

10-1908

The Bulletin of the University of Nebraska College of Medicine, Volume 03, No. 4, 1908

University of Nebraska College of Medicine

Tell us how you used this information in this [short survey](#).

Follow this and additional works at: https://digitalcommons.unmc.edu/thebulletin_com

 Part of the [Medical Education Commons](#)

Recommended Citation

University of Nebraska College of Medicine, "The Bulletin of the University of Nebraska College of Medicine, Volume 03, No. 4, 1908" (1908). *The Bulletin of the University of Nebraska College of Medicine*. 9.
https://digitalcommons.unmc.edu/thebulletin_com/9

This Book is brought to you for free and open access by the University of Nebraska Medical Center: Publications at DigitalCommons@UNMC. It has been accepted for inclusion in The Bulletin of the University of Nebraska College of Medicine by an authorized administrator of DigitalCommons@UNMC. For more information, please contact digitalcommons@unmc.edu.

THE BULLETIN

OF THE

UNIVERSITY OF NEBRASKA

COLLEGE OF MEDICINE

PUBLISHED QUARTERLY BY THE UNIVERSITY

CONTENTS

I ORIGINAL CONTRIBUTIONS

THE SCHOOL OF PHARMACY OF THE UNIVERSITY OF
NEBRASKA AND WHAT IT MEANS TO THE MEDICAL
PROFESSION

By RUFUS A. LYMAN

LONDON AS A MEDICAL CENTER

By H. M. McCLANAHAN

REPORT OF A SEMESTER'S WORK IN OPERATIVE
SURGERY

By A. C. STOKES

TUBERCULOSIS IN CHILDREN. A BRIEF REVIEW OF
67 PAPERS READ AT THE INTERNATIONAL CON-
GRESS ON TUBERCULOSIS, WASHINGTON, D. C.,
SEPTEMBER 28-OCTOBER 3, '08

By H. WINNETT ORR

SOME RECENT DISCOVERIES REGARDING TRYPANO-
SOMES AND SLEEPING SICKNESS

By HENRY B. WARD

THE PHYSIOLOGICAL ASPECTS OF SHOCK

By A. E. GUENTHER

II EDITORIAL

III COLLEGE NOTES

IV INDEX TO VOL. III

LINCOLN, NEBRASKA

APPLICATION MADE FOR ENTRY AT THE POST-OFFICE AT LINCOLN, NEBRASKA.
AS SECOND-CLASS MATTER UNDER ACT OF CONGRESS, JULY 16, 1894

CLINICAL FACILITIES

OF THE

University of Nebraska College of Medicine

THE COLLEGE DISPENSARY
THE NEBRASKA METHODIST HOSPITAL
THE IMMANUEL HOSPITAL
THE DOUGLAS COUNTY HOSPITAL
THE CLARKSON MEMORIAL HOSPITAL
THE WISE MEMORIAL HOSPITAL
THE CHILD-SAVING INSTITUTE
THE JENNIE EDMUNDSON HOSPITAL
THE TINLEY RESCUE HOME



DR. W. H. CHRISTIE

Emeritus Professor of Materia Medica and Therapeutics,
University of Nebraska College of Medicine

Died May 28, 1908

THE BULLETIN

OF THE

UNIVERSITY OF NEBRASKA

COLLEGE OF MEDICINE

VOL. III

OCTOBER 1908

No. 4

The School of Pharmacy of the University of Nebraska and What It Means to the Medical Profession¹

BY RUFUS A. LYMAN, LINCOLN, NEBRASKA

I have been asked by the secretary to say a few words concerning the subjects mentioned in the title of this paper. I can best get at the substance of my remarks by calling to your attention the status of the pharmacist in the United States.

We often hear the complaint, coming usually from the rank and file of the pharmaceutical profession, that the pharmacist is not duly recognized as a professional man. The question arises as to what constitutes a professional man.

The Standard Dictionary gives the following as the definition of a profession: "An occupation that properly involves a liberal education or its equivalent, and mental rather than manual labor, especially one of the so-called learned professions." The professions referred to are religion, law, and medicine. These were regarded as learned by all ancient nations and the idea is retained to this day. But the definition does not exclude other vocations, the essentials being a liberal education and some special mental training or some special discipline which leads to special attainment and culture. Thus, teaching, acting, writing, engineering, pharmacy, or the art and science of war may logically be considered as professions if the training has been such as to conform to the above mentioned requirements.

¹Read before the Alumni Association of the University of Nebraska College of Medicine, September 30, 1908.

There are today approximately 50,000 pharmacists registered in the United States. Barring a very small per cent, they can not be called professional men, because the ability to read and write and to pass the examination of the average state board of pharmacy, coupled with two or three years' experience in a drug store, does not constitute a liberal education; neither is it indicative of a scholar, a scientist, nor a man of culture.

The factors responsible for this deplorable condition of affairs in American pharmacy are many. I shall mention a few.

The state laws governing registration of pharmacists are very lax. In the case of medical registration every physician knows it is no longer an easy matter to register for the practice of medicine. So rapidly have requirements been raised in recent years that it is questionable if the majority of the rank and file of the medical profession could practice today if they were compelled to reregister and live up to the requirements demanded by our state examining boards.

You may or may not know the low standards required of applicants to practice pharmacy in our own state by the examining board, but unless you have made the matter a subject of special study you do not know how universal these conditions are. Up to date only two states, New York and Pennsylvania, have passed laws requiring candidates for registration to practice pharmacy to present a diploma from a school of pharmacy.

Practically all states require an applicant for registration to have served as "apprentice" in a drug store for a varying number of years. This would seem to indicate that the state boards consider the two or three years' apprenticeship of more value than a school training. This, of course, is absurd, for the apprentice receives no systematic instruction, either didactic or experimental. In fact, in most cases his employer is in no position to give him instruction even if he were disposed to do so. In other words, the apprentice in a drug store is left to get what he can "pick up." I am not saying that the apprentice system of training did not have its value at one time. At one time excellent, it is now obsolete. It is comparable in a way to the old preceptor method of medical teaching, which was unsurpassed before the advent of graded medical instruction and the laboratories and hospital wards of the modern medical school. Likewise, the modern

school of pharmacy offers facilities for didactic and laboratory teaching which are essential.

