PHYSIOLOGY-BOTANY

Pollinosis

You May Not Recognize That Name, But You Or Your Relatives and Friends Know It as Hay Fever

By DR. FRANK THONE

RAGWEEDS ripen by the hour. Already their time of blossoming has begun, sweeping in a great wave from the Canadian border to the Gulf, during the weeks from early August until late October. Sneezes and redness of eye sweep in a great wave with the wave of blossoming; for the air will be full of their pollen grains, which to most hayfever sufferers are objects of dread worse than the germs of any plague.

True, there has been hayfever in the land already, ever since the first days of spring. From frost to frost there is always pollen of some kind in the air, and many persons are sensitive to some of the early pollens, especially certain tree pollens, grass pollens, and the pollen of the narrow-leaved plantain.

But there are more sufferers from ragweed pollen than from all other kinds put together. So traditionally hayfever season is the same as ragweed season.

It seems strange, at first glance, that of all the scores of thousands of kinds of pollen, the grains from just one genus of plants should be singled out to bear such a curse. But a little closer look at the situation at least partly clears up the mystery.

Must Be Sensitized

To begin with, no susceptible person begins sneezing the moment he is first exposed to a pollen species. He must first be "sensitized" by getting a considerable dose into his system, under the right circumstances—which are by no means fully understood as yet. After that, very small subsequent doses will serve to set him off.

That being the case, it would follow that the kind of pollen most abundant in the air, for the longest time, would have the largest probability first of sensitizing the most victims and then of finding them on subsequent occasions and causing them to suffer.

Ragweed fits into this hypothesis like a hand into a glove. It is an exceedingly abundant weed, and its pollen production per plant, and per acre of infested land, is simply terrific. One specialist in the problem of hayfever pollens, Oren C. Durham, gives in his new book, "Your Hay Fever," an estimate of one million tons a year as the American ragweed pollen crop. Actual ragweed pollen counts from most American cities outnumber all other pollens added together by ten to one. Small wonder that this one kind of pestiferous dust should find, sensitize, and persistently torment so many victims!

Yet the picture is not quite so simple as all that. The hayfever importance of a given kind of pollen is not in direct proportion to its abundance in the air. Some kinds of air-borne pollens, pine for example, are exceedingly abundant at certain seasons; yet there are relatively few sufferers from pine pollinosis. Your pollen must not only be abundant, it must have a specific "cussedness." Pollen grains are like bacteria in this, at least: some of them are both abundant and vicious, while others may be equally abundant yet have no harm in them.

May Be Hereditary

Finally, not everyone is susceptible to the action of pollens. Susceptibility is a great mystery still, for all the scientific scrutiny that has been bent on the question. However, there does seem to be something hereditary about it, at least in some families. If your ancestors had hayfever, you may possibly become a victim. If you come of a hayfever-free stock, you may escape. But lest you jump at the conclusion that it's all like the old-fashioned doctrine of predestination—that you were either damned or saved from the hour of your birth, and nothing you could do could change it—it must be hastily added that this hayfever-heredity doctrine is not a dogmatic certainty, either. Maybe we'll know, some day; just now we know only in part, and so can prophesy only in part.

The whole story of hayfever and its relation to pollens of various kinds is too long and complex to tell in one short article. Books can be written about it. They have been written: the one by Mr. Durham, just mentioned, makes hayfever interesting and even exciting reading—except possibly to victims during their time of suffering, when nothing can possibly be interesting, except the prospects of an early frost. Another excellent book, also just off the press, is called simply "Pollen Grains." It is by Dr. R. P. Wodehouse, who directs a hayfever laboratory maintained by one of the great chemical companies. This second book goes into considerable detail on other scientific angles besides the hayfever one.

Essential to Life

For there is a lot to pollen besides hayfever. Most of us realize that, of course. We all know that all common plants (except ferns and mosses) produce it, and that it is carried from flower to flower, to make possible the production of seeds and fruits. And since all of us are dependent on plants for our continued existence, it can validly be argued that pollen is an indispensable link in the chain of life—even to hayfever victims who feel that the pesky dust is going to be the death of them.

There has been a vast deal of very bad natural history spilled into the air about pollen, particularly by nice, well-

TALL

Giant ragweed does not belie its name. This is only average height.

SOME PICK IT

Harvesting low ragweed from a thick-grown weed patch. The pollen will be carefully gathered in the laboratory, and used in the preparation of an extract for hayfever prevention.

intentioned people instructing children in what their own euphemism terms "the facts of life." The pollen grain is not the exact analogue of the male germ cell in animals and human beings, and it does not fertilize the flower and start seed production by the simple act of falling into it or being carried in by an insect. It is not so simple as all that.

