be established, for example, by the National Research Council? There could then be started somewhere else a journal of criticisms of the National Research Council and both publications would be assured of abundant material.

A criticism need not be caustic nor entirely unfavorable. It should call attention to the strong points of the article as well as its weak ones and it should never be anything but frank and honest. On occasion it may even have entertainment value.

The above notes while in manuscript form were referred for criticism to Dr. C. L. Shear. He returned them with a comment which so well bears out our central thought that we are quoting it in conclusion:

> In the case of young investigators it is little less than criminal to encourage or ignore hasty and poorly prepared publications, since by so doing their futures may be blasted and real contributions to science lost.

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ON THE DAYLIGHT VISIBILITY OF STARS FROM A MINE SHAFT

THE perennial question of the daylight visibility of stars from wells or mine shafts having been raised again, I have thought the following discussion might be of sufficient interest to justify a printed note.

Stars can, of course, be observed by daylight with a telescope. The image of a fixed star appears in a telescope as practically a point, but due to the light-gathering power of the objective of the telescope, is hundreds of times as bright as when seen by the unaided eye. The intrinsic brightness of the sky, an extended surface, can not be increased in the least. Consequently, on any clear day, the brighter stars are easily seen with a telescope of moderate size.

Now consider a person descending a well or a mine on a bright day. As one goes down, the patch of sky seen above becomes smaller and smaller, but from an elementary proposition in physics the intrinsic brightness is practically unchanged. The only change is the small loss due to atmospheric absorption, which will affect also any stars which happen to be in that area.

At a depth of a few hundred feet the general illumination would be greatly reduced, and the eye would be a little more sensitive; but since the contrast between the stars and the sky background is the same as at the surface, it is obvious that a star could be seen only if bright enough to be on the limit of visibility from the shade of any good sized building. The necessary brightness for daylight visibility is easily estimated from observations with a telescope, or obtained directly from observations of the planet Venus in midday.

With an objective of 6-inches aperture a star in daylight should theoretically appear about 1,000 times as bright as to the unaided eye. Further, it is found that the faintest stars which can be observed in midday with such an instrument give about one thousandth the light of the planet Venus at its maximum brightness. Making no allowance for atmospheric disturbances, we would expect these stars as seen in the telescope to appear about as bright as Venus seen with the unaided eye. But, as the "seeing" is always rather bad in the daytime and any disturbances are greatly magnified in the telescope, Venus at maximum brightness is an easier object to the unaided eye than such a star is in the telescope. As a matter of fact, Venus can be seen with no great difficulty on the best days when about half a magnitude below maximum. However, in the eastern and middle western states, one must have good eyesight and choose a very clear day to see Venus when as faint as thirty times the brightness of Vega, the brightest star which could be seen from a vertical mine shaft anywhere in the United States or Europe.

This is a pretty wide margin, and one naturally wonders how the stories started. A suggestion is that accidental views of Venus in the daytime are responsible. I have in the last twenty years personally known of several such, by persons with no astronomical knowledge. Any good news writer, hearing of such a glimpse of a "star" from an open window or cave opening to the south, could imagine that from a deep mine other stars could be seen. It should also be borne in mind that Venus passes overhead in tropical countries and should occasionally be seen from wells, shallow mines, large chimneys, etc., in those regions.

After the above was written, I spoke to Professor A. E. Drucker, a mining engineer of some twenty years' experience. His reply was that as one descends a deep mine the patch of bright sky at the top gets smaller and smaller, eventually looking like a star. He had never heard of any one's seeing a star by daylight from a deep mine shaft.

To summarize: Since the contrast between a star and the sky background would not be changed in descending a mine shaft, one could see a star only if practically on the limit of visibility from any spot above ground where the eyes are well protected from the glare of the sun. To be so seen a star must approach the brightness of Venus at greatest brilliancy. From this we can say that in the United States and Europe no stars could be seen from a ver-

tical mine shaft with the sun above the horizon. Venus can often be seen in midday and at such times could be seen in these latitudes from inclined mine shafts pointing exactly the proper direction. Occasionally Mars and Jupiter might be so seen in the early morning or late afternoon hours. In tropical countries Venus, Mars and Jupiter all pass overhead at certain times and might on those occasions be seen from wells, large chimneys and shallow vertical mine shafts.