Again, pharmacy as a profession is domineered over and swallowed up by pharmacy as a business. In pharmacy as in medicine the commercial aspect must always play a rôle, and rightly so. For while our professional ideals must be something other than dollars, we must supply ourselves and those dependent upon us with the substances necessary for the maintenance of normal metabolism. Commercialism has, however, in recent years, invaded pharmacy even to a greater extent than medicine. The patent medicine business and the prescribing of proprietary medicines by the medical profession at large has been largely responsible for the pharmacists' downfall. It is so evident that it needs no discussion how this practice of the physician must necessarily drive the pharmacist to become a mere vendor of patents and proprietaries or make him change his vocation, which is not always an easy thing to accomplish, however much he may desire to do so.

A traditional gulf lies between the physician and the pharmacist. Many excuses have been offered for its existence. Some attribute it to the fact that physicians prescribe nostrums, others maintain it is because physicians dispense their own drugs, and still others say it is because the pharmacist does more prescribing over the counter than the physician does in his office, and so on. While these facts may be causative factors to some extent, they can not explain existing conditions, and we must look in some other direction. I have mentioned the fact before that the pharmacist is wont to complain of his lot, that he is not considered professionally the equal of the physician. But why should he be so considered? Let us answer the question by studying for a moment the conditions in our own commonwealth. In Nebraska an applicant for registration to practice medicine must present to the examining board evidence of having completed a four-year high school course and evidence of having completed a course of medical instruction in a recognized medical school. On the other hand, an applicant for registration to practice pharmacy is not required to have any high school training or even a grammar school training and no training is required in a school of pharmacy. Before taking the examination the only requirement

asked is evidence of three years' experience in a drug store. Until the pharmaceutical profession of our state demand requirements for the practice of their profession equivalent to that demanded of medical aspirants, they can not command the respect of either the medical profession or the public.

It must be remembered that there are many cultured men in the pharmaceutical profession, who have organized a national association, the American Pharmaceutical Association, and thru this and its local branches are putting forth every effort to elevate their vocation and improve their profession and practice. This association, in conjunction with the American Medical Association, is doing much toward bringing harmony into the ranks of both professions. This means increased efficiency in both professions and better service for the public.

Pharmacy is a profession which concerns public health as vitally as does medicine. The opportunities in the private practice of the profession, in the various industrial and manufacturing pursuits, and in the government service are unlimited. The awakening going on in both professions and the interest manifested by the public resulting in the enactment of pure food and drug laws bodes well for the future of pharmacy.

Realizing the shortcomings of pharmaceutical training in our territory and believing that the influence of the University should be felt in every walk of life, the Chancellor some time ago appointed a committee to investigate the advisability of organizing a school of pharmacy in the University of Nebraska. The present school is the result. The object of the school is to give a training which will make competent pharmacists, food and drug analysts, chemical and physiological assayists, workers with and helpers of, and not competitors of physicians, to promote the interests of pharmacy, which will at the same time promote the interests of medicine and the public, to raise the entrance requirements for the study of pharmacy and stimulate legislation which will improve the standard of the profession, to emphasize the professional side rather than the business side of pharmacy, to raise pharmacy to the dignified position it should occupy, to put into practice the high ideals of the leaders of pharmacy and the allied sciences; in short to make men of culture and attainment. Evolution and not revolution must be our policy. Progress in the

face of the conditions I have pictured must necessarily be slow, but will be most rapid when persuasive and not antagonistic measures are used. The attitude that representative men of both professions take is most inspiring. Government officials tell us that the time is not far distant when the government will require men to have the bachelor's degree to be applicants for the important positions under the food and drugs act, in the governmental laboratories, as inspectors at the ports of entry, and for positions in the army, navy, and marine hospital service. This is one indication of the trend of the times.

In things pharmaceutical we request and in fact expect especially the cooperation of the graduates of the College of Medicine. If the School of Pharmacy reaches its ideals, and it will, it is evident what it means to the medical profession of our state as well as to the pharmaceutical profession and the public as well.

London as a Medical Center

BY H. M. M'CLANAHAN, OMAHA, NEBRASKA

Wherever the physician may decide to spend his time in post-graduate work in Europe he should at least pay a brief visit to London, not only the largest, but in many ways the most interesting city in the civilized world. In extent and variety of clinical material London has the advantage over any other great medical center. After visiting Vienna, Berlin, and Paris I am surprised that London is not more highly appreciated by American physicians. The marked objection to London for the study of medicine as compared with Vienna is that there are no private laboratories and no teachers giving private instruction or even instruction in small classes.

It was my impression before going abroad that a physician in middle life desiring to improve himself in the scientific branches as well as in clinical study would do well to divide his time between Vienna and London. I am now satisfied that this opinion is entirely correct and I have no hesitancy in saying that a physician would do well to first go to Vienna, review or renew his knowledge in the microscopical branches of medicine and also in the small classes for personal instruction in such branches as he may select, then go to London for pure clinical work.

A physician in going to London will have difficulty in ascertaining where work is to be found. There is no society there as in Vienna for giving information. The hospitals are widely scattered over that great city, and valuable time is lost in going from one to another. I met two physicians from New England who had spent eight days in London without accomplishing anything, in some cases arriving at the hospital only to find that the clinics had closed for the day. I recommend that a physician going to London for study first decide upon some hospital, then go there and arrange work, and after he has become well established he will find hours when he may visit other hospitals with profit.

I would suggest that a physician first visit Louis' book store on Gower street. This is not only a medical book store but there is a department of secondhand books and also a splendid library.

