

VISION + DETERMINATION
Pearsall on the factory floor at Statitrol Corporation in the 1970s. The company was originally formed to develop a device that removed static electricity in commercial and industrial applications.



Where There's SMOKE

Fifty years ago, Duane Pearsall stumbled across a technology that offered the possibility of a new kind of smoke detector.

What he did with his discovery was anything but accidental, and has helped save tens of thousands of lives in home fires.

BY DAVID A. LUCHT, P.E., FSPE

It was a rough day for Duane Pearsall. It was 1963, and Pearsall, along with an engineer and a technician, was huddled around a makeshift experiment in a backroom lab at the Pearsall Company in Denver, Colorado. The men were trying to figure out why one of their new products was failing, and the atmosphere in the lab was tense. The problems were serious enough that Pearsall, an entrepreneur and businessman, worried about losing his entire investment in the project, including a second mortgage on his house. It didn't help that the experiment was spewing out readings no one could explain.

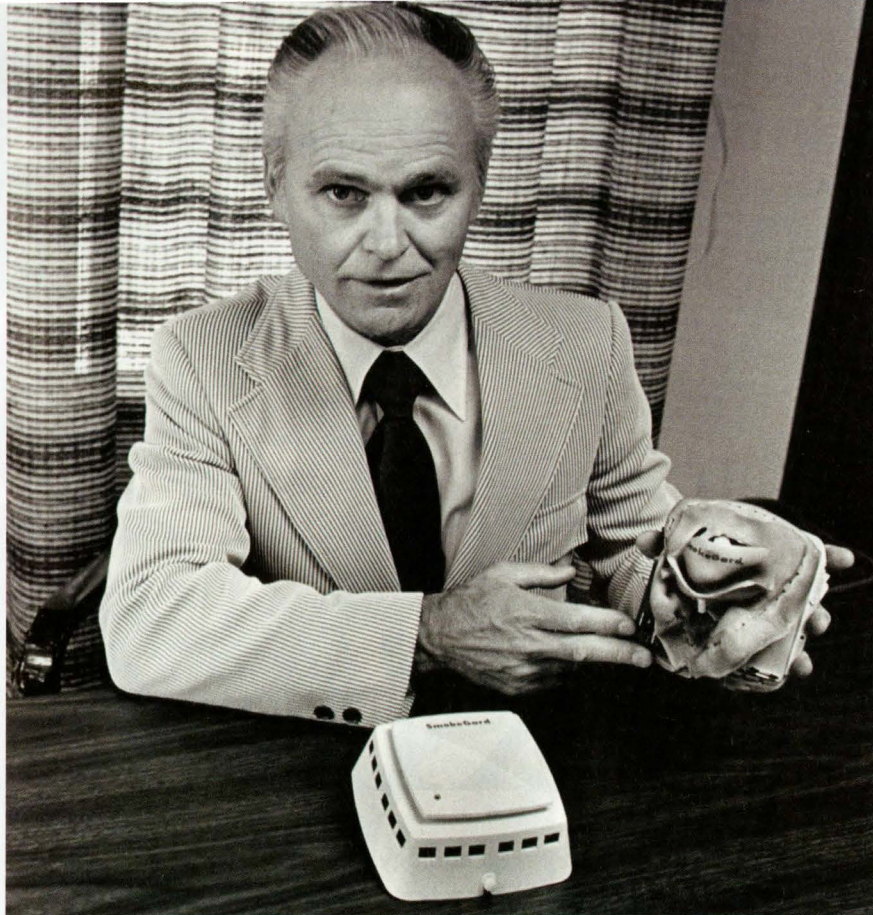
Pearsall's company primarily sold heating and air distribution equipment for commercial buildings in the Denver area. He had recently spun off a new venture, Statitrol Corporation, to develop and sell a promising new product he called the "static neutralizer," which was essentially an ion generator. The device was designed to remove electrostatic charges in commercial and industrial applications, such as photo labs and clean rooms, and orders were coming in. But there had also been product failures in the field—fine particles of dirt were collecting inside the devices, interfering with ion generation—and Pearsall and his team were working to design a new version of the neutralizer that they hoped could solve the problem.