How It Happens

When a pollen grain is left on exactly the right place on the tip of the pistil of a flower (botanists call it the "stigma"), the living protoplasm within the grain breaks through the thin, horny outer coat and starts to grow down through the tissues of the pistil, like an exceedingly fine little root growing down through the soil. Drawn by an irresistible chemical guide, this "pollen tube," as it is called, approaches the female germ cell, or egg nucleus. Then, and then only, is the male pollen nucleus released, to unite with the egg cell; and the new combined nucleus begins the long process of divisions and development that finally result in the curled-up little plant embryo within the seed, and in the little packet of reserve food stored in or around it. These are, in shorthand outline, the essential facts about pollen action—a subject, again, on which thick books have been written.

Once a pollen grain gets to the stigma of the flower, its action is fairly dependable. The critical job is getting the pollen across the gap—sometimes only the fraction of an inch, sometimes miles—that separates the pollen-producing flowerpart, or stamen, from the female or seed-producing organs.

We have all heard the fascinating story of cooperation between insects and flowers: how the flower baits bees, butterflies, even beetles and flies, with bright colors, sweet scents, and the reward of nectar to eat, and how they then unwittingly carry the fertilizing grains on their hairy bodies to other flowers.

This is a really economical way of dealing with the problem of pollen transfer, and flowers that thus depend on insects do not need to produce so much pollen. What they do produce, however, is of a special kind, with large, heavy, usually sticky grains, so that they will adhere the better to the coats of the insects.

In Orchids

Tropical orchids reach the ultimate limit in this kind of thing: they produce all their thousands of grains lumped together into two large, sticky masses, which a special trigger apparatus slaps against the side of the visitor (sometimes a hummingbird instead of an insect!) to be carried to the next orchid and there picked off again by an apparatus just as specialized.

At the opposite extreme from this all-eggs-in-one-basket system of the orchids is the method of all the plants that figure in the hayfever situation. These produce millions of times as many pollen grains as ever will find their tiny living targets, and simply throw them into the air for the wind to carry like any other dust. It is the barrage system, in which only one missile in millions ever hits anything important.

Wasteful But Effective

Like the barrage system of artillery fire, wind pollination is exceedingly wasteful, yet exceedingly effective. The world's most successful plants use it. No one can deny that the ragweeds are successful—from their own point of view, whatever might be said from ours. The great forests of the world—pines, spruces, oaks, beeches, practically all nut trees—are wind pollinated. Finally, and most important for us, the whole great grass family, which includes everything from lowly pasture grass through the grains to the towering bamboos of the tropics, depends on the wind to carry its pollen. Thus we depend on wind-pollinated plants for our daily bread, butter and meat, for our houses and at least some of our fuel, for the very paper you are reading at this moment and maybe for some of the rayon garments you are wearing.

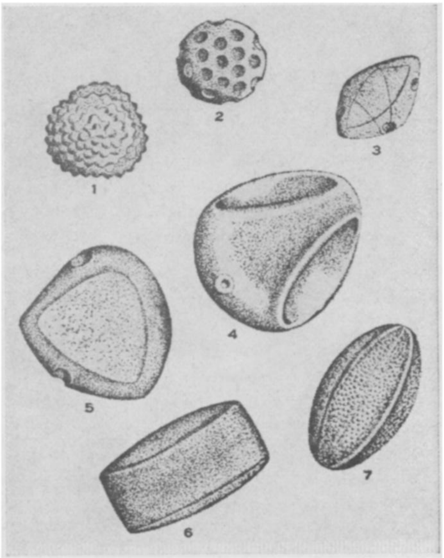
There are other ways of distributing pollen, too: some water plants, for example, set their pollen adrift on the water instead of casting it into the air. But the major means are either insects or air currents.

Wide Range of Size

Naturally, pollens that perform in so many different ways have many different shapes and sizes. The range of size alone is very great; an array from giant grains like those of the cucumber family down to the midgets of the family, like those of the ragweeds, reminds one a little of a size-scale chart of the planets, from giant Jupiter down to midget Mercury.

Pollen grain shapes may be thought of as all based on a sphere. Many of them retain that shape—simple smooth round objects like a child's play-ball in miniature. Others have been pulled out into torpedo- or cigar-shapes, or squashed flat into drum-shapes, or dented in as a soft rubber ball can be deeply creased with the fingers. Many, perhaps most, are marked in various ways: the ragweed pollens have innumerable little warts all over them, Russian thistle pollen is pitted like a golf ball, muskmelon pollen is studded with little points or prickles.

Size in pollen grains is highly important. For successful wind pollination, as a rule the grains must be quite small.