By the payment of one pound he can have the use of the library for three months and withdraw one book for use in his room, and then at the end of the three months will have a considerable amount of the deposit returned to him. I found it advantageous to spend one or more hours a day in the library in study where it was possible to procure almost any book of reference and to follow out a subject very fully. Also he will be able to get valuable information here as to the location of the various hospitals. The London *Lancet*, which is on file, contains each week a directory of the hospitals and clinics. It is my belief that most physicians doing post-graduate work do not spend enough of time in real study, but depend too largely upon observation. One or two hours spent in careful study will add very much to the value of the post-graduate work.

Near Louis' is the London Polyclinic on Cheeny street. This institution was founded by Jonathan Hutchison and contains his magnificent collection of charts and casts illustrating skin diseases. It also contains an excellent laboratory where physicians may receive instruction in microscopical work at moderate cost. There is a very good library here, too, which any one taking the ticket is entitled to use. A fee of one pound entitles the visiting physician to attend all clinics and lectures. There is a lecture and clinic held here for five days a week from 4:00 to 6:00 P.M. The lectures, on a variety of subjects, are given by men prominent in London and England. These lectures are arranged and advertised in advance. It was my privilege to hear Clifford Allbutt and other prominent physicians. Any physician expecting to spend three months in London would, in my judgment, do well to take out the ticket admitting him to the lectures and clinics in this institution.

University Hospital is only two or three blocks away. This is one of the largest and altogether the most modern hospital in London. It occupies a very large block of ground. There is a central square building, from each corner of which extends a wing admitting of a large amount of light and air to the various wards. There is daily held here a large ambulatory clinic. It was my privilege to attend one ward clinic in this institution given by Sir Thomas Barlow, a man of charming personality, and also a clear and incisive clinical teacher.

The undergraduate department of the University of London is immediately across the street from the hospital. The buildings occupy three sides of a hollow square, the open court looking to the street. The central building is of Greek style of architecture and very imposing, the front of the building being supported with immense fluted columns of granite. It was here one evening that I witnessed the arrest of a number of the undergraduate students because of their razing the statue of the little brown dog which was placed in one of the parks of London by the Anti-vivisection Society as a protest against vivisection. This incident aroused a good deal of unfavorable criticism in the daily press against medical students.

St. Mary's Hospital is interesting because it contains Wright's laboratories. The laboratories occupy a portion of two floors. There are a number of waiting rooms where patients may receive treatment. It was my privilege at one of my visits to personally meet Dr. Wright. He impressed me as a hard, earnest worker filled with enthusiasm without personal ambition for success beyond what he may achieve in his laboratory work. A limited number of students are admitted to this course, but only those who are thoroly trained in bacteriology and haematology can be admitted to the course. I am satisfied that as the result of the work of Wright and of the pupils who will go out from there much valuable information will result to scientific medicine, and that in the years to come his work will be accorded a place in medical history along with that of Pasteur and Koch. His work does not receive the credit in London that it merits and I thot of the Scripture saying: "A prophet is not without honor except in his own country." I heard much in praise of Dr. Wright and his work in Vienna and Berlin, but usually only criticism in London.

The London Hospital in the White Chapel district should be visited. Probably the largest dermatological clinic in the world is to be found in this hospital. On the second floor is a large room devoted to the treatment of skin diseases, especially epithelioma and lupus, by means of the Finsen light. This room is about forty by sixty feet in size. There are suspended from the ceiling eight immense arc lamps. From each arc, the light passes thru a water drum to sift out all the heat rays. From the drum

the light passes thru four tubes, each tube directing the light for the treatment of one patient, so that each arc supplies light for four patients, making a total of thirty-two patients that can be treated at the same time. It is necessary to have a nurse for each patient, who is required to hold a quartz lens over the part to be treated, each treatment lasting from one-half to one hour. The quartz lens is used because the Finsen light, which is the ultra-violet light, will not pass thru glass. This is said to be the largest plant anywhere in the world.

The National Hospital for Epileptics on Queen's Square is an institution of international renown. My information pertains only to the dispensary department. Here clinics are held four afternoons a week, conducted by James Taylor, Sir Risien Russell, Mr. Turner, and others. These clinics include a wide variety of nervous diseases. There are also held in the amphitheater, twice a week, lectures by members of the staff, well worth the time of any physician. I recall an illustrated lecture by Sir Risien Russell on syringomyelia. The stereopticon pictures of the section of the cord made an impression upon the mind never to be forgotten. No one can attend these clinics without realizing in what high esteem Sir William Gower is held by his associates. It was indeed pleasant to realize that a man still living could have the respect and cordial good-will of his fellow men.

My time was given almost entirely to the study of diseases of children at the Hospital for Sick Children, Great Ormond street. Here it is possible to give almost the entire day to the study of this branch of medicine. Each forenoon a dispensary clinic is held in the basement, and the average number of children attending is from two hundred to three hundred a day. These cases are first looked over by a resident physician, and the more interesting ones are selected for presentation by the attending physicians. This work is largely done by Drs. Still, Hutchison, and Poynton. Dr. Still is well known for his investigations in the bacteriology of meningitis, and English people recognize a form of basilar meningitis as Still's disease. Dr. Hutchison is recognized as an authority upon the blood of the new-born. Dr. Poynton is well known for his original work upon the cause of rheumatism. He is the author of the article in Osler's recent *System of Medicine*.

The surgical clinic, which is going on at about the same time, is under the direction of Mr. Waugh. The opportunities here for the study of orthopedics and the diagnosis of joint lesions are excellent. During three afternoons a week clinics are held in the eye, ear, nose, throat, and teeth. These clinics are not well attended by visiting physicians, and deserve more attention than they usually receive. Minor operations, including circumcisions, adenoids, tonsils, and the removal of tumors by electrolysis are done here daily. I clearly remember having seen twenty-one circumcisions in one afternoon.

