24 × 50-mm. rectangles come off as fast or even faster than 18-mm. circles unless the long ones are overlapped by a label which is not entirely immersed in the caustic.

The slides must not be in contact or else the hot caustic cannot penetrate between them. If any cover slip does not drop off in two minutes, it can readily be shoved off with the edge of a slide.

When all cover slips and labels have fallen off, the beaker is left over the flame for about a minute or two longer, the slides are released from the spiral, the caustic soda is poured off into the spare beaker, and another set of slides in a holder is set to soak. In the meantime the beaker with slides and cover slips is held under a gentle flow of hot water in the sink. The hot caustic soda apparently saponifies the esters in the Canada balsam, and the hot water washes it all away, leaving both slides and cover slips beautifully clean. If any balsam remains adhering to the glass, it can usually be washed off between thumb and finger under the tap; occasionally an obstinate one must be dropped back into the hot caustic to soak.

By the time one has carefully washed 10 slides and their cover slips between thumb and finger under the tap and dried and boxed them, the next series of 10 is ready for washing. It is therefore unnecessary to have a larger setup.

A more convenient method than the one outlined above, would be to have a wire-gauze box of copper or stainless steel with a spiral or slotted holder on top, so that the whole thing could be suspended in a large beaker of caustic and the box and its contents lifted out instead of having to pour the alkali from one beaker to another. In the method just described, additional caustic solution has to be added from time to time to the beaker over the flame to make up for the amount washed away under the tap. This periodic addition of new solution seems to keep up the effectiveness of the hot bath, which does not become saturated and therefore impotent until many slides have been cleaned.

Solutions of 10, 15 and 20 per cent have been tried. The 10-per cent solution seems to work as well as the stronger ones. Leaving slides to soak overnight, or even for days, in cold caustic is quite ineffective and seems to render the balsam somewhat resistant to saponification when the slides are finally placed in a hot solution.

Letters to the Editor

Sources of Our Future Scientists

Vannevar Bush, Director of OSRD, has estimated in his recent report to the President (*Science, the endless frontier*) that the deficit of those who would have received a bachelor's degree in science or technology had reached 150,000, and that by 1955 there would be a loss of 17,000 who would otherwise have been given advanced degrees.

There is, however, one important element in the supply of future scientists which he did not consider. This is the source of the hereditary material, the necessary biological counterpart of the favorable educational environment which he discusses. All recent studies of this indispensable prerequisite for future scientists are alarming, indicating as they do that for the past century our most educated groups have failed to bear enough children to replace themselves. These studies have, of necessity, been based upon the ability to acquire a given amount of education, usually that represented by a college degree. For economic reasons, this test does not include all who might have become graduates, but it does indicate an intelligence level well above that of the average in the country. While there will obviously be exceptions, it seems fair to assume that the average scientific ability of the offspring will also be high, and that the surroundings and mental stimulation to which these children will be exposed will be favorable for the production of scientists.

While graduates of Yale in the early 1700's had averaged about 5 surviving children each, this record steadily decreased. For the classes graduating about 1825, 3.5 children were born to each graduate; for those graduating in the decade from 1870 to 1880 from Harvard, Wesleyan, Syracuse, and Yale, the children were well below the number necessary for replacement. For the Harvard classes of the 1890's, they had fallen to 1.45 per graduate. To secure later information, the writer has made a study of the five most recent Harvard classes to have issued their 25-year reports (The deficit in the birthrate of college graduates. *Hum. Fertility*, in press). These give statistics collected at a time when their families are nearly complete. A more favorable trend was found, with 1.67 children per graduate, but the offspring are still distinctly below the replacement level. Furthermore, it may be only a transient increase, since reports of the classes of 1931 and 1936 disclose that in the early years after graduation, their children were only 77 and 62 per cent of the per-capita rates of 1916 to 1920 for the same periods.

Ominous figures are also found in the recently published volume of the U. S. Census Bureau (*Population, differential fertility 1940 and 1910, women by number of children ever born.* 1945). Women included in the 1940 census, aged 45 to 49 and with less than 4 years of schooling, reported an average of more than 4 children each. As the amount of education increased, this number fell until for high school and college graduates it was 1.75 and 1.23, only 77 and 55 per cent of the number of children necessary for the replacement of the parents. The Census Bureau estimates that for one son per father (or daughter per mother) to survive to the age at which his father (or her mother) was enumerated, 2.22 children must be born. With the better than average care given by college graduates, the number is somewhat less than this for that group.