The engineer, Lyman Blackwell, had improvised the test to measure the flow of ions in the airstream discharging from the generator. Soon after the experiment was powered up, the ion concentration meter,

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VIDEO

Author David Lucht talks about the history of the home smoke detector



Pearsall with a smoke detector damaged in a home fire. In his memoir, he wrote fondly of the first documented instance, in 1975, of a SmokeGard detector that helped save lives.

located six feet from the ion generator, began showing erratic readings that none of them could explain. Then they realized the strange readings only happened when the technician, a chain smoker who was indeed smoking that day, exhaled smoke near the fan inlet of the ion generator. The meter, they realized, was detecting invisible smoke particles.

It didn't take them long to realize that they'd stumbled upon the technology that could be used in a commercially viable smoke detector. "We embarked on this experimental procedure without any forethought that the outcome would dramatically change the world," Pearsall later wrote in an unpublished memoir, *My Life Unfolded*. "But it did."

It was Pearsall's eureka moment. Ionization smoke detection wasn't new, but Pearsall realized that the basic technology in Blackwell's "kludged together" ion meter held the potential for a new kind of smoke detector. Soon, Pearsall, who did not have a fire protection background, was channeling much

of his effort into the development of a life-saving product that he believed could be more efficient, and more affordable, than the smoke detectors already on the market. His decade-long struggle to bring a home smoke detector to market dovetailed with a growing awareness of the fire problem in the United States, and the device he eventually produced would come to be regarded as perhaps the single greatest technological contribution in the fight against home fire deaths.

Fifty years after that chance meeting between cigarette smoke and an ion concentration meter, it seems like a good time to celebrate the profound influence Pearsall's work has had on fire safety in the U.S. and around the world, and to acknowledge the tens of thousands of lives that have been saved by his pioneering efforts.

Meanwhile, in Washington...

Through the 1960s, as Pearsall and his colleagues turned their attention to developing smoke detection and alarm

systems for commercial and, later, residential applications, the issue of public safety was front and center in the media and in Congress. The civil unrest and riots in cities across the country in the late 1960s tested the capability of local police and fire services. In 1968, Congress passed the Safe Streets Act to support and assist state and local law enforcement agencies as well as the Fire Research and Safety Act to explore the need for similar support for the fire services. President Lyndon Johnson signed the bill into law, noting that in 1966 fire killed more than 12,000 Americans—though the actual figure was probably closer to 8,000, based on improved statistical methods used by NFPA—and was responsible for billions of dollars in property damage. "This great nation, of which we are all so proud and dedicated, leads the entire world in technology," Johnson said, "but it falls . . . far behind the other nations in protecting its own people."

The act required the presidential appointment of a 20-member panel to conduct a comprehensive study of the nation's fire problem and make recommendations for reducing fire losses. The panel, known as the National Commission on Fire Prevention and Control, was appointed by Johnson's successor, Richard Nixon, and in 1972 the commission held public hearings in Washington, D.C., Dallas, Los Angeles, San Francisco, and Chicago. Based on its own research and testimony from scores of witnesses, the commission compiled its findings in a report it called *America Burning*.

The report was a watershed moment in American fire history. Released in 1973, *America Burning* wasted little time in getting to some difficult truths. The first page echoed Johnson's assessment five years earlier: "Appallingly, the richest and most technologically advanced nation in the world leads all the major industrialized countries in per capita deaths and property loss from fire." More than 80 percent of U.S. fire deaths occurred in peoples' own homes, the report said, often at

night when they were most vulnerable. *America Burning* made fire safety a high-profile public issue and proposed a goal of cutting U.S. fire losses in half within the next generation.

It was against the backdrop of this emerging national safety issue that Pearsall pressed on with the development of smoke detectors he could bring to market. First to emerge was a new hard-wired ionization smoke detection system for commercial and industrial applications, introduced in 1968. Based on a modified version of Blackwell's experimental ion flow measuring device, the new system was relatively efficient, requiring just a 24-volt power supply compared to the 220 volts needed for a competing device produced in Switzerland. The response was encouraging; Honeywell placed an

Part of Pearsall's genius was an exceptional ability to harness the participation of other enthusiastic talents, from engineers and marketing professionals to dedicated rank-and-file factory workers and public-sector advocates.

order for 15,000 units, and 1,100 were installed aboard the *Queen Mary*, the retired ocean liner permanently moored at Long Beach, California.