Post-mortems are held daily at 1:30 P.M., and average from two to four a day. I was surprised and disappointed at the limited number of physicians in attendance at the post-mortem room and was impressed as never before with the practical value of this work. No one can attend here daily without realizing that mistakes in diagnosis can occur with the best of men. The major operations in this institute are done in the large amphitheater on the fifth floor. Mr. Lane is the chief surgeon. He is well known in this country, principally because of his treatment of cleft-palate.

The work in the wards is under the direction of Drs. Garrod, Battin, and Volckner. The visiting physician has the opportunity of going thru the wards from bed to bed with the attending physician, and I think any one from this country will be impressed with the fact of the prevalence of rheumatism and heart disease in England. I doubt if anywhere there can be found an institution where the opportunities for studying diseases of children, both for variety and number of cases, are as good as in this splendid old hospital.

No physician visiting London should fail to go to the Royal College of Surgeons at Lincoln's Inn Field. This large and historic old institution contains a museum that in extent and variety is not excelled anywhere. The extensive library and reading room is upon the second floor. The museum, occupying three floors of a very large building, is divided into a number of departments. The anatomical museum alone will repay many hours of study. Here are to be found carefully dissected sections of the various parts of the human body preserved in natural color in large flat glass jars so arranged that they can be seen distinctly. Here with the aid of Gray's Anatomy a person can spend hours

in study almost to as great an advantage as in a modern dissecting room. The department of comparative anatomy is interesting, but the pathological display, including all varieties of morbid growths, is beyond anything that I have ever seen. The section devoted to skin diseases is replete with unique and interesting specimens.

I have briefly spoken of the above institutions only in so far as I had personal knowledge. There are many other hospitals and clinics in London that I did not even visit. The enormous amount of clinical material in London may be more fully realized when we stop to consider that London is a compact city, occupying an area of twelve miles in diameter and containing nearly six million people. It is estimated that one-third of the inhabitants, or two million, receive gratuitous treatment at the hospitals and clinics of London. If there were the facilities for doing laboratory work, and if there were teachers willing to take small classes or give private instruction, as there are in Berlin and Vienna, then in that event I have no hesitation in saying that London would not only be the largest, but in every way the best medical center in the world.

Report of a Semester's Work in Operative Surgery

BY A. C. STOKES, OMAHA, NEBRASKA

Our work for the last semester, 1907-1908, in operative surgery on dogs, has been eminently satisfactory to the instructors. We held fourteen operative exercises in which all forms of operations were completed with as much care in technic as is possible to impress upon the students. Our chief aim was the teaching of technic, and this we tried hard to emphasize. This course is elective and open to juniors. Ten students registered for the course, making two squads of five each.

Nothing of any particular moment worth mentioning transpired in the ordinary operations, such as appendicitis operations, gall-bladder operations, intestinal operations, brain operations, etc. However, during the course we encountered five cases of surgical pathology in dogs. It is the report of these five cases which I consider the most valuable part of the exercises outside of the direct instructions which the students received, and outside of the deductions which we were able to make from our work on fractures, published in another place.

The five pathological conditions consist of the following: two cases of umbilical hernia, one case of ununited fracture, one case of simple goitre, one case of hypertrophic sclerosis of the liver. The two cases of umbilical hernia were brought to us thru Mr. Pixley of Omaha. We found in each case a small mass protruding thru the umbilical opening. The hole appeared to be about the size of one's little finger. The mass which protruded was about the size of a small walnut, and disappeared when the dog was laid upon its back and returned when the dog was standing.

Dog number one was operated upon by the writer, and upon going thru the skin and deep fascia, we found ourselves within the canal of the umbilical cord, separated only from the abdominal cavity by the peritoneum. The muscles and muscular fascia did not cover the canal. The hernia was evidently a central umbilical hernia. Our operation was done as follows: an incision was made thru the skin and deep fascia, after which we entered the lumen of the canal. We isolated the sack from the walls of

the canal, ligated and excised, and dissected out the edges of the recti muscles from the deep fascia, imbricating the deep fascia over the umbilical opening; next imbricated the muscles, then sewed the superficial layer of the fascia of the rectus with a continuous cat-gut suture. The skin and superficial fascia closed in an ordinary fashion.

The second dog was operated upon in the same way by Dr. Robert Hollister, my colleague in this work. Umbilical hernia is common in dogs. Veterinarians usually cut thru the skin, push the peritoneum back, cauterize the edges of the canal, sew it together; this is the operation. The intra-abdominal pressure in an animal walking on four legs is much less than the intra-abdominal pressure of an animal standing upright, consequently the amount of resistance is much less. However, it does not seem very scientific, and the same rules which we have worked out for operation for umbilical hernia on human beings should be carried out on dogs.

A case of ununited fracture was a fracture of the humerus of some weeks' standing. It was cut down upon, the edges freshened, the bone bored thru and tied together with number three twenty-day chromacised cat-gut. The wound was closed and dressed and placed in a plaster cast. Convalescence was uneventful, and on the fourteenth day the cast was removed. The dog walked lame for more than two weeks, after which there was nothing further to be observed. The two notable features of this case was the uniting of the bone with the suture, and the use of plaster of Paris.

We have been taught in surgery from time immemorial to use wire, nails, or some suture that was not absorbable. Little by little we are coming to the belief that we are able to obtain better results by the tying together of bone by sutures which are absorbable in from fifteen to twenty days. The philosophy of the thing is simply this, that after the first five or six days, any bone will form a provisional callus which will be sufficiently resistant to hold the bone in approximation if it was in approximation before this. Much literature might be cited upon this point, but in this short period we will only say in passing that our chromacised cat-gut suture gave good results in this case. The second point of the discussion is the use of plaster of Paris following opera-

tions for fractures. The experience of this case and of numerous other cases in dogs makes us believe that the use of plaster of Paris for the first few days, or perhaps a week after the fracture, has very many disadvantages, to say the least. In dogs who can not be well controlled it is absolutely necessary to use it. In human beings, however, it would seem to the writer from his experience with these animals and with his own work on human beings that plaster of Paris casts following the operative treatment of fracture is, as a general rule, not to be used in any fracture of long bones. In some joint cases it might be of value, particularly in the hip and knee, altho it has its disadvantages here. If plaster is used at all immediately after the operation it should be put on very loosely. We may remark incidentally in this connection that our experience in operative treatment or the so-called open treatment on dogs has been rather against the use of this method as a general statement; even in a dog which resists infection greatly a large per cent of these fractures become infected. A more extended discussion will be found in the proceedings of the State Medical Society of Nebraska for 1908.