To determine the extent of this loss of an important national resource, a study of the numbers of children born to the graduates of other colleges seems of value. The Population Reference Bureau, 1507 M St., N.W., Washington 5, D. C., has, therefore, planned a nation-wide intercollegiate comparison of these birth rates. Questionnaires have been offered without charge to those wishing to assemble the needed information from the classes of 1921 and 1936, the twenty-fifth and tenth reunion classes. The earlier class was chosen because few children are to be expected after this date; the later class, to indicate the more recent trend.

Sixty-six colleges, with about 26,000 students in these two classes, have asked for the questionnaires. The results should give valuable information regarding the sources from which our future scientists may be expected, and the degree to which our present educated groups are replacing or failing to replace themselves.

CLARENCE J. GAMBLE, M.D.
255 Adams Street, Milton, Massachusetts

B-Glycoside Formation in Plants From Absorbed Chemicals

The letter by E. G. Beinhart (*Science*, 1946, 103, 207–208) with reference to the absorption of the vapors of phenols by plants is of interest in calling attention to the relative ease with which absorption and retention of non-naturally-occurring organic compounds may take place. Experiments conducted several years ago by the writer (see, for example, *Science*, 1940, 92, 42–43, and *Contr. Boyce Thompson Inst.*, 1943, 13, 185–200) showed that various chemicals containing an alcoholic or phenolin hydroxyl group were readily absorbed from nutrient solutions (and in several cases, inadvertently from vapor in the air) and combined within the plant with sugars to form β-glycosides. Such a biosynthesis of glycosides seems to take place quite generally among higher plants, and it appears likely that the phenols with which Beinhart's article is concerned were fixed within the plants as β-glycosides. This would explain the persistence of the flavor and the lack of off-flavors in the root crops (carrots, beets, and potatoes), since these glycosides do not seem to move readily from one organ of the plant to another.

In view of the stability of these β-glycosides within the plant it follows that the presence of relatively small amounts of chemical in the air over a long period of time could result in the building up of appreciable concentrations of foreign β-glycosides in the edible portions of plants. The hazard is thus much greater with chemicals that undergo this or similar reactions than with those that are not fixed by the growing plants.

LAWRENCE P. MILLER
Boyce Thompson Institute for Plant Research, Inc.
Yonkers 3, New York

On Recognition of High School Science Training

Charles A. Gramet's letter on High School Science (*Science*, 1946, 103, 149) brings up a point on which I can report two observations, one personal and one professional, but both illustrative of the serious influence which the college attitude toward high school science has on a student's planning of his academic work and his preparation for gainful employment.

In 1916, when I was 12 years old, my father followed the rather unusual expedient of arranging for me to spend a summer term studying chemistry in company with a friend of the same age. At the conclusion of this term our instructor informed our parents and the school authorities that we had quite satisfactorily completed the equivalent of a rather stiff first term of senior high school, or first year college, chemistry.

Later, because I was interested and did not mind the duplication of the first term of work, I took a full year of chemistry in my senior year at East High School, Rochester. With no further training in chemistry I carried out some work in my father's anatomical laboratory which required careful chemical manipulation; I held a job for nine months as an assistant to a photochemist in the Eastman Kodak Research laboratory; and I later did considerable writing on subjects which required some basic knowledge of chemistry.

Obviously, I was interested in chemistry. I considered certain college courses permitting advanced work in chemistry, but in two instances I met with an absolute refusal by colleges to accept this excellent preparatory training as an equivalent of first year college chemistry. A similar experience took place in relation to biology. After a boyhood and youth spent in close contact with the various Ward family activities in anatomy and the biological sciences, and a year of an excellent senior high school biology course, my college would not give credit for senior high school biology and I took first year college biology. It differed little from the high school course and, in essence, was so much waste motion.

I have just gone back to some of my letters, written in first year college in 1922, and I find that the need to "repeat chemistry and biology" was a constant consideration which led me to make some rather drastic changes in my college plans and to swing over to journalism and sociology. This was not a student whim; it was a carefully considered reaction to the waste of time and boredom of repeating high school science courses.