Despite its efficiency, the Statitrol hard-wired system was still too costly for homeowners, especially for retrofitting existing homes, and Pearsall continued to work on a home version that he believed could accomplish what others had not. Fire alarms for home use—originally spring-wound or compressed-gas-powered heat detectors—had been around since the 1950s, but they were expensive, often more than \$1,000 per home, and had made little impact on the marketplace. Research began to show the superiority of smoke detection for life safety, and the first single-station home smoke detection product appeared in 1966. It was an AC-powered photoelectric detector designed to hang on the wall, with a flexible cord for

plugging into an electrical wall outlet. Several companies offered home smoke detectors, but a large-scale retail market had so far failed to emerge.

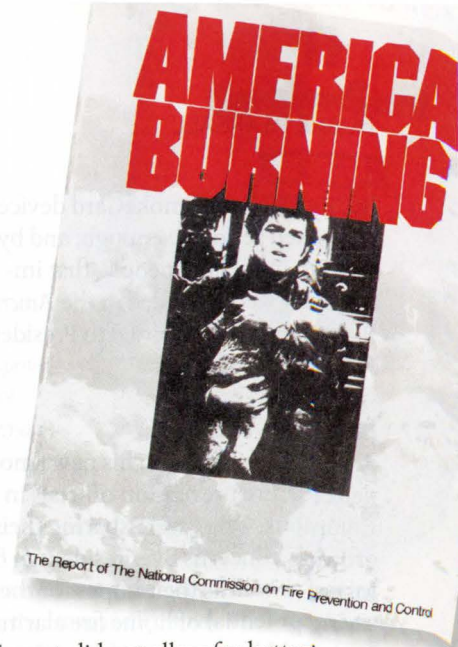
Pearsall was convinced he could do better with his ionization detector. Because its power requirements were minimal, the Statitrol device would be self-contained and battery-powered, an entirely new feature for smoke alarms. It would be roughly the size of a coffee cup, and could easily be attached to the ceiling with two screws. Blackwell, a gifted inventor, again contributed to the design, helping to make the battery energy source feasible.

But Pearsall was concerned about the possibility of the batteries going dead and disabling the detector. To guard against this, Statitrol's staff engineer, Paul Staby, worked with

Blackwell to develop self-monitoring circuitry that would produce an audible "chirp" when the battery strength deteriorated—a feature that would be critical for overcoming resistance to the idea of a battery-powered smoke detector from skeptical fire officials. As an added safeguard, Pearsall decided to mail an annual battery replacement reminder to consumers who sent in the business reply card included in each product package.

Blackwell and Staby filed the patent on the self-monitoring battery-powered home smoke detector on April 9, 1971 (US Patent Office #3,778,800). Pearsall called it the "SmokeGard."

Despite his progress, Pearsall knew that all manner of hurdles lay ahead in the journey toward actual retail sales of the SmokeGard. For starters, the detector did not comply with standards of the day. NFPA 74, *Household Fire Warning*



Equipment, did not allow for batteries as the sole source of power, and testing labs like UL and Factory Mutual wouldn't test the product because it didn't comply with NFPA standards. To further complicate things, none of the model codes recognized the battery-powered smoke detector concept or required detectors in dwellings. Then as now, sales of fire protection devices were heavily driven by state and local building and fire code requirements, as well as the consensus model codes upon which they were based.

But Pearsall persisted, and began to formulate a strategy for working within the system of codes and standards to make the SmokeGard feasible. While he was personally involved every step of the way, part of his genius was an exceptional ability to harness the participation of other enthusiastic talents, from engineers and marketing professionals to dedicated rank-and-file factory workers and public-sector advocates. He assembled an ad hoc group of fire community members to help him promote understanding of the detector and resolve concerns among fire and building professionals. The group included fire protection engineering consultant Rexford Wilson, Denver Fire Chief Myrle Wise, and consultant John "Gus" Degenkolb, a retired Los Angeles Fire Department officer. Together they talked up the idea, answered technical questions, and distributed free prototypes of the detector to movers and shakers in the world of fire safety.

Bit by bit, the work began to pay

off. By 1973, the SmokeGard device was taken seriously enough, and by enough influential people, that images of it were included in the *America Burning* report submitted to President Nixon and Congress.