The fourth pathological case was that of a dog in which there was a large goitre. The goitre was removed by Mr. Sayer, a senior medical student, under the direction of the writer. The ordinary Kragenschnitt of Kocher was made, and the superior and inferior thyroid arteries tied. The operation offered no incidents; it is not very difficult. The veins around the thyroid gland of the dog are larger than those in a human being and were, therefore, more easily tied off, and the tumor was somewhat easy to control. The goitre was not examined microscopically, but a macroscopic diagnosis proved the goitre to be filled with a number of small isolated tumors in a fibrous tissue capsule, which could be easily enucleated from the thyroid gland proper. Within the tumor was an ordinary gelatinous non-dializable semi-fluid material; in other words, the goitre was a simple cystic goitre.

These goitres are very common among dogs. So common that one can easily, in a walk of several blocks, see dogs with goitre. The exact per cent I do not know. They are usually in dogs well along in years, from seven years upwards. They seem, so far as the writer has observed, to be equally common in males and females, somewhat more common in dogs which are well fed and

well cared for than in those of the cur type. We have not seen any exophthalmic goitres as yet. I am informed that they occur occasionally. Hemorrhagic cysts occur occasionally in dogs. Cushing reports three cases.

The fifth and most interesting case of all was a case brought into the dog hospital in Omaha, very much emaciated, with a very much dilated abdomen filled with fluid. He was also a very small dog, weighing about twenty pounds, and was a wanderer, apparently having no home. The dog was chloroformed and the abdomen opened to discover, if possible, the pathology within. When the peritoneum was opened there was seen a large quantity of fluid of a straw color, clear, homogeneous, specific gravity of 1006, and which contained 1 per cent of albumen. About two liters of this material escaped. The abdominal contents were thoroly examined, everything was found to be normal except the liver, which was about twice the size of a normal liver. It is rather hard to just exactly say what a normal liver under such conditions would be, but the liver in this case occupied all the right hypochondriac region, extending nearly to the umbilicus below and over to the spleen on the left side. It would be easy to say that the liver was twice the normal size. The dog was killed with chloroform and sections of the liver taken for examination. The author saw the slides, and found a typical "Laennec hypertrophic sclerosis." It is a well-known fact, of course, that hypertrophy and atrophy of the liver in human beings is quite largely due to either alcoholism or syphilis, this not occurring in dogs in any case. The writer was anxious to work out the etiology, and in this respect a talk with Professor Kinsley, professor of pathology in Kansas City Veterinary College, led to this understanding,—that both atrophic and hypertrophic sclerosis occur occasionally in dogs, but usually only among dogs who are of a low type and who have no home, and live around town from garbage barrels and refuse thrown from hotel kitchens, restaurants, and private houses. This being a fact apparently well known among veterinary men leads to the possibility that any form of toxemia to which an organism is constantly subjected may produce a sclerosis, and if our observations could be carefully noted we might find cases of sclerosis of the liver in the human, not due to either of the above cases, but possibly to constant indiscretions

of diet or constantly loading the organisms with some toxic material, which fact is of course not new, but I sometimes think not sufficiently impressed.

Our experience with this work last year has given us a stimulus for observations of diseases in other animals beside man. It has been an invaluable aid to the instruction of students in technic and will be continued the second semester of this year in a somewhat modified form from last year, with considerable improvement.

*Tuberculosis in Children*¹

A BRIEF REVIEW OF SIXTY-SEVEN PAPERS READ AT THE INTERNATIONAL CONGRESS ON TUBERCULOSIS, WASHINGTON, D. C.,
SEPTEMBER 28—OCTOBER 3, 1908

BY H. WINNETT ORR, LINCOLN, NEBRASKA

The spirit of the Tuberculosis Congress of 1908 was that of a student with a difficult problem which he has determined to solve. With reference to the subject of tuberculosis in children, as in other departments of the congress, the discussion was largely of ways and means to stamp out the tuberculosis we have at present in children and to prevent the development as far as possible of new cases in the future.

Nominally, one section of the congress was set aside for the consideration of tuberculosis in children; but practically, papers were read in all of the seven sections bearing upon this particular phase of the question.

For the purpose of this review I have selected from abstracts of the papers, all of which deal with the various forms of tuberculosis which appear in childhood, and with the problems which are particularly the problems of tuberculosis in the young. These I have classified in a general way as follows: 1, those dealing with the problems of the transmission and etiology of tuberculosis; 2, diagnosis; 3, symptoms; 4, pathology; 5, prognosis and various forms of treatment of the different manifestations of the disease in infancy, closing with a reference to the institutions for the care of tuberculous children reported at the congress.

The prevailing sentiment thruout the papers reviewed is in favor of an educational and hygienic campaign in which, while the physicians must be the leaders, those of the laity who are able to do so must take an active part.

In general it has been found that about 7 per cent of infants under one year are infected with tuberculosis. This percentage gradually increases to the fourteenth year—probably 10 per cent

¹Read before the Pathological Club of the University of Nebraska College of Medicine, September 10, 1908.

of all children succumb to this disease—doubtless a majority of these, needless victims of inadequate protection from infected parents or contaminated food.

Crafer in his paper, No. 15,¹ pointed out that in general, tuberculosis has a higher death rate in the foreign born than in the native population and called attention to the reasons for the same. An investigation by him into the homes of persons dying of tuberculosis showed that more than half lived in poor or very bad sanitary environments, while only about 8 per cent had lived in what could be called excellent surroundings. He emphasized what has already been pointed out many times, that congested districts show the largest death rate.

