not complete; not even Miss Carson can point to a single sizable sprayed area where "no birds sing."

To answer insistent complaints, the National Academy of Sciences sponsored a careful study of pesticide damage to wildlife. Its conclusion: the damage, though always regrettable, is not disastrous, and the damaged wildlife population generally recovers in a few years. Sometimes it may be necessary, remarks the Academy, to choose between elms and robins, both of which have their partisans.

Insect Paradise. Lovers of wildlife often rhapsodize about the "balance of nature that keeps all living creatures in harmony," but scientists realistically point out that the balance was upset thousands of years ago when man's invention of weapons made him the king of beasts. The balance has never recovered its equilibrium; man is the dominant species on his planet, and as his fields, pastures and cities spread across the land, lesser species are extirpated, pushed into refuge areas, or domesticated.

Some species, most of them insects, benefit increasingly from man's activities. Their attacks on his toothsome crops are as old as recorded history—the Bible often refers to plagues of locusts, cankerworms, lice and flies—but their damage was only sporadically serious when population was small and scattered. Modern, large-scale agriculture offers a paradise for plant-eating insects. Crops are grown year after year in the same or nearby fields, helping insect populations to build up. Many of the worst pests are insect invaders from foreign countries that have left their natural enemies behind and so are as free as man himself from the check of nature's balance.

Agricultural scientists try hard to find ways to check insect pests by tricks of cultivation. They import the ancient enemies of invading foreign insects and foster the resident enemies of native pests. They are developing bacterial diseases to spread pestilence among insect populations. Because these tactics alone are seldom enough to protect the tender plants of modern, high-yield farms, the use of insecticides is economically necessary. Tests run by the Department of Agriculture show that failure to use pesticides would cost a major part of many crops; a 20-year study proved that cotton yields would be cut by 40%. Production of many kinds of fruit and vegetables would be impossible; unsprayed apple trees, for instance, no longer yield fruit that is sound enough to be marketed.* Potato fields swept by the Colorado beetle or late blight (the fungus that caused the great Irish potato famine of 1846) yield hardly any crop.

A Quandary of Surpluses. Chemical insecticides are now a necessary part of modern U.S. agriculture, whose near-miraculous efficiency has turned the ancient tragedy of recurrent famine into the biologically happy problem of what to do with food surpluses. Says Entomologist George C. Decker of the Illinois Agricultural Experiment Station: "If we in North America were to adopt a policy of 'Let nature take its course,' as some individuals thoughtlessly advocate, it is possible that these would-be experts would find disposing of the 200 million surplus human beings even more perplexing than the disposition of America's current corn, cotton and wheat surpluses."

Many scientists sympathize with Miss Carson's love of wildlife, and even with her mystical attachment to the balance of nature. But they fear that her emotional and inaccurate outburst in *Silent Spring* may do harm by alarming the nontechnical public, while doing no good for the things that she loves.

* In the smaller orchards of prespraying days, fruit had a better chance to escape heavy insect damage, and since quality standards were lower, moderately damaged fruit often went to market.

APOLLO SPACEMEN*
To ring around the moon, a skull full of skills.

SPACE

Nine More Astronauts

As the U.S. space program raises its horizons, new and younger men are needed to perform the difficult tasks that deeper space exploration demands. Last week in Houston the National Aeronautics and Space Administration unveiled its second batch of astronauts—nine young spacemen on whose shoulders will ride much of the success of the U.S. race to the moon. Since they will be national heroes as well as hard-working technicians, it is only fitting that all are handsome, married (average: two children), and with good backgrounds and college educations. They are slightly younger than the first batch (32.5 *v.* 34.5 for the older group when selected) and for the first time include civilians—two of them.

Behind their pleasant façades are impressive records of experience and achievement. All were test pilots with an average of 2,800 flying hours each, 1,900 of them in jets. Four are Air Force pilots, three Navy; the two civilians came from NASA and General Electric. They were selected from 253 applicants over a period of many months. Sixty-three lasted through the initial screening, and 32 of those were selected for elaborate mental and physical testing. One was eliminated at this stage as too tall (maximum allowable height: 6 ft.), and 31 went to Houston for the finals.

The new astronauts will begin their training on Oct. 1. The first phase will be catching up with the Mercury program, but they will not be trained as pilots of the Mercury capsule. As potential Gemini and Apollo pilots, who may rendezvous around the moon or even land on it, they must learn esoteric subjects—including computer theory and celestial mechanics—that have to do with active space navigation. Their capsules will maneuver more or less freely, changing their orbits and trying to join other orbiting objects. The new astronauts will carry along their own propulsion systems and navigation instruments, and will wrestle with the strange and complicated forces that govern the motion of bodies in space. Thus, the brains of the nine young spacemen will have to contain knowledge and skills that have never before been crammed into a human skull.

* Left, rear: Neil A. Armstrong; Lieut. Commander John W. Young, U.S.N.; Captain James McDivitt, U.S.A.F. Second row: Elliot M. See Jr.; Captain Thomas P. Stafford, U.S.A.F., Captain Edward H. White II, U.S.A.F. Foreground: Lieut. Commander James A. Lovell Jr., U.S.N., Lieut. Charles Conrad Jr., U.S.N., Major Frank Borman, U.S.A.F.