creased by 70 percent during this period. Fifth and subsequent births have also increased somewhat in recent years and are likely to continue upward for the balance of the decade, although there is little likelihood that the rates for these birth orders will return to the levels of the 1920's.

Second births increased almost without interruption from a low point in 1933 to a peak in 1952. Although the rate has fallen off somewhat, it still is at an unusually high level—one-third above the rate in 1940, and about one-eighth higher than in 1920. In 1945–55 the number of families that had a second child exceeded those that had a first child—a situation which is probably without precedent in our history.

At the other end of the scale, the Metropolitan Life Insurance Company statisticians report that the proportion of older people has been increasing for more than a century, slowly at first and more rapidly in recent decades. The proportion of population at age 65 or older is 8.6 percent, or about one in 12. In 1900 only 4.1 percent of all Americans were in this age group.

According to the Population Reference Bureau, Inc., for the third consecutive year the number of births in the US has totaled more than 4 million. This rising tide of births will soon add further to the mounting school enrollment figures. For the three years from October 1953 through October 1956, kindergartens and elementary schools had to expand enough to take in an extra million children each year. The Census Bureau finds that the total increase for those three years was 3,119,000. The big increase in school children is still to come. Kindergarten enrollment went up 82 percent from 1950 to 1955. Between 1950 and 1955, the number of children who are 5 years of age or under jumped from 14,184,504 in 1950 to 18,305,000 in 1956, an increase of 4,120,496. The number of children in elementary schools increased by 24 percent, and high-school enrollment rose only 19 percent.

## Uranium Production

The Atomic Energy Commission has disclosed for the first time statistics concerning uranium ore reserves and uranium mining and milling operations. The information, which was limited to production since 1 July 1955, was authorized by the commission's revised declassification guide.

The uranium ore reserves still in the ground on 1 Nov. 1956 were estimated in millions of tons as follows: New Mexico, 41; Utah, 7.5; Colorado, 4.1; Arizona, 2.6; Wyoming, 2.3; Washington, 1.5; and others, 1. The total is 60 million tons.

The uranium ore mined during the period from July to December 1955 was 840,000 dry tons; from January to June 1956, 1.34 million dry tons; and from July to December 1956, 1.66 million dry tons.

The amount of uranium concentrate milled from the raw ore doubled this last year, the yield of concentrate from the crude ore averaging about ¼ of 1 percent. At the beginning of 1956, uranium concentrate was produced at a rate of about 4000 tons per year; at the close of the year the rate was more than 8000 tons per year. Specifically, uranium concentrate milled during the period from July to December 1955 was 1600 tons; from January to June 1956, 2600 tons; and from July to December 1956, 3400 tons.

At present, 12 uranium mills are in operation in the United States. All are privately owned with the exception of one AEC-owned plant. The total private investment is established at $50 million, with a total daily capacity of 8960 tons. Eight more mills, representing an investment of about $35 million and a rated daily capacity of 4025 tons, are scheduled for completion in 1957 or early 1958.

## Randomized Cloud-Seeding Experiment

A recent decision of the Board of Supervisors of Santa Barbara County, Santa Barbara, Calif., to finance a randomized cloud-seeding experiment provides an unusual opportunity for studying the effects of silver iodide smoke, produced by ground generators, on storms passing over mountainous areas. It appears that this will be the first randomized experiment conducted in the United States using ground generators of silver iodide. Also, because of possible complications with lawsuits for damages and the consequent reluctance of public agencies to conduct cloud-seeding experiments on their own, it may be quite some time before another experiment of this kind is organized. In the past there appear to have been only two randomized cloud-seeding trials, those conducted by the U.S. Weather Bureau and by the University of Chicago meteorologists and statisticians. However, these trials involved seeding from aircraft.

During the decade that has elapsed since the discovery of techniques for artificially nucleating supercooled clouds there has been a large amount of effort expended to secure an answer to the question, "Does cloud seeding produce significant increases in precipitation?"

Several years ago the Division of Water Resources of the Department of Public Works of the state of California conducted an investigation of this subject, particularly in relation to the widespread commercial cloud-seeding operations in California. With the help of the Statistical Laboratory of the University of California, it was established that no clear-cut answer to the question of the efficacy of the cloud-seeding operation is available and that none can be expected until a special, so-called "randomized," experiment is performed.

In order to understand this pessimistic conclusion one must take into account that, according to the opinion of professional meteorologists, not all storms are suitable for seeding and only a part of them are actually seeded. Also, in order to judge whether or not the seeding is effective, one must have some sort of standard of comparison, such as, for example, the amount of rain fallen from the same storm in a comparison area, presumably not affected by seeding. In these conditions, even if the comparison between the rain in the target and in the comparison areas appears favorable to the conclusion that seeding is beneficial, there is always the question of whether or not the observed excess of rain in the target is the effect of seeding or a mark of success of forecasting.

In fact, the meteorologist engaged in cloud seeding may be expected to be able to identify among the approaching storms those that will deposit in the target relatively more rain than the others. Then, if only those more promising storms are seeded, the comparison with any preassigned standard would tend to indicate a positive effect of seeding, even though the actual effect of this operation is minute or nil.

This difficulty of distinguishing between the success of forecasting and the success of seeding can be avoided by performing a randomized trial. The meteorologist engaged in weather modification is allowed to select at will the opportunities for seeding. Once such an opportunity is identified, a random experiment is performed: for example, a coin is tossed. If the coin falls heads then the actual cloud seeding begins, but not otherwise. However, the observations of the rainfall are conducted on all seeding opportunities, both those seeded and those not seeded. Then, with a sufficiently long series of observations, the comparison between the seeded and not seeded storms allows a definite conclusion regarding the effectiveness of seeding as such, free from the possible effects of forecasting.

For quite some time appeals for a randomized experiment went unheeded. On the one hand, the communities that paid for cloud seeding (and they were those that believed in the effectiveness of these operations) were reluctant to let about one-half of the seeding opportuni-