La Fetra, No. 20, reported an analysis of 130 hospital cases of tuberculosis in children. He called attention to the large percentage of unfavorable results in tuberculosis in children, and argued in favor of careful medical supervision of children in tuberculous families and patient instruction of the parents in methods of prevention.

Guilfoy, No. 25, gave a statistical report bearing upon the distribution of tuberculosis in the different years of life.

von Pirquet, No. 49, whose more important paper on the diagnosis of tuberculosis will be referred to later, reported 1,400 examinations to determine the prevalence of tuberculosis in childhood. He advocated that an effort be made to compile international statistics based upon the examination (testing reaction to tuberculin) of school children of all ages, as a result of which he thought it would be possible to segregate those who are dangerous to their fellows and hasten the stamping out of tuberculosis in our schools.

In a paper by Anders, No. 1, an argument was made in favor of insisting upon education of the young to cultivate and increase their bodily health and vigor. This he considered as important a part of the campaign as an effort to do away with the infective agent.

The influence of heredity was made the subject of three papers, Nos. 56, 57, 58, in which consideration was given both to the possibility of the transmission of the hereditary tendency and the

¹Refer to numbered bibliography at end of this paper.

development of tuberculosis in the young from association with their tuberculous parents.

Warthin read a paper, No. 61, on the placental transmission of tuberculosis, and presented specimens in the pathological exhibit illustrating this comparatively rare condition. He insisted that placental transmission must be retained as a definite factor in the etiology of infantile tuberculosis.

A paper by Copeland, No. 13, emphasized the predisposing influence of the acute infectious diseases and one by Courmont and Lesieur, No. 14, pointed out the possibility of the germs passing directly thru the skin, pointing out that infection probably occurs thru the hair follicles.

Opposed to the hereditary view, which so long held the attention of the profession, a series of papers, Nos. 35, 23, 12, 41, 51, were read pointing out the effects of association with infected adults in the development of infantile tuberculosis. It was shown how much larger a percentage of the children born in tuberculous families and reared by them acquire the disease than others of any class, however unfavorably situated in other respects.

Comby, No. 12, makes the flat assertion that tuberculosis is in no sense a hereditary disease, and in a general way the evidence of the other papers along this line were strongly in support of this view.

Knopf, No. 35, reiterates the doctrines of prevention which he has so successfully advocated.

Other papers along the general line of domestic hygiene, emphasizing the importance of sanitary surroundings, infection-free food, and the necessity for upbuilding the physical resistance of children were read, Nos. 4, 29, 43, 59.

One group of papers, all read in section five of the Congress, Nos. 28, 31, 55, 65, 26, were devoted to an encouragement of instruction of the young along the lines of hygiene, sanitation, and particularly definite instruction in schools and colleges in regard to the tuberculosis problem. One writer, Stiles, No. 55, argued for the establishment in the schools of a public health week. This suggestion was the outcome of his experience as an officer of the Public Health and Marine Hospital Service, in connection with which he has been traveling in the South, instructing both the old

and young in regard to methods of preventing tuberculosis and infection with the hook worm disease.

Norton, No. 44, also read a paper on the relations of colleges to the crusade against tuberculosis, a relationship which he deemed of the greatest importance because of their influence while instructing teachers to be later supplied to the schools.

Baumel, No. 5, urged compulsory examination and treatment in all public institutions where by reason of association with other children they become subject to supervision of public officials.

More papers than on any other subject were devoted to the diagnosis of tuberculosis particularly in the young. Wolff-Eisner, No. 66, read a paper on early diagnosis, mentioning as particularly valuable the conjunctival reaction to tuberculin and discussing in some detail the varying character of the results obtained by this method. He claims priority for the announcement of this reaction, his communication having appeared in May, 1907, while the work of Calmette was not reported until one month later.

The ophthalmo-reaction to tuberculin is made the subject of a number of papers, Nos. 2, 3, 10, 37, 53. The paper read by Calmette himself, No. 10, reports that of about 3,000 patients clinically tuberculous, 92 per cent gave positive reactions. After a review of the comparative advantages of the conjunctival and cutaneous reactions to tuberculin, he concludes that in spite of its inconvenience the conjunctival test is to be preferred for children over one year and for all adults. He concludes also that for comparative purposes in hospitals a simultaneous employment of both tests is to be recommended.

The cutaneous reaction of von Pirquet was made the subject of three papers, Nos. 5, 22, 50. The last paper was read by von Pirquet himself and reviews his work in the examination of two hundred post-mortem examinations of children previously tested for the cutaneous reaction to tuberculin. Of sixty-eight cases positive to the von Pirquet skin test while living sixty-six showed definite tuberculous lesions post-mortem.

Detre read a paper, No. 17, which was one of the features of the congress. He offered not only valuable evidence to support the use of the von Pirquet reaction to tuberculin as a diagnostic measure, but has succeeded by the use of special preparations of

tuberculin from the bovine and human types of bacilli in distinguishing, so he claimed, between the two types of infection in children. Detre gave a demonstration at the children's hospital in Washington where, by means of the cutaneous test, different kinds of tuberculin being used on different parts of the skin at the same time, he secured reactions in some to the bovine and in some to the human tuberculin. He claimed to be able to distinguish by this means not only between the two types of infection but also to be able to discover when an individual was infected at the same time with both types of the tuberculous organism. The procedure was recommended as a diagnostic measure and for its value as a preliminary procedure to the use of tuberculin in treatment. After this procedure the form of tuberculin to be used should correspond to the type of infection found to be present.

Sondern, No. 54, read a paper on lumbar puncture as a diagnostic procedure in tuberculous meningitis.

