demonstration of these methods is given. In this connection students are always shown the proper way to introduce the various metal air-ways on the living subject and the use of carbon dioxide and oxygen as a respiratory stimulant. All students are taught that the character and rate of the respiration are the most reliable guides to the depth of the anaesthesia and that the pupillary and other reflexes are but confirmatory.

In instructing students one naturally brings up many points for discussion concerning preparation of patients, pre-medication, selection of anaesthetic agent, shock, after care etc. and the instructor is able to judge how much it is necessary to instruct that particular student in these matters.

All instruction is individual, only one student being taken on a case, except the first lesson. Attempts at group instruction have not proved to be the best way in this particular specialty.

Most of the requests for instruction are for the newer methods or for the newer agents, so we have very little demand for work in drop ether but many wish to learn how to administer nitrous oxide ether sequence, nitrous oxide and oxygen, and ethylene and oxygen.

The methods covered by the Course are: open ether, chloroform, insufflation of ether or chloroform either by air or oxygen, ethyl chloride open or semi-closed method, nitrous oxide, nitrous oxide ether sequence, nitrous oxide and oxygen, ethylene and oxygen, carbon dioxide ether sequence, colonic administration of oil and ether, endovenous ether, pharyngeal insufflation of ether nasal or oral, and pharyngeal inhalation.

Owing to the fact that our surgeons rarely like chloroform or intra-tracheal anaesthesia used, the facilities for instruction in this method or the use of this drug are curtailed.

INSTRUCTION AT JOHNS HOPKINS MEDICAL SCHOOL BALTIMORE

By Professor E. M. K. Geiling and Miss Baise.

By the time the medical student begins to study anaesthesia in his course in pharmacology, he has already had a series of lectures on the essentials of physiology. Dr.
E. M. K. Geiling, the Associate Professor in the department of Pharmacology, devotes six lectures and demonstrations to the principles of anaesthesia. An introductory lecture deals with the historical aspects of the subject. Mention is made of the contributions by Simpson, Long, Morton, Richardson, Wells and Paul Bert. As reference reading, articles by Chauncey D. Leake and H. H. Young and the chapter in Neuberger's history of medicine, are recommended. This is followed by a discussion on the different types of anaesthesia, namely, local anaesthesia, spinal anaesthesia and general anaesthesia. The anaesthetic state is defined as a "physiological condition in which normal responsiveness, or automatic activity of the living organism is temporarily abolished or decreased," and this definition is enlarged upon. Attention is called to the fact that the change produced by the drug is reversible, unless the drug is used in too great a concentration, in which case, death occurs. The student is warned to use the smallest amount of the anaesthetic drug to produce the required depth of anaesthesia. Then follows a discussion of the chemistry of anaesthetics and the impurities present are enumerated. The concentrations of the various anaesthetics in the blood are given in tabular form. Next, the methods employed for the administration of anaesthetics are described—inhalation and rectal anaesthesia, in the case of volatile substances, local injection, spinal and epidural nerve blocking. The papers on spinal anaesthesia by Martin and Arbuthnot and on "Epidural anaesthesia in perineal prostatectomies" by Shaw, as also Halstead's contributions are suggested for reference reading.

The two anaesthetics in most constant use by inhalation methods, ether and chloroform, are discussed first separately and then in comparison. Dogs, cats and rabbits are anaesthetized with these drugs, demonstrating the initial reaction, and the subsequent stages passed through before complete anaesthesia is obtained. Dr. Geiling makes use of the tables given in McGuigans's Experimental Pharmacology to emphasize the various stages and the symptoms accompanying each step. The difference in the action of the two drugs become apparent in these demonstrations which lead to a discussion of the comparative usefulness and dangers of ether
and chloroform. The irritation caused by inhaling ether causes rabbits to stop breathing after the application of the cone, while chloroform fumes fail to have this effect. A dog may not exhibit the irritation to the respiratory tract as markedly as the rabbit, but shows a typical excitement stage with the beginning absorption of ether, which excitement will be less marked with chloroform anaesthesia. The behaviour of the cat emphasizes the narrow margin in both drugs between true surgical anaesthesia and a lethal dose; the cause of death is noted to be primarily respiratory failure in ether, whereas chloroform appears to paralyse the heart muscle. The student is instructed in the danger of delayed chloroform poisoning. At this time Dr. Geiling refers to the use of chloroform for the state of analgesia in obstetrics.

