

# HOW FIREWORKS LIGHT UP THE SKY

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BY RYAN E. SMITH  
BLADE STAFF WRITER

A lot of things can change in a millennium. Knowing how to make a big boom isn't one of them.

All over the country this evening, the night sky will erupt with radiant sparks as fireworks declare Independence Day using the same scientific principles as when they were first devised.

"That really hasn't changed in 1,000 years," said William Weimer, vice president of Phantom Fireworks, which is headquartered in Youngstown and has three stores in northwest Ohio.

There have been some improvements since the Chinese first used firecrackers to scare away evil spirits, of course. Colors are brighter and more numerous now, and designers have figured out how to burn everything from smiley faces to butterflies into the evening air. It's less risky for the professionals now too, who these days can use computers to ignite the fireworks from a safe distance and carefully choreograph the explosions to music.

The basics, though, remain the same. At the heart of any fireworks display is black powder. It is this substance that's ignited by a fuse to shoot an aerial shell into the air as well as to burst it apart once it reaches the proper height, thanks to another fuse.

Inside the shell - traditionally spherical in shape if it's Chinese, cylindrical if it's European - are pellet-shaped objects called stars. These small chemical compounds are what give fireworks their unique colors when they burn.

Mother Nature handles the rest, handing out a rainbow of colors: barium compounds make green, copper compounds are used to produce blue, strontium compounds equal red. Each element is paired with an oxidizer, a chemical that provides oxygen and allows the reaction to burn quicker.

In recent years, the fireworks industry has been tinkering more with its chemical color palette, according to Julie L. Heckman, a Piqua, Ohio native who is executive director of the American Pyrotechnics Association in Maryland.

"Now we're seeing wonderful hues of lemon and chartreuse and tangerine and pink, where 10 years ago we didn't have those colors," she said. "Blue is still by far one of the hardest colors to make and one of the most respected. A really deep blue is something to be appreciated."

Another recent development is using fireworks to make specific designs. Ms. Heckman traces that back to the early '90s following Desert Storm.

"That was the first time we saw yellow bows and purple hearts. Now we're seeing five-pointed stars. We're seeing almost three-dimensional boxes. Smiley faces are very popular," she said.

Such patterns in the sky are determined by the way the stars are configured within the shell. So, if the bursting charge is in the middle and surrounded by a ring of stars, the result would be a ring in the sky. More complicated designs require trickier configurations.

Arthur Rozzi, president of Rozzi's Famous Fireworks in Loveland, Ohio, is no stranger to these kinds of issues. He's been part of the 112-year-old family business since he was 9.



Fireworks cast a beautiful light over the Maumee River in downtown Toledo (THE BLADE)

[It's] something that's passed down like a craft. You learn it from your parents," he said.

Those in the industry are just as drawn to these big, colorful kabooms as the rest of us, even if they've figured out the mysteries behind them.

"You're always fascinated by it," Mr. Rozzi said.

Professionals - and those who are just fans - are always striving to make the next great leap forward. Earlier this year, members of the Michigan Pyrotechnics Arts Guild, a group of fireworks hobbyists and professionals, shot off a 24-inch shell that weighed 185 pounds just because they could.

"When you produce a firework that large, it completely fills the sky horizon to horizon," said president Aaron Enzer, who started his own fireworks display company, ACE Pyro near Chelsea, Mich.

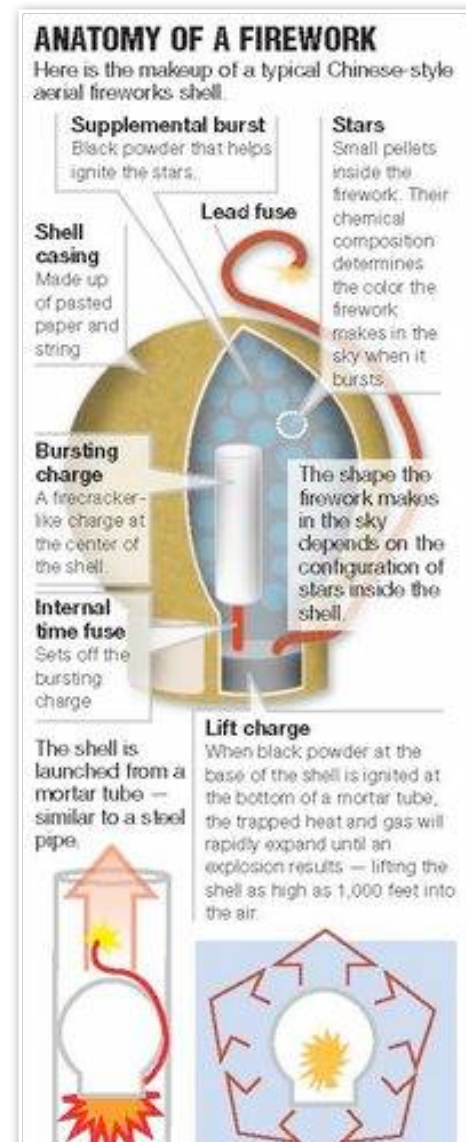
He and others in the group revel in playing the mad scientist, dreaming up new colors that use simpler chemicals or have less impact on the environment.

"It's somewhat like being a pastry chef trying to create a new treat," he said. "You may or may not know exactly what the results are going to be, but because of years of experience you can give it a good try ...."

When they work, the results can provide quite a rush.

"I'll never be a rock star, I'll never be a famous athlete, but when I can produce a display of fireworks and literally have 100,000 people cheering in excitement at something I created, that can be very addicting," Mr. Enzer said..

Contact Ryan E. Smith at: [ryansmith@theblade.com](mailto:ryansmith@theblade.com) or 419-724-6103.





When the lead fuse is lit, it sets off a lift charge of black powder and propels the shell into the sky.

When the shell reaches the proper height, the internal time fuse sets off the bursting charge, breaking the shell open and sending burning stars in all directions.

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