Along the lines of general pathology of tuberculosis in children papers were read on the relation of the teeth to prognosis, No. 47, on primary localization, No. 30, and on the distribution of the lesions in tuberculous children, No. 67.

The involvement of lymphoid tissue in tuberculosis, No. 42, and the involvement of lymph glands, No. 52, were also made separate topics of discussion.

Craig, No. 16, gave the points upon which a prognosis of tuberculosis in children may be based. He called attention to the fact that older children give better results than younger, and patients treated in sanatoria better than those treated in dispensaries or hospitals. He stated that incipient tuberculosis in the young is more apt to recover than in adults, but that when the disease is at all advanced the results in children are not so good.

Tuberculosis of the bones and joints in children was thoroly discussed. Kertesz, No. 34, gave an elaborate histological report of the beginning of tuberculous processes in bones.

Tuberculous lesions in the knee and hip, Nos. 38, 62, and a discussion of the relation of orthopedic surgery to tuberculosis, No. 33, tuberculosis of the pericardium, No. 60, meningeal tuberculosis, Nos. 21, 36, all received due attention in the different sections.

Dinwiddie, No. 18, who reported the results of a series of ex-

periments to determine the susceptibility of cattle to the surgical forms of human tuberculosis, concluded that the theory that surgical forms of tuberculosis are regularly of bovine origin received no support from his experiments.

The hyperemic treatment was made the subject of one paper, No. 39, Meyer concluding that in every tuberculosis sanatorium a ward should be set aside for adults with bone tuberculosis in which this method could be used.

Surgical tuberculosis was made the subject of a paper by Bradford, No. 7, and by De Forest Willard, No. 63. Willard emphasized the methods to be used and the excellent results so far obtained by the outdoor treatment of these patients.

Ochsner, No. 45, reported results obtained by carefully regulated vaccine therapy, and Beck, No. 6, gave a valuable report of the further results obtained by the bismuth vaselin injection method first devised by him during the present year. In connection with his paper he presented a collective report of cases treated during the past five months in which a number of very gratifying results had been obtained.

The use of tuberculin in surgical tuberculosis was also made the subject of a paper by Philip, No. 48, of Edinburgh, who believes it to be a valuable agent in conservative surgery.

The surgical treatment of tuberculous cervical glands was made the subject of two papers, Nos. 19 and 40, which were along the lines already generally followed.

The use of Mosetig paste to fill tuberculous bony articular cavities was reported as having been used in twenty-six cases, No. 32, with very good results.

The importance of efficient immobilization in tuberculous arthritis was discussed by Codivella, No. 11, and Wilson, No. 64, who stated in considerable detail the methods used to obtain satisfactory fixation and the necessary preliminaries to be observed before plaster of Paris or apparatus is applied.

The value of children's playgrounds and gardens was emphasized by Mrs. Henry Parson, No. 46, and the advantages pointed out of combining hygienic instruction with such measures.

Illustrated reports were presented by Bramon, No. 8, of the work at the Sea Breeze Hospital and by Gillette, No. 24, at the State Hospital for Crippled Children in Minnesota. These insti-

tutions are accomplishing each in its own way an enormous amount of good, largely along the lines of work followed at the Hospital for the Ruptured and Crippled in New York city, the orthopedic clinic at the Post-Graduate Hospital, New York, the Boston Children's Hospital, the Institute for Destitute Crippled Children in Chicago, and other institutions of the same class. The author of this communication being a Nebraskan can not refrain from commenting upon the fact that the Nebraska Orthopedic Hospital, while not represented at the International Congress, has adopted and is following successfully the lines of work which have been so satisfactory in these other, larger institutions.

There can be no doubt but that the entire subject of tuberculosis in children has received at this Congress an impetus which will carry the work rapidly forward from this time on. As indicated in the very brief abstracts presented, the entire range of human endeavor along this line received encouragement and support at the hands of those who participated in the affairs of the Congress. Methods of diagnosis no less than treatment are being standardized to the very great advantage of the children who suffer from this disease, and the active and efficient men who are engaged in this work give promise of magnificent attainment in the immediate future.

BIBLIOGRAPHY

1. Anders, Howard S., Philadelphia. *The Body or the Bacillus; Which Shall be Emphasized in the Hygienic Education of the Public?*
2. Arloing, Fernand, Lyons. *On the Ophthalmo-reaction of Tuberculin.*
3. Baldwin, Edward R., Saranac Laboratory, Saranac Lake, N. Y. *Conclusions from 1087 Conjunctival Tuberculin Tests by a Uniform Method.*
4. Barr, Martin W., Chief Physician to the Pennsylvania Training School for Feeble-minded Children, Elwyn, Pa. *The Relation between Tuberculosis and Mental Defect.*
5. Bäümel, Adolph, Eger, Austria. *Compulsory Examination and Treatment in Nurseries, Schools, Orphan Asylums, etc.*