Meanwhile, in Ohio...

As Pearsall labored on his new smoke detector, fire prevention officials in Columbus, Ohio, were sharing their growing concerns over residential fire losses, as well as their hopes for the life saving potential of home fire alarms. I was working as a research engineer at the Ohio State University Building

The affordable, easy-to-install device developed by Pearsall helped make it feasible to retrofit the nation's vast inventory of existing residential building stock with smoke detectors.

Research Laboratory, providing technical support to the Ohio Building Code and conducting fire tests of building construction systems. In 1971, I volunteered to help the Central Ohio Fire Prevention Association arrange demonstration projects for the media and for safety researchers to spotlight the value of home smoke detectors. We were also doing some in situ studies of longer-term detector stability. Sample SmokeGards donated by Pearsall were used for the demonstrations.

Those demonstrations helped convince state officials that detectors were necessary, and in 1971 Ohio became the first state to adopt residential smoke detector requirements into its state building code, as well as its model code for one-, two-, and three-family dwellings. In 1972, I published an article in this magazine, then called *Fire Journal*, that reported on the new Ohio provisions and advocated for widespread use of affordable home fire alarms. "It is hoped that future studies and developments in fire technology will make possible higher levels of protection at less cost," I

wrote. "For the present, however, strong and reasonable efforts must be made to influence public officials, owners, and builders to do more to make the home a safer place in which to live."

One thing led to another. During the demonstration project, I met Robert Lynch, Ohio's state fire marshal, who offered me a job to write the first Ohio Fire Code, which I began in 1972. The new code was issued the following year and included residential smoke detector requirements. I succeeded Lynch as state fire marshal following his retirement in 1974, with authority for the Ohio Fire Code I had written. Not long

after becoming state fire marshal, the White House contacted me, and I was nominated by President Gerald Ford to be the first deputy administrator of the U.S. Fire Administration, a new agency created by Congress in 1974 to implement the recommendations in *America Burning*. I moved to Washington in 1975 after my Senate confirmation hearings.

Pearsall, meanwhile, was making progress. With ample support from national advocates for a low-cost home smoke detector, the Technical Committee responsible for NFPA 74 prepared to take a significant step. In 1972, the standard was amended to allow the self-monitoring battery power feature. The new provisions required an audible trouble signal before the batteries were incapable of powering an alarm, and the trouble signal, or chirp, was required to last for at least seven consecutive days.

Discussions were also underway on modifying the number of detectors required in homes. At the time, NFPA 74 required smoke detectors in the hallway outside bedrooms, as well as

heat detectors "in all rooms, all closets, and in all other areas where fires can occur." These requirements resulted in system costs that were prohibitive for most homeowners. In 1974, Richard Bright, a leading detection researcher at the National Bureau of Standards (now the National Institute of Standards and Technology), estimated a cost of \$700 to \$1,200—as much as \$6,000 today—to protect a typical three-bedroom home. Empirical fire research was beginning to show that smoke detectors alone provided a high rate of return in terms of lives saved versus system costs compared to heat detectors.

The 1972 edition of NFPA 74 acknowledged this by stating for the first time that it "recognizes that the use of partial protection can provide some degree of life safety for sleeping occupants when a basic smoke detector is installed in the immediate area(s) of, but outside of, the bedroom(s)." The 1974 edition of the standard went even further. Bright would later write that it "recognized the fact that smoke detector technology has advanced to the point where the judicious installation of one or two smoke detectors could be more effective than a house full of heat detectors in alerting dwelling occupants to fire."

Final steps

From the start, Pearsall knew retailers would be reluctant to put the SmokeGard on their shelves without a seal of approval from a nationally recognized testing laboratory, which is why he approached Factory Mutual Laboratories (now FM Approvals) in the early 1970s with a proposal to test his smoke detector. In its 136-year history, Factory Mutual had never tested and approved a household product—it worked exclusively on fire equipment for industrial and commercial applications—but FM management took an interest in the Statitrol SmokeGard Model 700. Using a new residential approval category, FM issued an approval for the SmokeGard in 1972, the same year the detector made its retail debut in the Sears & Roebuck catalog at the relatively affordable list

Eureka! Now What?