Having discussed these volatile liquids, the gases employed to produce the anaesthesia are taken into account. The first of these gases referred to is nitrous oxide and its use with and without oxygen. Its rapid and fleeting effect upon the organism is noted, as is its association with anoxæmia. It is demonstrated that the action of ethylene is similar to, but more potent than N₂O; also that oxygen deprivation is less marked and the sleep induced more like natural slumber than nitrous oxide anaesthesia. The student is referred to papers by Lückhardt and Carter on ethylene anaesthesia and to those by Halsey, Reynolds and Prout for a description of the anaesthetic properties of propylene, the newest of the anaesthetic gases. Brief mention is made of ethyl chloride, and of mixtures and sequences of anaesthetic drugs which facilitate administration or exert a synergistic effect.

Dr. Geiling takes up next, the recent chemical studies in anaesthesia. He quotes conclusions by Chauncey D. Leake in his paper entitled "Anaesthesia and Blood Reaction," also in his paper on "Acidosis of Ether Anaesthesia in the Dog," and on "The Effect of Ethylene-Oxygen Anaesthesia on the Acid-Base Balance of the Blood" and "Blood Reaction in Ethylene and Nitrous Oxide Anaesthesia." A paper on "Blood Changes caused by General Anaesthetics" by Stannor is used in this discussion of recent studies. It contains tables of the CO₂, sugar, uric acid, lactic acid, phosphorus and NPN contents of the blood.

of dogs before and after anaesthesia produced by chloroform, ether, nitrous oxide and ethylene. A similar study made by Brown and Henderson is noted.

The lectures end with a review of the theories of anaesthesia. Lillie's paper on "Theories of Anaesthesia" is found to be very comprehensive in dealing with this subject. Work by Henderson and Brown is discussed as described in their paper entitled "Theory of Anaesthesia and the Problem of Toxicity." Finally, the Myer-Overton hypothesis, to the effect that anaesthetic drugs owe their action to their solubility in lipoids and that their potency is in direct ratio to this solubility, is refuted by a demonstration of complete anaesthesia in a rabbit obtained with magnesium sulphate. The animal is tested for reflexes and is found to be in a state of deep narcosis, but immediately regains all normal responsiveness and activity on receiving an intravenous injection of calcium chloride.

Local anaesthetics are also discussed; attention is called to their more extensive use at the present time. The toxicity, mode of action and standards of comparison are mentioned. The advantages and disadvantages of some of the more common local anaesthetics are discussed.

In their further course in pharmacology each student is obliged to induce anaesthesia in one or two animals.

The literature referred to in the above text is placed at the disposal of these second year students. Dr. Geiling commented on the fact that these reprints were read by the majority of the class.

Owing to the interest stimulated by Dr. Geiling in the subject of Anaesthesia, the attitude of the third year man is one of keenness when the opportunity is given him to anaesthetize an animal. This opportunity is afforded him with an elective course in experimental surgery. The chief hospital anaesthetist supervises the anaesthetics given in this course. The method of anaesthesia used approximates as closely as possible the method used on human subjects, i.e., the drop method. The attention of the student is called to individual reactions, variations in narcotic depth with different surgical procedures; he learns to anticipate moments that require stronger anaesthetic mixtures, as when the peritoneum...
is closed, or traction is made on the cystic duct. Respiration
and pulse rate are recorded and the amount of ether used
during the operation is noted. The anaesthetics given in this
course complete his instruction and practical experience in
anaesthesia in the Medical School.

Anaesthesia at the Johns Hopkins Hospital is in charge
of graduate nurses under the direction of the Chief of the
Surgical Department. All anaesthetics in the hospital are
given or supervised by this permanent staff. The anaesthetists
are graduates of Nursing Schools offering a three years
training, and complete a six months course in anaesthesia
before they are eligible for positions on this staff. This
course in anaesthesia consists of three months instruction
in the administration of ether, followed by two months devoted
to learning the use of the anaesthetic gases. During the last
month only, is the pupil permitted to administer anaesthetics
without supervision by a member of the staff. As only one
nurse is admitted to the course at a time, the instruction in
the principles underlying anaesthesia is individual and not
confined to courses of lectures. Books on Anaesthesia are
available for study, such as Gwathmey's, Flagg's, Poe's and
Buxton's. If a nurse shows no interest in the psychology of
anaesthesia and is unable to gain the confidence of her patients
she is not allowed to complete the course. Regard for the
state of mind of each patient and an effort to abolish their
fear and apprehension are considered essential in an anaes-
thesist, but these points are not so easily taught, as is the
purely mechanical induction of anaesthesia.

The surgical interne is assigned to anaesthesia for three
to six weeks during his internship, during which period he
administers from 30 to 60 anaesthetics for major operations,
supervised by a member of the anaesthetist staff. He is
instructed in the use of straight ether, ether with nitrous-
oxide-oxygen for the induction and in nitrous-oxide-oxygen
throughout the operative procedure.