 years, which, when sufficiently concentrated, will glow with its own heat. If subject to the correct circumstances, the lump will become a "critical mass" and collect enough of its own flying neutrons to create a chain reaction that increases the rate of radioactive decay and can produce enough electricity for a whole city. In fact, in other circumstances, the chain reaction inside the critical mass could get out of control and cause the entire lump to decay instantly. This would release so much energy that it would create a temperature hotter than the surface of the Sun and a blastwave so powerful that it would level all the buildings in a small city. This, of course, is how scientists make nuclear bombs.

In the early days of nuclear research, accidents happened when people allowed lumps of nuclear material to go critical while standing nearby. The first happened on Aug. 21, 1945, when Dr. Harry Daghlian clumsily dropped a brick of tungsten carbide, which landed on a sphere of plutonium resting on a work table. This brick reflected enough neutrons back into the plutonium sphere that it became a critical mass and released a burst of radiation before he could remove the brick. Dr. Daghlian died 25 days later.

On Dec. 30, 1958, Cecil Kelley was working next to a vat of liquid that contained dissolved plutonium particles. He switched on a mixing blade in the vat, which created a whirlpool, which caused enough of the plutonium particles to concentrate in the vortex to create a critical mass for about 200 millionths of a second. It was more than enough. A flash of light filled the room,

and Kelley died the next day.

On May 21, 1946, one of America's leading nuclear weapons scientists, Dr. Louis Slotin, was teaching seven colleagues how to surround a plutonium core with two hemispheres of beryllium, to bring the core close to critical, "tickling the tail of the dragon." The core was nestled in the lower hemisphere, and Slotin was holding the upper hemisphere with his hand, and using the blade of a screwdriver to keep the two apart. Suddenly the screwdriver slipped, and the hemi-spheres came together around the core. Even though the upper hemisphere never left Slotin's hand, and he instantly threw it to the floor, the seven scientists saw the air glow blue with ionization, felt a wave of searing heat, and tasted metal in their mouths. Slotin was rushed to the hospital, but died nine days later. The others suffered radiation poisoning and died before reaching old age.

What's the point? It's interesting that these materials can innocuously sit on the table, presenting very little danger to anyone, but when concentrated and subject to the right push, release astounding energy. A critical mass of nuclear fuel contains frightening power!

It reminds me of what the Thessalonians said when they heard Paul and Silas preaching for just three brief weeks (Acts 17:2), and watched as some of the Jews, Greeks, and leading women of the city joined the number of the disciples (17:4), and felt disturbance radiate throughout the city. They said, "These men who have upset the world have come here also … saying there is another king, Jesus" (17:6–7).

The gospel is a powerful force. It is "the power of God for salvation to everyone who believes" (Rom. 1:16). It replaces affection for the world with loyalty to God. It only takes a few faithful people giving it open proclamation to make palpable waves. It only takes a few people assembling together and devoting themselves to the kingdom of God to make a real impact. Before long, their influence spreads, and they begin to make more and more disciples, and their number multiplies. Before long, there isn't a corner of society that has been spared their heat.

So, how many disciples does it take to form a critical mass? How long before their influence is felt in the air? Not many, not long, when there is faith and work. Paul and his follow workers established a faithful congregation in Thessalonica in just three weeks; and it was still standing firm months later when he wrote to them. In Philippi, Paul's first sermon was presented to a handful of women gathered by the riverbank. Lydia and her household were converted, and soon a thriving bunch of Christians were meeting in her home for worship. Months down the road, thoughts of their work together filled Paul's heart with joy and thanksgiving, when he wrote to them from prison.

Just a few people! Just a few weeks! The gospel rippling through society! Why is it that so many churches, so many Christians, sit motionlessly on the table without unleashing the energy of a critical mass? Sometimes they are too comfortable, and need God to drop a brick on their heads, to get the chain reaction going. Perhaps that is what God will accomplish in our American society soon. God did it with the group in Jerusalem, when "those who had been scattered [by

persecution] went about preaching the word" (Acts 8:4).

Sometimes they are too diluted, and need to be purified into a faithful concentration. God did it with the first group of Christians, via the difficult Sapphira episode, "and great fear came over the whole church … and all the more believers in the Lord, multitudes of men and women, were constantly added to their number" (Acts 5:11–14).

May we never sell ourselves short, thinking that God cannot save the world through His people! But it starts with our friends, our neighbors, and our co-workers, right here in this very community. Unleash the power of the gospel!A Critical Mass

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- John Guzzetta