In his unpublished memoir, *My Life Unfolded*, Duane Pearsall recounts the discovery that products of combustion could be detected by a "kludged together" ion concentration meter—the basis for his development of an affordable, easy-to-install home smoke detector that became the SmokeGard, made by the Statitrol Corporation. The following scene from the memoir includes Pearsall, an engineer and inventor named Lyman Blackwell, and a Statitrol employee who Pearsall identifies only as "Randy." Our thanks to the George C. Gordon Library at Worcester Polytechnic Institute for its generous loan of Pearsall's memoir.



TO OVERCOME the maintenance issue of removing dirt from the [static neutralizer], it was now becoming urgent that we complete the development of a new static neutralizer as quickly as possible. We needed to come up with a test procedure to measure the relative efficiency of the neutralizer output and, in effect, measure the concentration of ions. We could then empirically derive the best configuration for the highest output.

We came up with a test procedure that did much more than address our little company's problem. We embarked on this experimental procedure without any forethought that the outcome would dramatically change the world. But it did.

We set up a small test lab using a fan that blew air across an ion generator to move the ions about eight to ten feet through a duct hanging on the wall. We installed two access doors in the duct four and six feet downstream of the fan. To measure ion densities, Lyman kludged together a number of electronic components into a meter....

The solution to our dirt-building problem was nowhere near as exciting or momentous, however, as the mind-blowing discovery we made during this set of experiments. Lyman had designed his meter so that it measured ion concentrations as a weak electrical current. During repeated test cycles, we often noticed unexplained, erratic changes of the meter signal. Randy happened to be working near the fan inlet. He also happened to be a chain smoker. We suddenly realized that as air entering the fan brightened his cigarette or if he exhaled smoke into the fan inlet, our meter six feet downstream would go crazy. Sometimes it hit zero so hard we could hear the needle click. The smoke particles had absorbed the

ions, and in so doing stopped the flow of electrical current. We then tested several more cycles of the fan, with and without the high-voltage static neutralizer turned on. Inserting smoke under both circumstances, we discovered our test system had detected products of combustion that were so small they were not visible as smoke.

We did not immediately recognize the significance of this new capability to detect smoke at such a low level, but we

Honeywell's commercial division. In looking over the Honeywell display, I noticed they were using a light beam and an infrared sensor across a duct in the return air stream to a central fan system. Joe conceded the system was flawed because smoke particles or dust collecting on either the source of light or on the photocell always contributed to sounding an alarm, making it false-alarm prone. He seemed embarrassed

WHEN HE SAW THE METER GO TO ZERO in the presence of smoke, he exclaimed, "That's what we're looking for! Cut the static crap and develop a smoke detector."

would later look back at this event as, indeed, the point of discovery. It may also be worth noting that Lyman's kludged static meter, when slightly modified, became the genesis of the low-voltage ionization smoke detector....

A few days later, I attended an exhibition and conference held in Denver City Auditorium for school administrators. Pearsall Company, representing Modine Manufacturing Company, was displaying hot water and electric heating units commonly found in school exit ways, entrance lobbies, etc. When the administrators went into private sessions in the morning and afternoon, we had nothing to do but wander through the exhibit booths and see what products our competitors made. By coincidence, across the aisle from our display booth, Honeywell had a display featuring their security system with a smoke detector in a fan inlet. The salesman manning the Honeywell booth was a friend of mine, Joe Reynolds. Joe was in charge of security sales in

to acknowledge the system was not up to Honeywell standards. I suggested that if he wanted to see a real smoke detector he ought to come to our office.

The next day he appeared in the office with an assistant and witnessed our crude test setup. When he saw the meter go to zero in the presence of smoke, he exclaimed, "That's what we're looking for! Cut the static crap and develop a smoke detector."

With that acknowledgement from someone who had spent time in the security industry, including fire, there was an immediate inclination to drop everything in the static business and concentrate on smoke detection. Thus began a long and difficult period trying to develop a smoke detector to meet Underwriters Laboratories' approval....

The development of the home smoke detector began with an accidental observation. From that point on, however, Statitrol would focus on a commitment to perfect a life-saving product every homeowner could afford.