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TWINNING IN A MOLLUSC, SERPULOIDES VERMICULARIS

IN view of a statement by Newman[1] it seems worth while to mention a possible case of twinning observed in embryos of *Serpuloides vermicularis*. Newman writes:

> I have never seen a reference to a case of twins or double monstrosity in Mullusca . . . characterized by *determinate cleavage* in its highest form. . . . It is no wonder then that in groups with strictly determinate cleavage we find no example of twinning, for twinning requires a totipotency of blastomeres or regions of the blastoderm.

Serpuloides is a sessile tubiculous mollusc living on the under sides of rocks in shallow water along the Pacific coast. Ovoviviparity is the rule. The young individuals are "born" with a simple coiled shell resembling that of an ordinary snail. The young *Serpuloides* soon become attached to the substratum and begin to grow in length. As they grow, they keep adding material at the mouth of the shell, gradually increasing its size so that a long irregularly coiled tube, resembling that of some of the polychetes, is produced eventually. The material in question, collected on the Pacific coast during the summer of 1923, consists of three pairs of "twins." In each case, two apparently normal young individuals, each with a larval shell fully formed but below the average in size, are contained in a single intact egg "shell," or membrane. These embryos were studied in the living condition and then fixed and preserved in alcohol for future examination. During life their movements were similar to those of other embryos at corresponding stages of development. Other preserved material on hand is being examined for possible earlier stages of such a phenomenon. This communication is presented as a suggestion that twinning is not impossible in the Mollusca, in spite of the determinate cleavage so characteristic of the group.

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[1] "The Physiology of Twinning," 1923.

SCIENTIFIC BOOKS

Laboratory Manual of the Foetal Pig. By W. J. BAUMGARTNER. New York: The Macmillan Company, 1924.

THIS is a laboratory manual that merits the consideration of every teacher of comparative vertebrate anatomy. It contains excellent directions for the dissection and study of a form hitherto largely overlooked, which presents certain obvious advantages over the dog, cat or other mammal more frequently the object of such study. Among these advantages the author calls attention to the following:

(1) The unlimited number of specimens which may be obtained at any good-sized packing plant with a minimum expenditure of time and labor.

(2) The convenient size of the specimens together with their ease of preservation.

(3) The absence of any objectionable odor or other quality that would make them objects of disgust to the most "finicky" student.

(4) The impossibility of any sentimental restrictions on their use arising from humane societies or antivivisection societies. Related to this is the fact that the student has no tender associations to be outraged as is sometimes the case where "pet" animals are used.

(5) The softness of the muscular and skeletal systems in the fetal pig make easier the dissection of the nervous and circulatory systems. And finally,

(6) The student gets a very good idea of the course of the fetal circulation in mammals.

The disadvantages in the use of this type of material are few and easily remedied. Some who have attempted it in the past have complained that the pigs become soft and "mushy." This is due to improper fixation and is readily overcome by following strictly the procedure described in this manual, which is the result of twelve years' experience. The imperfectly developed skeletal system can be readily supplemented with prepared skeletons, and the very immaturity of the pig gives the student an idea of bone development which he can not obtain from a study of mature animals only. There is left only the muscular system as a real difficulty and this can be remedied by the use of a few mature animals for the demonstration of the muscles, their arrangement and functions. This disadvantage is after all such a minor one that it is far outweighed by the greater usefulness of the pig in all other respects.

Typographically this book is up to the usual Macmillan standard. Only a very few errors have been noted, the most serious being the constant use of *"foeti"* as the plural form of *"fetus."* Not only does the correct Latin plural of this word end in *"-us,"* as in the singular, but attention may also be called to the fact that the *"oe"* in the first syllable is likewise