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

in the waters of tropical Africa. Although unsuccessful in obtaining the eggs of Ceratodus, owing to the early season, Professor Spencer was able, from a careful study of the surroundings under which the animal lives, to infer that its lung is of as great a service to it during the wet as during the dry season — a theory in direct opposition to the generally accepted one that the lung functions principally during the dry season, when the animal is inhabiting a mud-cocoon within the dry bed of the river.

— A second attempt is to be made to build an observatory at the top of Mont Blanc. As the workmen who tunnelled last year through the snow just below the summit did not come upon rock, M. Janssen has decided that the building shall be erected on the frozen snow. A wooden cabin was put up, as an experiment, at the end of last summer, and in January and early in the spring it was found that no movement had occurred. According to the Lucerne correspondent of the London *Times*, the observatory is to be a wooden building 8 metres long and 4 metres wide, and consisting of two floors, each with two rooms. The lower floor, which is to be embedded in the snow, will be placed at the disposition of climbers and guides, and the upper floor reserved for the purposes of the observatory. The roof, which is to be almost flat, will be furnished with a balustrade, running round it, together with a cupola for observations. The whole building will rest upon six powerful screw-jacks, so that the equilibrium may be restored if there be any displacement of the snow foundations. The building is now being made in Paris, and will shortly be brought in sections to Chamounix. The transport of the building from Chamounix to the summit of Mont Blanc and its erection there have been intrusted to the charge of two capable guides — Frederick Payot and Jules Bossonay.

— Dr. J. Hann laid before the Academy of Sciences at Vienna, on May 5, says *Nature*, another of those elaborate investigations for which he is so well known, entitled "Further Researches into the Daily Oscillations of the Barometer." The first section of the work deals with a thorough analysis of the barometric oscillations on mountain summits and in valleys, for different seasons, for which he has calculated the daily harmonic constituents, and given a full description of the phenomena, showing how the amplitude of the single daily oscillation first decreases with increasing altitude, and then increases again with a higher elevation. The epochs of the phases are reversed at about 6,000 feet above sea-level as compared with those on the plains. The minimum on the summits occurs about 6 A.M., and in the valleys between 3 and 4 P.M. The double daily oscillation shows, in relation to its amplitude on the summits, nearly the normal decrease, in proportion to the decreasing pressure, but the epochs of the phases exhibit a retardation on the summits, of as much as one or two hours. In the tropics, however, this retardation is very small. He then endeavors to show that these modifications of the daily barometric range on mountain summits are generally explained by the differences of temperature in the lower strata of air. In connection with this part of the subject, he considers that even the differences in the daily oscillations at Greenwich and Kew are mostly explained by the different altitudes of the two stations and by the fact that Greenwich is on an open hill. In the second section he has computed the harmonic constants for a large number of stations not contained in his former treatise of a similar nature, including some valuable observations supplied by the Brazilian Telegraph Administration, and others at various remote parts of the globe.

— The last meeting of the Royal Meteorological Society for the present session was held on Wednesday evening, June 15. A paper on "English Climatology, 1881–1890" was read by Mr. F. C. Bayard. This is a discussion of the results of the climatological observations made at the society's stations, and printed in the *Meteorological Record* for the ten years, 1881–1890. The instruments at these stations have all been verified, and are exposed under similar conditions, the thermometers being mounted in a Stevenson screen, with their bulbs four feet above the ground. The stations are regularly inspected and the instruments tested by the assistant secretary. The stations now number about eighty, but there were only fifty-two which had complete results for the ten years in question. The author has discussed the results from these stations and given the monthly and yearly means of temperature, humidity, cloud, and rainfall. His general conclusions are: (1) With respect to mean temperature the sea-coast stations are warm in winter and cool in summer, whilst the inland stations are cold in summer and hot in winter. (2) At all stations the maximum temperature occurs in July or August, and the minimum in December or January. (3) Relative humidity is lowest at the sea-coast stations and highest at the inland ones. (4) The south-western district seems the most cloudy in winter, spring, and autumn, and the southern district the least cloudy in the summer months, and the sea-coast stations are, as a rule, less cloudy than the inland ones. (5) Rainfall is smallest in April, and, as a rule, greatest in November, and it increases from east to west. "The Mean Temperature of the air on each day of the year at the Royal Observatory, Greenwich, on the average of the fifty years, 1841 to 1890" was presented by Mr. W. Ellis, F.R.A.S The values given in this paper are derived from eye observations from 1841 to 1848, and from the photographic records from 1849 to 1890. The mean annual temperature is 49.5°. The lowest winter temperature, 37.2°, occurs on January 12, and the highest summer temperature, 63.8°, on July 15. The average temperature of the year is reached in spring on May 2, and in autumn on October 18. The interval during which the temperature is above the average is 169 days, the interval during which it is below the average being 196 days.

— The Todas, inhabiting the Nilgiri plateau, says *Nature*, are not dying out gradually, as has long been supposed. The last census figures show that they have increased by no less than 10 per cent during the last ten years, there being now nearly eight hundred of them altogether.

— In a recent number of the Journal of the Straits Branch of the Royal Asiatic Society there is an interesting note on the little insectivora, *Tupaia javanensis*. It is very common in Singapore, and especially in the Botanic Gardens, where it may be often seen running about among the trees. It is easily mistaken for the common little squirrel (*Sciurus hippurus*), of which it has much the appearance. When alarmed it quickly darts up the trunk of the nearest tree, but it is a poor climber, and never seems to go high up like the squirrel. Besides these points of resemblance, it appears to be largely frugivorous. It was found that the seeds sown in boxes were constantly being dug up and devoured by some animal, and traps baited with pieces of cocoa-nut or banana were set, and a number of tupaias were caught. These being put into a cage appear to live very comfortably upon bananas, pine-apple, rice, and other such things; refusing meat. The Rev. T. G. Wood, in his "Natural History," states that *T. ferruginea* is said to feed on beetles, but to vary its diet with certain fruits. The common species at Singapore seems to be almost entirely frugivorous, though its teeth are those of a typical insectivora.

— The Mississippi Valley Medical Association will hold its eighteenth annual session at Cincinnati, Oct. 12–14, 1892. An excellent programme, containing the best names in the valley and covering the entire field of medicine, will be presented. An address on Surgery will be delivered by Dr. Hunter McGuire of Richmond, Va., President of the American Medical Association. An address on Medicine will be made by Dr. Hobart Amory Hare, Professor of Therapeutics and Clinical Medicine, Jefferson Medical College, Philadelphia. The social as well as the scientific part of the meeting will be of the highest order. The Mississippi Valley Medical Association possesses one great advantage over similar bodies, in that its organic law is such that nothing can be discussed during the sessions save and except science. All ethical matters are referred, together with all extraordinary business, to appropriate committees — their decisions are final and are accepted without discussion. The constitution and by-laws are comprehensive and at the same time simple. Precious time is not allowed the demagogue or the medical legislator. The officers of the Pan-American Medical Congress will hold a conference at the same time and place. E. S. McKee, M.D., Cincinnati, is the secretary.