



Arie Jan Haagen-Smit

Caltech's Crusader for Clean Air

Six thousand pounds of pineapple flown from Hawaii to Caltech in 1945 started California on the way toward a solution of its air pollution problems.

The pineapple was delivered to Arie Jan Haagen-Smit, professor of bio-organic chemistry in Caltech's biology division, to use in his flavor studies. To obtain basic information about the chemical constituents of pineapple flavor—a study he was doing for the Pineapple Research Institute of Hawaii—Haagen-Smit had to distill the essence from huge amounts of fruit. Several tons of the pineapple yielded only a few grams of the material containing the flavor—a mixture of substances which was then fractionated by physical and chemical processes to

determine its components.

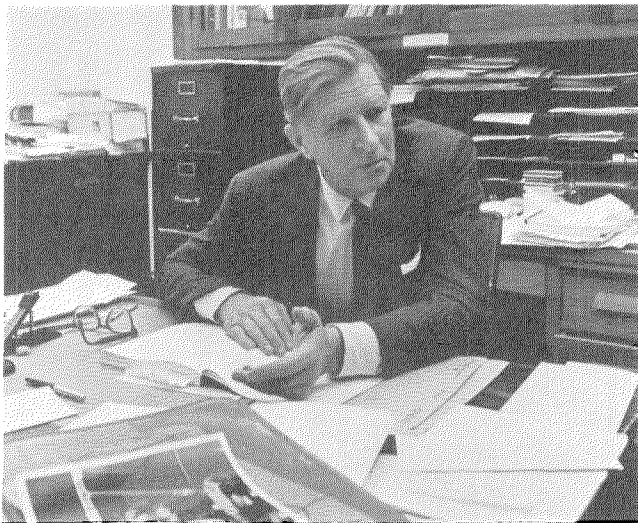
One smoggy day in 1948, when Haagen-Smit was nearing the end of this project, he decided to apply his flavor research technique to the irritating air everyone was complaining about. Starting with several hundred cubic feet of air (an equivalent of the amount a person breathes in one day) he collected a few ounces of condensed smog. This liquid was found to be mostly water containing a number of evil smelling chemicals—aldehydes, acids, and organic peroxides. Although these substances were known to be products of incomplete combustion and known to cause eye irritation, they had never before been reported as significant air pollutants.

Their discovery in smog opened up a whole new field of investigation into the problem.

As a result of this work, Haagen-Smit concluded that the organic material released into the air—mostly hydrocarbons—was oxidized through the combined action of oxides of nitrogen and sunlight. In these reactions plant-damaging, eye-irritating, and rubber-cracking materials are formed.

Continued research clearly revealed that oil refineries and automobiles were responsible for most of the hydrocarbons in the atmosphere. These results were not received with great enthusiasm by the oil and auto industries, though they eventually cooperated to reduce smog. Today, in fact, California refineries are the best controlled in the world. And today most of the automobile plants have impressive projects devoted to the study and control of auto exhaust.

Although the automobile is now considered to be the prime contributor to the hydrocarbons in air pollution, the oxides of nitrogen—the compounds which, through the energy of the light, convert the hydrocarbons to smog—must still be controlled. De-



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bate on this problem has finally resulted in a program of control of its main offenders, automobiles and power plants.

“We have just started to pull a little ahead of the increase in air pollution,” Haagen-Smit says. By 1974 he estimates that 90 percent of the hydrocarbons, 75 percent of the carbon monoxides, and 75

percent of the nitric oxides from new cars will be eliminated. By 1980 about 60 percent of the total wastes from stationary and moving sources should be controlled.

“But control will always be marginal,” he says. “It’s always going to be an uphill fight.”



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He is afraid that far too many people think smog will disappear the day cars have effective pollution control devices. At best, he thinks, we can only bring pollution levels down to where we can live comfortably with them. But even this means long-range city planning—including green belts and transportation systems that get people to and from work easily and cleanly. Regrettably, he sees little evidence that this kind of planning is under way.

Haagen-Smit’s patient crusade (one friend refers to him as a combination of Old Dutch Cleanser and St. George) has finally elevated him to a position where he has some might behind his right. In 1968 Governor Reagan appointed him head of the air resources board which coordinates all air pollution control in California; he has an executive officer and staff of about 100, with offices in Sacramento, Berkeley, and Los Angeles.

“I’ve turned from the test tube to the telephone,” he says.

Haagen-Smit was born in Utrecht, Holland, in 1900, the son of a chemist. He received three degrees—his AB, AM, and PhD—from the university there and then joined the faculty. His work on the isolation and synthesis of plant hormones gave him

an international reputation among plant physiologists and brought him an invitation, in 1936, to lecture for a year at Harvard, and another invitation from Caltech's famous geneticist, Thomas Hunt Morgan, to join the Caltech biology division in 1937.

At Caltech Haagen-Smit continued his investigations of the structure, determination, and synthesis of naturally occurring compounds—returning to a project he had begun while working on his doctorate—the analysis of essential oils. From that work he moved to his flavor studies, and thus, eventually, to smog. He has been involved with smog ever since.

Much of his time in recent years has been taken up interpreting his findings and their ultimate meaning to the public, who will have to pay for smog control remedies; to special interests, who are afraid that any change in procedures will lose them profits; and to politicians, who hope to keep both groups happy.

He has a fat file of letters containing suggestions about siphoning the smog through a big tunnel cut through the mountains, or creating a system of gigantic fans to disperse it, or building a vast overhead sprinkling system to water down the air. One

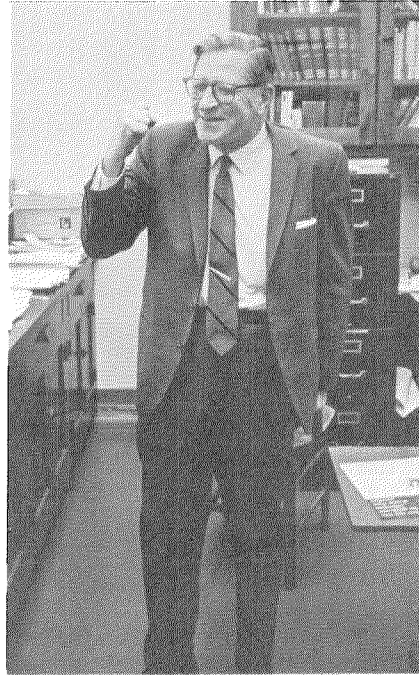


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correspondent writes to explain to him that the air is turning dead and, as it does, “people are trapped into a strange, hypnotic psychiatric state.” He cites

times and places and wants Haagen-Smit to do something about it. Another writes:

“I fraugh with contempt for all academic supposed know-how. You have refused to acknowledge the fact that it is hydrogen sulphide gas which be-



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comes sulphuric acid mist. This comes from the sewer main lines and garbage . . . It is very gratifying to see you people missing the boat.”

Haagen-Smit's name has inevitably come to be bracketed with the word smog to most people, but he also continues his interest in all aspects of growing things. He is president of the board of the Los Angeles County Arboretum Foundation, and looks forward to being able to spend more time with it after his retirement from Caltech in 1971. He likes to go on long river trips with fellow Sierra Club members and is a devoted nature photographer. Since 1966 he has directed Caltech's Earhart Plant Laboratory, and is known around the campus for his surprise gifts of orchid varieties he grows there and at home. And he enthusiastically plays caretaker to several aquariums of fish and plants in the biology buildings.

But smog is still his chief concern.

“You know,” he admits, “if I look at the daily graph to see how much smog is in the air, I feel a twinge of disappointment when there's just a small amount.”