the 12 days. This was a little surprising to us after we had failed, in a previous trial, to obtain a positive calcium balance on a dry ration and a mineral supplement. We realize that the goats were in a later stage of lactation in this trial than in the one two months previous, when a negative calcium balance was obtained, with practically the same intake, yet we do not believe that this difference can be entirely attributed to this factor.

A vitamin or the vitamins of green plants may play an important part in the assimilation of calcium, yet we do believe the difference between green (fresh) and dry plants in causing the assimilation of calcium is partly due to the difference in physical properties of the cell wall and the cell content.

Our data are not yet inclusive enough to substantiate our hypothesis or to draw definite conclusions.

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TRABECULAE OF SANIO IN ANGIOSPERMS

THE occurrence of "Trabeculæ of Sanio" has been noted previously only in Gymnosperms but their discovery in an Angiosperm at the Forest Products Laboratories of Canada demonstrates a wider distribution than hitherto has been credited to these rod-like structures which extend across the lumina of cells.

Typical trabeculæ—homologues of those common to Gymnosperms—were observed extending radially throughout a series of tracheids in secondary wood from the stem of *Alnus oregona,* Nutt. One section of this alder shows a series of trabeculæ which, as well as crossing a number of tracheids, traverses the lumen of a wood parenchyma cell.

Generalizations regarding a primitive position for the Betulaceæ which are based on the occurrence of trabeculæ in members of this group must be hazardous as the ubiquitous distribution of these typically rod-like structures in the Gymnosperms leads to the presumption that they may be of widespread occurrence in the Angiosperms as well.

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A COURSE IN PHYSICAL MEASUREMENTS FOR STUDENTS IN OTHER SCIENCES

IN the issue of SCIENCE for August 29, 1919, a plea was made by Dr. Paul E. Klopsteg for courses in physical measurements for students of chemistry and related sciences. In view of the inherently physical nature of almost all quantities which can be observed and evaluated, the reasonableness of such a plea seems obvious. The emphasis of the writer was upon the need of training in physical measurements as differentiated from "physics."

During the past semester we have offered a course of this type and it seems advisable to add our experience to the plea made by Dr. Klopsteg. The section has consisted of ten men, seniors and juniors, whose major interests have been in astronomy, chemistry, engineering and mathematics. All have pursued a course in general physics which included a year of laboratory practice of the ordinary college type. Each one has had laboratory experience, more or less extended, in some other science.

The material for the course was determined by choosing from the instruments commonly employed in the physical laboratory those which were judged to have application in other fields. Opportunity was given for becoming familiar with each instrument by using it for some particular determination. The method of its use was stressed rather than the quantity which was being determined. For instance, the potentiometer was studied in principle and one was used in calibrating a thermocouple. The choice of instruments has been influenced by the resources of the laboratory and the list here given is not to be taken as a final selection. In each case the particular use to which the instrument was put has been indicated.

1. The Pulfrich refractometer for the index of pure liquids, solutions and solids.

2. The prism spectroscope with photographic registration of an "unknown" and a comparison spectrum, measured with a comparator.

3. The alternating current bridge and galvanometer for electrolytic conductivity, using an electrically controlled thermostat.

4. The Carey-Foster bridge for the checking, coil by coil, of a decade box against a standard.

5. The potentiometer in the calibration of a base metal thermocouple.

6. The Kelvin double bridge (Wolff type) in calibrating a platinum resistance thermometer.

7. The MacLeod gauge, with double range, measuring the pressure produced by an oil and a mercury diffusion pump in the various stages of the discharge in an attached Geissler tube.

8. The triode amplifier. Its static characteristics and its amplifying factor were measured. Its application was discussed but not made.

The emphasis of the course has been upon the use and application of specific instruments and upon the principles governing measurements in general and not upon the physical theory involved in the experiments. It is debatable how far this distinction may be carried with profit, but our first experience seems to justify for such students this type of course. There is no doubt of the appeal which it has made to the men and of their conviction of its value in preparing them for their chosen fields. We feel that physicists owe it to their fellow-workers to make their instruments of precision more widely known and propose courses of this general nature as a step in that direction.

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BIOLOGICAL RECORD CARDS

FOR a number of years there have been in use in the zoological laboratory of Harvard University small record cards of the standard library size (75 m.m. by 125 m.m.), similar to the first of the illustrations printed below. These were devised primarily for use in keeping permanent card records of the treatment of histological and embryological material, but are serviceable for recording any procedure or experiment with animals or plants in which a time record is important. The time-saving helpfulness of such cards has been recognized by persons in other laboratories and this has suggested the possibility that the cards might be useful in many laboratories if they were readily procurable.

The method of use is shown in the second of the accompanying illustrations. The serial numbers indicate successive steps in the treatment of the object. The *printed* numerals are the "units" only; the "tens" are to be *written* in front of each "0." By ignoring the last four lines, the steps in a series can be carried to any desired number, the second card beginning with step 21, the third with 41, etc.

In the column headed "Reagents," abbreviated names can be used and, if one desires, small rubber stamps may be procured for the more common reagents, as illustrated in parts of lines 3 and 16-19. Sometimes several methods may be indicated on a single stamp, all except the one employed being stricken out, as in 17, where the staining was in Ehrlich's haematoxylin.

The time record shows the instant at which the treatment begins, it being assumed that that treatment continues till the beginning of the next following one. The period during which any treatment lasts is *not* to be recorded; but can be determined at once by noting the difference in time between the beginning of the treatment and the beginning of the one next

	REAGENT	MO.	DA.	HR.	MIN.
1					
2					
3					
4					
5					
6					
7					
8					
9					
0					
1					
2					
3					
4					
5					
6					
7					
8					
9					
0					
1					
2					
3					
4					

E. L. M.

Fig. 1