The author (with a SmokeGard alarm) at WPI in 2012, at the dedication of an exhibit honoring Pearsall's work.

price of \$37.88, or a little over \$200 in today's dollars. Underwriters Laboratories tested and listed the SmokeGard in 1974 as a "single-station (battery operated type) fire alarm device" of the combustion products detecting type.

Pearsall was also entering the home stretch in his codes and standards campaign. Early on, with help from supporters, Pearsall had targeted the western U.S. region through the International Conference of Building Officials, and

began adopting the model codes for new construction. Some jurisdictions adopted home fire alarm requirements directly through laws and ordinances without relying on model codes. The affordable, easy-to-install device developed by Pearsall helped make it feasible to retrofit the nation's vast inventory of existing residential building stock. Later, lawmakers ventured into retroactive regulations for existing homes, usually requiring installation

of smoke detectors at the time of a purchase-and-sale agreement.

One of the final obstacles Pearsall encountered came from famed consumer advocate Ralph Nader. In 1976, Nader filed a complaint with the Nuclear Regulatory Commission (NRC), claiming that ionization smoke detectors produced radioactive emissions that were hazardous to the health of people in buildings. The complaint asked the NRC to recall the detectors and ban further sales.

Fire deaths began to decline soon after home smoke detectors hit the market. Thirty years later, U.S. fire deaths had dropped by half, achieving one of the primary goals spelled out in the 1973 *America Burning* report.

in 1973 the Uniform Building Code became the first regional model code to incorporate requirements for smoke detectors in the hallways immediately outside bedrooms. That same year, a Tentative Interim Amendment was issued to the 1973 edition of NFPA's *Life Safety Code* requiring smoke detectors in every dwelling unit, including apartment buildings and one- and two-family dwellings. By 1975, similar requirements had been incorporated into the country's two other regional model building codes, as well as that of the Council of American Building Officials.

Soon state and local governments

Like all ionization smoke detectors, the SmokeGard contained a small radioactive source, americium-241, for the purpose of creating ions in the detection chamber. But the NRC dismissed the claim on the grounds that the radioactive exposure was minimal, a fraction of that experienced by a person in a commercial aircraft during a round-trip flight across the country.

Once the roadblocks had been overcome, Statitrol went into full production. The business grew rapidly, with the workforce expanding to more than 1,000 by 1976. Pearsall sold Statitrol to Emerson Electric in 1977 and shortly

thereafter cofounded Columbine Venture Fund, with the goal of helping other entrepreneurs and inventors advance technological innovations.

The impact of home smoke detectors

I'd gotten to know Pearsall through correspondence and telephone conversations over the years, but I didn't meet him in person until the NFPA annual meeting in Boston in 1980. I'd recently taken a job at Worcester Polytechnic Institute to create a new graduate degree program in fire protection engineering, and we were looking for our first leadership gift to get the fundraising ball rolling. We were introduced by Rexford Wilson, who explained my role at WPI and our need for a leadership gift. Pearsall, sitting next to me on a hotel sofa, promptly turned and said, "Dave, I'll pledge \$50,000."

Even though he hadn't attended WPI—he'd graduated from the University of Denver on the GI Bill after World War II—he would later say that he saw his support of the school as a "means of repaying the industry that brought me success." In that moment, though, I was stunned by his generosity and by his ability to extend the offer without a second's hesitation. In years to come, he would continue to support fire protection engineering education at WPI. Later on, Pearsall and his wife, Marjorie, donated a five-acre parcel of land in rural southwest Denver to WPI, which the university eventually sold for more than \$300,000, all of which was dedicated to the fire protection engineering graduate degree program.

WPI recognized Pearsall with an Honorary Doctor of Science degree in 1996, and in 2004, on the 25th anniversary of its fire protection engineering graduate program, the university awarded him the Presidential Medal for his work as a Technological Humanist. Last year, Pearsall was honored posthumously at the dedication of the Innovators Exhibit at WPI's Gordon Library Gladwin Gallery, where he took his place among the likes of WPI graduates Robert Goddard, known as the father of modern rocketry, and aviation

The Photoelectric-Ionization Debate

WHILE RESIDENTIAL SMOKE ALARMS like Statitrol's SmokeGard have clearly played an important life safety role since they were introduced, the debate over the relative effectiveness of the different detection technologies has continued for years.