HOW IT LOOKS

These are pollen granules, very highly magnified. 1. Common Ragweed. 2. Russian thistle. 3. Hemp. 4. Corn. 5. Hickory. 6. Oak. 7. Sagebrush. (From Durham's "Your Hay Fever")

The bigger the grain the more rapidly it will fall through the air. So we find the smallest pollens are the most abundant in the air: ragweed, practically all the grasses, most of the hardwood trees.

The wind-borne pollens of pines and other similar evergreens are an exception to this rule. They, however, achieve buoyancy through another mechanism. Their moderately large grains are each equipped with a pair of hollow air sacs, that look very much like waterwings, and perform in the air very much as waterwings do for timid swimming pupils in the water.

Wind-pollination, for all it seems a hit-or-miss (usually miss) method, must not be for that reason only thought of as a mark of primitiveness in plants, or a sign of low place on the evolutionary scale. True, hardwood trees are usually assigned a spot near the bottom of evolutionary lineups among plants, and orchids, which are as far removed as possible from wind-pollination, are set at the top of their particular division of the plant kingdom. But grasses are also rather advanced plants, evolutionally speaking; and the most prolific of all wind-pollinators, the pesky but successful ragweeds, are composites, and thus among the very aristocracy of plants. They are, indeed, unacknowledged but close cousins of the sunflower—which at least one of our great political parties will tell you without hesitation is the noblest of all vegetables.

Science News Letter, August 15, 1936

ASTRONOMY

Radio Data From Eclipse Seem Unlikely To Be of Much Value

HOPES that radio observations of the recent eclipse of the sun on June 19 in Siberia would be highly valuable were dimmed when scientists at the National Bureau of Standards revealed results of experiments made in Washington during the eclipse period. Although few people realized it, a great magnetic storm struck the world just before and during the eclipse.

Despite general cloudiness and other unfavorable weather conditions, which ruined the visual and photographic observations of many eclipse expeditions from the United States and other nations, it was generally felt that the radio observations would be successful.

There was world-wide cooperation on the radio tests on the recent eclipse. While scientists on the eclipse path were taking their observations of the reflections of radio signals from the ionizing layers miles above the earth's surface, scientists S. S. Kirby, T. R. Gilliland, N. Smith and S. E. Reymer in Washington took similar measurements which were to establish the normal pattern of the world's radio "roof" half way round the world. Thus, it was hoped, the effect on the layers of the moon's shadow due to the eclipse could better be ascertained.

What decreases the hopes that the eclipse radio observations will be of value is the discovery that on the two days preceding the eclipse, the eclipse day itself and the following day, the ionizing layers indicated a severe magnetic storm which made the whole world picture a greatly abnormal one.

Even if the actual observations in the eclipse zone are different from the usual pattern it will be difficult to estimate just how much of the abnormality was due to the solar eclipse and how much was due to the known magnetic storm.

The National Bureau of Standards observations, just reported (*Physical Review*, Aug. 1), mark a new step in what should become standard practice in future eclipse studies with radio.

While the effect of the sun's eclipse on the reflecting layers has been observed before in the actual eclipse zone, there has previously been no attempt to learn what were the normal world-wide conditions and to use this knowledge as a check against the eclipse readings.

Science News Letter, August 15, 1936

PSYCHOLOGY

Fatigue on the Road Increases Accident Risks

TO THE experienced automobile tourist, rolling along a smooth highway for something like seven hours in a day is a simple matter. If he has stopped for a generous lunch and another time or two to stretch his legs and pick up a snack to eat or drink, he probably does not even feel tired.

Psychologists tell us, however, that this man is not mentally as efficient as he was at the start of his drive in the morning. Eye and hand do not work together with the same accuracy that they did. Vision is not so keen. It takes him longer to think. In short, temporarily he is what insurance men would call a "poor accident risk."

Details of psychological tests given to drivers at the beginning and the end of a day on the road are made public in a report by Drs. A. H. Ryan and Mary Warner, of Chicago, Ill., to the *American Journal of Psychology*.

Driving requires, among other things, fine discriminations through the eyesight and the muscular sense, sustained attention and complex movements, the scientists explain. Tests which would measure exactly these same abilities in the laboratory were chosen as a means of checking up on the efficiency of the drivers taking part in the experiment. Ability to keep the attention on a task was scored by means of a test of mental addition and another which required the calling off of the names of some 1,200 different colors. Other tests included measures of eyesight, steadiness on the feet, reaction of the skin to pressure from a blunt instrument (an index to action of the blood vessels) and coordination of the eye with the hand.

A decidedly lowered efficiency on the part of the driver was revealed by these tests given after the long drive when the results were compared with per-