student and a familiarity with analytical geometry and calculus is assumed.

Subjects treated include mechanics, thermodynamics, electricity and magnetism, together with a short discussion of the special or restricted theory of relativity. Mechanics is emphasized not only because it furnishes fundamental concepts for all other branches of physics, but also because its development provides examples of a number of important mathematical methods. The treatment of Hamilton's principle and the discussion of Gibbs's statistical mechanics, in particular, although not elaborate, are very satisfactory. On the other hand, more space could well be devoted to thermodynamics, and the same is true to a less extent in connection with the portions of electricity and magnetism dealing with material media.

In addition to the above, chapters are devoted to differential equations, calculus of variations and vector analysis. The treatment of these subjects, although compact, is clear and should be very useful to the student of physics with only the average preparation in mathematics. No attempt is made to develop any of the various subjects in great detail, much being left to the student in the form of problems, of which there are a large number. For those interested in collateral reading an excellent list of references is appended to each chapter.

The most serious defect in the book is the almost entire lack of figures. There are but three altogether, although at many points a figure would undoubtedly be an aid to the student's comprehension of the analysis.

"Principles of Mathematical Physics" should prove satisfactory as a basic text in a lecture course introducing mathematical physics and also should be of value as an auxiliary in more advanced courses, particularly in the field of mechanics, as there are a number of items included here which are often omitted from other texts. The book is not well suited, however, to independent study by the average student, as supplementary physical background should be supplied in many places.

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SCIENTIFIC APPARATUS AND LABORATORY METHODS

INTRATRACHEAL INOCULATIONS IN THE RAT[1]

As a preliminary step in the study of lobar pneumonia in the rat, the following method of intratracheal inoculation has been developed.

The anesthetized animal is placed on its back with the head at the edge of the table and held by an assistant, who grasps the tongue with a hemostat. Traction is applied to the tongue so that it is held firmly to the side of the mouth and against the lower teeth. The root of the tongue is raised by spreading the blades of a curved hemostat inserted far back in the pharynx and held by the operator. The field is illuminated by reflected light from a head mirror. Under direct vision a specially devised cannula may then be inserted into the trachea.

The cannula is made of brass tubing 7 cm long, 2.5 mm outside diameter and 1.6 mm inside diameter. The tube is bent upward at an angle of 15°, 0.5 cm from the distal end. The tip is beveled on the upper surface, care being taken to avoid sharp edges. Near the proximal end of the tube a brass rod 5 cm long and 3 mm in diameter is soldered at right angles to serve as a handle.

To enter the trachea, the beveled tip of the cannula is placed just under the epiglottis, which is then raised slightly. The handle of the instrument is depressed and the cannula passed gently into the trachea. When the cannula is in the trachea a drop of soap solution placed over the proximal end will form soap bubbles which break explosively. If the cannula has entered the esophagus bubbles may form but do not break with expiration. This test is important.

In the final step of the procedure a No. 5 French ureteral catheter (1.5 mm in diameter) is passed through the lumen of the cannula and withdrawn 0.5 cm at the first sense of resistance. This serves to free the tip of the catheter. Up to 0.5 cc of material may be injected from an attached syringe.

After an experience of over 300 inoculations made by this method, it is believed that with limited practise one should be able to make successful inoculation in at least 95 per cent. of the trials. Guinea pigs may also be inoculated by this method, although greater difficulty is encountered in passing the cannula into the trachea.

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[1] From the Department of Bacteriology, Northwestern University Medical School, Chicago, Illinois. Aided by a grant from the American Medical Association.

THE PRESERVATION OF CARTILAGE

THIS technique was evolved to obviate certain difficulties in handling the cartilaginous structure of a chimaeroid fish, *Hydrolagus colliei* (Lay and Bennett). In this case the cleaned cranium was dehydrated by ordinary histological methods. After it had been placed in paraffin, the temperature of the