The ionization-type SmokeGard may have brought innovations to the smoke detector market when it was introduced in the early 1970s, for example, but it wasn't alone. Photoelectric-type alarms were also being introduced around the same time the SmokeGard debuted, and other ionization-type alarms followed, too. Soon an array of manufacturers were jumping at the chance to sell affordable, easy-to-install, "single-station" detectors to American homeowners, many of whom were newly aware of home fire hazards as a result of media attention around the 1973 *America Burning* report. As the battle in the marketplace heated up, questions arose over which technology was more effective.

Ionization-type smoke alarms have a small amount of radioactive material between two electrically charged plates, which ionizes the air and causes current to flow between the plates. When smoke enters the chamber, it disrupts the flow

of ions, thus reducing the flow of current and activating the alarm. This type of detection is generally more responsive to the invisible particles produced by flaming fires.

Photoelectric-type alarms aim a light source into a sensing chamber at an angle away from the sensor. Smoke enters the chamber, reflecting light onto the light sensor and triggering the alarm. Photoelectric smoke detection is generally more responsive to the visible particles produced by fires that begin with a long period of smoldering.

NFPA's smoke alarm requirements are included in NFPA 72®, *National Fire Alarm and Signaling Code*, which does not specify either technology, with one exception: When the alarm is near cooking appliances, the code calls for either a photoelectric-type alarm, or any type of alarm if it has a hush feature.

Since ionization smoke alarms are generally more responsive to flaming fires, and photoelectric smoke alarms are generally more responsive to smoldering fires, NFPA recommends that both types of alarms, or a combination photoelectric-ionization alarm, should be installed in homes for the best protection. For more on smoke alarms visit nfpa.org/alarms.

pioneer Richard Whitcomb.

Duane Pearsall is on my short list of the most brilliant people I have ever met. A quiet and humble man, he was also profoundly civic-minded. He was a leader in the U.S. Chamber of Commerce and cofounded its Small Business Council. (In 1976, well before the true impact of the home smoke detector was known, he was named Small Business Person of the Year by the U.S. Small Business Administration.) He was frequently invited to speak on small business issues before Congressional committees, federal agencies, and university and business groups.


Pearsall died in 2010 at the age of 88, and to his last day he sought to give back to the community he always felt gave so much to him. And through the development of an affordable, easy-to-use home smoke detector, he also had the greatest impact on fire deaths of any other person I can think of. He would be the first to tell you he didn't do it alone, but it was Pearsall who brought the vision, passion, dogged commitment, resources, diplomacy, and entrepreneurial skills to the cause and made it happen.

Fire deaths began to decline soon after home smoke detectors hit the market. Thirty years later, U.S. fire deaths had dropped by half, achieving one of the primary goals spelled out in the 1973 *America Burning* report, and the per capita death rate had undergone an even greater reduction. It is estimated that that some 60,000 deaths did not occur that would have, had the death rate remained constant over those three decades. While the decline in fire deaths can be attributed to a number of factors, including a reduction in cigarette smoking, there can be little question that the home smoke detector has had a major impact. Over that same period, according to NFPA statistics, the percentage of homes equipped with smoke detectors increased from fewer than 4 percent to 94 percent. Today, self-monitoring battery-powered home smoke alarms can be purchased for less than \$10.

In his memoir, Pearsall writes about the first documented report that a SmokeGard detector had helped save lives in a home fire. It was 1975, and he got a call one morning at his office from Rexford Wilson, whose consulting

company was located outside Boston. Wilson started to tell him the story of a Massachusetts family that had just survived a house fire, but Pearsall interrupted him to broadcast the call over the public address system in the Statitrol plant. As workers listened, Wilson told them that he had a burned and shriveled SmokeGard in his office that had been recovered from a house fire two days earlier. The alarm had sounded in the middle of the night, and a family of three, along with their dog, had escaped. The quality control inspector number, 5602, was stamped on the detector, and Wilson congratulated the employee who'd conducted the inspection.

Pearsall offered a few words of gratitude to his employees over the PA system, he writes, and as soon as he finished speaking, "wild applause followed" from the plant.

That seems like a fitting response to the legacy Duane Pearsall left behind. 

DAVID A. LUCHT was the first head of the graduate program in fire protection engineering at Worcester Polytechnic Institute in Worcester, Massachusetts.