

complete course in physical geography — of all high school subjects the most difficult and the one most commonly poorly taught. Certain universities, as Harvard and Michigan, require elementary chemistry; others entirely omit it, because in it students are too often poorly prepared. Said a university professor of chemistry to me, not long ago, "I prefer my students to come to me with no chemistry. I find they too often come with matter and methods to be unlearned." Now, this must be remedied in the chemistry work of the high school; the "indictment must be quashed;" the fault must be corrected by proper instructions and skilled methods. Without appliances, that is to say, without laboratory facilities, radical and valuable revolution is impossible. Physical science in the high school must be experimental.

Without multiplying words, then, it may be stated that the high school must give, to those who ask it, preparation for entrance into university work. It must adapt its science curriculum to the requirements of the standard college or university. For long years these higher institutions compelled certain and definite work in language and mathematics, they compel that work, with little or no modification to-day. Why cannot they, equally well, compel proper science preparation? We believe they can; we think they will.

There will not be, in the nature of things there cannot be, a set limit to science requirements in the universities. As the tables of the various laboratories, physical, chemical, physiological and biological, become over-taxed, up go the requirements. The standards of entrance are being steadily raised, especially in Indiana University, Michigan University, Cornell, Yale, Harvard, and Leland Stanford, Jr., Universities, as fast as the high and other secondary schools will admit of it. So there is no goal; no end; the high school will ever need to keep close watch on university matters and determine its own work accordingly. Our own State university proposes to the high school to occupy advanced ground in this very matter; to gain and hold the confidence of the university, on the one hand, to meet a legitimate demand for more complete preparation in science on the other, the high school course must be materially modified.

THE FEEDING OF HORSES.

BULLETIN No. 13 of the Agricultural Experiment Station of Utah has been received. This bulletin reports the results of a feeding trial of horses by the director, J. W. Sanborn. It reports the result of a trial in a direction that the American Experiment Station literature is almost silent upon, viz., feeding horses hay and grain mixed, and feeding cut against whole hay to horses.

It is a common belief with horsemen that when grain, especially meal, and more especially such meal as corn meal, is fed to horses alone or mixed with hay, it tends to compact in the stomach and produce indigestion. It is believed that it so far compacts that the gastric juices do not have free access to the mass of it. Furthermore, it is believed to be subject more to the washing influence of heavy drinking. In the latter respect it is known that the horse's stomach is very small, and that grain is liable to be washed out of it, as the stomach necessarily overflows with water.

As usual, the writer fed two lots of horses for nearly three months, one lot with hay and grain mixed, and the other lot with hay and grain fed separately. At the end of this period the food was reversed, and the horses were fed some two months more. It would be unnecessary to quote the

figures of lengthy trial. Suffice it to say that it was found that horses, as in the case of cattle and pigs, showed no disadvantage by the division of the grain and hay into separate feeds over feeding hay mixed with grain. Indeed, in this trial he found a disadvantage for the horses on the hay and grain mixed, they not maintaining their weight as well. The author ascribed this result to the fact that the timothy hay when cut fine, with its sharp solid ends, irritated and made sore the mouths of the horses, and possibly induced too rapid eating, as when the hay and grain were moist they would be more likely to eat more rapidly than when fed dry. As this trial is in accord with trials with ruminants and with the pig, it would seem quite probable that the old and persistent argument in favor of mixing hay and grain is not sound.

The second trial reported in this bulletin covered feeding of cut against whole hay to horses. This trial also covered two periods in which the foods were reversed with the sets, in order to determine whether any change of weights found was due to the individualism of the horses, or whether it was due to the system of feeding. The two periods covered from August 10 to December 31. As in the other case, we will not review the tabulated data that accompany the bulletin. This trial was very decisively in favor of the cut clover for the four months and a half covered by this period. The food fed was clover, and the author points out the fact that clover hay and lucerne, unlike timothy hay, do not present sharp, solid, cutting edges. The results are decisive, and in accordance with those of a trial made by the Indiana Experiment Station with cattle. Director Sanborn points out the fact that these trials, covering nearly a year's time with four horses, showed that horses consume practically the same amount of food that cattle do when high fed, and make it somewhat clear that horses make as economical use of hay and grain as do cattle, and he calls attention to the fact that the practice of charging more for pasturage of horses, where grooming is not involved, is not well founded. He also shows that less food was eaten during the hot months than during the cooler months, and particularly that the horses ate less grain during the hot months than during the cooler months. The trial seems to show also that a rather large ration of grain for work-horses is an economical one.

NOTES AND NEWS.

THE idea of flower-farming for perfumes seems to be exciting a good deal of interest in New South Wales, as many inquiries on the subject have lately been submitted to the Agricultural Department. There are at present in the colony no means of illustrating the practical operations of this industry, but the *Agricultural Gazette of New South Wales* hopes that this deficiency will soon be supplied by the institution of experimental plots on one or more of the experimental farms. The *Gazette* points out that in scent farms large quantities of waste material from nurseries, gardens, orchards, and ordinary farms might be profitably utilized, while occupation would be found for some who are unfit for hard, manual labor. A Government perfume farm was lately established at Dunolly, in Victoria, and this promises to be remarkably successful.

— At the meeting of the Field Naturalists' Club of Victoria on March 14, as we learn from *Nature*, Professor Baldwin Spencer, the president, gave an interesting account of a trip he had made to Queensland in search of *Ceratodus*. Special interest attaches to this form, since it is the Australian representative of a small group of animals (the Dipnoi) which is intermediate between the fishes and the amphibia. *Ceratodus* has its home in the Mary and Burnett Rivers in Queensland, whilst its ally, *Lepidosiren*, is found in the Amazon, and another relative, *Protopterus*, flourishes