

America burning: a nation wakes up

by Joan Arehart-Treichel

"Put a hibachi in a mobile home, and you have problems."

—Irving N. Einhorn
University of Utah

"Somebody is making a baby bed out of styrene foam, and that stuff burns like mad."

—Lewis Mayfield
National Science Foundation

"Suppose this thing goes off prematurely without a fire being present, and we wet an elderly patient. The doctor is not going to be too happy about it."

—Richard Bright
National Bureau of Standards

It's a blustery, chill day in Baltimore. The city fire department on Lexington Street is jumping. Firemen in the communications room on the second floor answer one fire alarm after another. They promptly dispatch firemen from strategic firehouses around the city.

If an alarm suggests that a fire is of major consequence, with lots of smoke, nurses Berthe (Bert) Hohman and Julia Saculles don helmets, grab their medical bags and drive to the scene. Once the firemen have the fire under control, and provided they don't have to be rushed to the hospital for treatment, Hohman and Saculles take blood samples from them. The nurses return the samples to the fire department. There the samples are picked up and delivered to Johns Hopkins University, School of Hygiene and Public Health, to be analyzed for carbon monoxide content. . . .

This drama, spun out daily for two months now, is "Project Smoke." It is an effort to find out how much CO firemen, and possibly civilians, are exposed to from fire smoke. Project Smoke is one of the many research programs that have sprung up during the past five years or so to learn more about the physics and chemistry of fire, and about fire's impact on the physiology and psychology of its victims. Before that, pathetically little scientific notice was paid to fires.

It's about time. Twelve thousand Americans die annually from fire. Some 300,000 Americans are injured or brutally disfigured by fire. Financial losses from fire run \$11.4 billion a year.

America suffers more deaths, injuries and monetary waste from fire than does any other nation.

There is no simple explanation of why the nation finally woke up in the late 1960's and realized that fires, unlike death and taxes, are *not* inevitable. But some people have ideas why. Says Merritt M. Birky, a fire scientist at the National Bureau of Standards: "In the past the United States was more interested in going to the moon than in creating a safe environment. But things are turning around now. Fire research is attracting top chemists." Says Irving N. Einhorn, a fire investigator at the University of Utah: "We are just beginning to realize that fire safety is one of

emerge from research of the past half-decade is that smoke and fire gases, not burns, are what do people in. "Carbon monoxide, carbon dioxide, heat, smoke and the components of smoke are well ahead of flame," says Einhorn. "This was an eye-opener for us," says B. A. Zikria of the Columbia-Presbyterian Medical Center in New York City.

Carbon monoxide appears to be a major villain. Even at low levels of CO, a person's reflexes and vision are impaired, so that he or she does not respond to the smell of smoke or the sinister crackling of flames. Death from smoke inhalation was dramatically illustrated in a 1970 nursing home fire. The nursing home was only one floor and



the last areas to be done."

Then Congress passed the Flammable Fabrics Act and the Fire Research and Safety Act, which provided impetus and funds for fire research. Today research action is largely centered in the National Bureau of Standards and in the National Science Foundation. The Society of the Plastics Industry, the American Iron and Steel Institute, the Insurance Institute for Highway Safety, other industries are also conducting research to reduce fires.

One of the most important things to

met the latest fire safety codes, but a fire that started in a wastebasket and spread along the carpets produced smoke that filled the entire building. Although the fire was quickly extinguished, the smoke hampered rescue attempts. Thirty-two patients died.

Some 300 gases besides carbon monoxide are present in fires, and some of them also look suspicious. Hydrogen cyanide is emitted when wool or plastics burn, and it joins CO in competing with oxygen for places on hemoglobin molecules in the blood, reports Gwen-



L.A. County Fire Dept.

dolyn Ball of the University of Michigan. The hydrogen chloride in ship paints is a dangerous chemical in ship fires, says J. P. Stone of the U.S. Naval Research Laboratory in Washington.

Most fire deaths seem to take place in residences. Of 101 persons killed in fires, 86 died in homes or apartments, Byron Halpin of Johns Hopkins University reports. And 45 percent of those fires arose from smoking, and 60 percent of that 45 percent were accompanied by drinking. Apparently cigarettes get fires going, and alcohol slows people down. Many fire victims are elderly, and have heart or lung problems.

Even if people escape fires, damage to their lungs may be irreversible. While

workers are trying to develop standards for smoke detectors to be used in residences. They are trying to couple fast-operating smoke detectors to fast-operating sprinkler heads to protect patients in nursing homes. Fire protection in the nation's 20,000 nursing homes is a matter of great controversy (SN: 1/15/72, p. 39).

Turning research results into fire preventatives will be tough. There is a mishmash of fire standards for building materials, home furnishings and clothing. Health, Education and Welfare has its standards, Housing and Urban Development has its standards, Defense has its standards. There are standards at the state and local levels.

think sprinklers are the thing," says Halpin. "Smoke sensor people think smoke sensors are the thing." Sprinklers will put a fire out and save people in other rooms, says Einhorn, but a smoke sensor is most likely going to save a person in the room where the fire starts.

Promising new technology has its own bugs. Suppose a smoke sensor attached to a sprinkler in a nursing home goes off "without a fire being present," Bright conjectures, "and we wet an elderly patient. The doctor is not going to be too happy about it."

Extrapolating research findings to a real fire is risky. A Baltimore fireman suggests that if you have a fire in a high-rise apartment, you should stuff rugs against the door, close the windows, call the fire department and sit tight for firemen to rescue you. But as a fire scientist pointed out, it doesn't always work. He cites a recent fire fatality where a woman stayed in her apartment, and firemen failed to get her out alive. Howard Emmons of Harvard University is trying to develop models that would allow one to predict from the floor plan of a house what the fire hazard will be. But in the opinion of Lewis Mayfield of the National Science Foundation, "this is a very tough task," and the results "will be relative rather than absolute."

Results are encouraging, but much remains to be done. The Commission on Fire Prevention and Control, the nation's first and mandated by Congress, reported out its findings in May. Many of its recommendations—setting up a U.S. Fire Administration and a National Fire Academy; improving fire-fighting and treatment of burn and smoke victims; better understanding flame chemistry and what-have-you—are incorporated into the Federal Fire Prevention and Control Act, which passed the Senate with flying colors on Nov. 2, and is now before the House. What the bill's ultimate fate will be in these days of governmental crises, though, only time will tell.

But one thing is certain: The nation is finally awakening to a monumental and longstanding problem, and many people think science is the best way to counter it. □

Nurses Saculles and Hohman draw a blood sample from a Baltimore fireman (left). The sample is sent to the Johns Hopkins University School of Hygiene and Public Health, where Cynthia Hanson analyzes it for carbon monoxide content (right).



Joan Arehart-Treichel

animals can be treated for exposure to CO, they cannot be treated for exposure to aldehydes (from burning furniture and cotton clothing). The aldehydes combine with amino acids and nucleic acids in lung cells, and destroy them. Presumably people are as susceptible as animals.

Efforts are also being made, largely at NBS, to improve fire department equipment, fire extinguishing equipment and smoke detectors, and to bring about stronger standards for flammable fabrics. Richard Bright and his co-

And "standards," a fire scientist says, "are often politically motivated, since codes often affect the very people who make them."

Fire retardants are a double-edged sword. If they reduce flame spread, they buy time, says Birky. But if they cause incomplete combustion, they can result in dangerous products, Einhorn says.

Devices for detecting and suppressing fires are already on the market, but there are many arguments about which device will do what. "Sprinkler people