6. Beck, Emil G., Surgeon to the North Chicago Hospital, Chicago. *The Surgical Treatment of Tuberculous Sinuses and their Prevention.*
7. Bradford, E. H., Boston. *Surgical Tuberculosis.*
8. Brannon, John W., New York. *The Seashore and Fresh Air Treatment at Sea Breeze Hospital of Tuberculous Disease of the Bones, Joints, and Glands in Children.* Illustrated by Lantern Slides.
9. Butler, Wm. J., Chicago. *Inquiry into the Opsonic Power of Breast Milk for Tubercle Bacilli.*
10. Calmette, Prof. A., Lille. *The Application of the Cutaneous and Conjunctival Tuberculin Reactions in the Diagnosis of Tuberculous Infections.*
11. Codivilla, A., Royal Orthopedic Institute of Bologna. *The Importance of Immobilization in Tuberculous Arthritis.*
12. Comby, Jules, Paris. *Human Contagion as a Factor in Infantile Tuberculosis.*
13. Copeland, Edgar P., Washington, D. C. *The Relation of the Infectious Diseases—Measles, Whooping Cough, and Influenza—to Tuberculosis in Children.*
14. Courmont, J., and Lesieur, Lyons. *Transcutaneous Inoculation of Tuberculosis.*
15. Crafer, Thos. W. B., A.M., LL.B., Fellow in Political Economy, Harvard, Boston. *Economic Aspects of Tuberculosis.*
16. Craig, Frank A., Philadelphia, Pennsylvania. *The Prognosis in Pulmonary Tuberculosis in Children under Fifteen Years of Age.*
17. Detre, Ladislaus, Privat-Docent in the Kön. Ung. Universität, and Chief of the Jenner-Pasteur Institute and of the Tuberkulose Abteilung in the Charite-Poliklinik, Budapest. *The Use of the Differential Cutaneous Reaction in the Diagnosis, Pathology, and Treatment of Tuberculosis.*
18. Dinwiddie, R. R., Experiment Station, Arkansas. *Susceptibility of Cattle to the Surgical Forms of Human Tuberculosis.*
19. Dowd, Charles H., New York. *Tuberculosis of Cervical Lymph Nodes; Report of 275 Cases Treated by Radical Extirpation.*
20. Fetra, La Linnaeus Edford, A.B., M.D., New York. *Tuber-*

- culosis in Infants; an Analysis of 130 Hospital Cases as Regards Etiology and Diagnosis, with Remarks upon Prevention and Treatment.*
21. Fife, C. A., and McCarthy, D. J., Philadelphia. *The Report of a Case of Miliary Tuberculosis Meningitis in an Infant Seventeen Weeks Old.*
 22. Fischer, Louis. *An Aid to the Diagnosis of Tuberculosis in Infancy and Childhood by Means of the Cutaneous Inoculation of Diluted Tuberculin (Pirquet Method).*
 23. Floyd, Cleaveland, and Henry I. Bowditch, Boston. *A Clinical Study of the Transmission and Progress of Tuberculosis in Children thru Family Associations.*
 24. Gillette, Arthur J., St. Paul. *The Importance of, and How the State of Minnesota Cares for Its Indigent Children Suffering from Tuberculosis of the Bones and Joints.*
 25. Guilfoyle, Wm. H., Registrar of Records, Health Department, New York. *At What Age-periods and in What Measure Has the Mortality-rate from Tuberculosis Manifested Itself in the City of New York During the Past Forty Years?*
 26. Gulick, Luther H., New York. *Tuberculosis and the Public Schools.*
 27. Heiman, Henry, New York. *Some Clinical Observations on the v. Pirquet Reaction in Children.*
 28. Heron, G. A., F.R.C.P., Delegate of the Royal Society of Medicine of London to the Congress. *Report on the Teaching of Elementary Hygiene in the Training Colleges and Elementary Schools of Great Britain and Ireland, Made by Request of the International Society for the Prevention of Tuberculosis to the Congress held at Washington in September and October, 1908.*
 29. Hess, Alfred F., New York. *A Study of the Tuberculous Contamination of New York City Milk.*
 30. Hutchinson, Woods, A.M., New York. *The Primary Localization of Tuberculosis in Children.*
 31. Jacobs, Henry Barton, Baltimore, Maryland. *Hygienic Instruction in Schools.*
 32. Josserand, Nové —, Lyons. *Obliteration of Tuberculous Bony and Articular Cavities with Mosetig Paste.*

33. Judson, Adoniram B., New York. *A Contribution from Orthopedic Surgery to the Study of Tuberculosis.*
34. Kertesz, Josef, Budapest. *The Histogenesis of Tuberculosis of Bones.*
35. Knopf, S. Adolphus, M.D., New York. *Overcoming the Predisposition to Tuberculosis and the Danger from Infection During Childhood.*
36. Kotz, A. L., and Green, E. M., Easton, Pennsylvania. *Report of a Case of Miliary Tuberculosis in a Child Aged Four and One-half Months. Report of Autopsy. Illustrated.*
37. Malmström, V., Stockholm. *On the Conjunctival Reaction to Tuberculin.*
38. Mauclaire, Fellow of the Faculty of Medicine, Paris. *Two Special Forms of Tuberculous Arthropathy of the Knee.*
39. Meyer, Willy, New York. *Fresh Air Combined with Hyperemic Treatment in the Management of Complicated Surgical Bone Tuberculosis in Adults.*
40. Meyer, Willy, New York. *The Possibility of Avoiding Scar Formation in Softened Tuberculosis of the Cervical Glands.*
41. Miller, J. A., and Woodruff, J. O., New York. *The Occurrence of Pulmonary Tuberculosis in the Children of Tuberculous Parents.*
42. Nobecourt, Prof. P., and Tixier, Leon, Paris. *Note on Hypertrophy of the Lymphoid Tissue: Its Relation to Tuberculosis.*
43. Noble, Mrs. Emile, New York. *First Aid in Better Lung-development for Children and Olfactory Nerve Influence on Respiration.*
44. Norton, Prof. William Harmon, Cornell College, Iowa. *The Colleges of the United States and the Campaign Against Tuberculosis.*
45. Ochsner, Edw. H., Chicago. *Vaccine Therapy in Joint Tuberculosis.*
46. Parsons, Mrs. Henry. *The Value of Children's Gardens, in Congested Districts, to Children with a Tendency Toward Tuberculosis or in Whom the Disease has been Arrested or Cured.*
47. Paschall, Benjamin S., Seattle, Washington. *Condition of the Teeth in Tuberculosis in Relation to the Prognosis of the Disease.*

48. Philip, R. W., M.A., M.D., F.R.S., and F.R.C.P., Edinburgh. *Surgical Bearings of Tuberculin.*
49. v. Pirquet, C., Vienna. *Frequency of Tuberculosis in Childhood.*
50. v. Pirquet, C., Vienna. *Experiences with the Cutane Tuberculin Reaction on Two Hundred Post-mortem Children.*
51. Sachs, Theodore B., Chicago. *Children of the Tuberculous.*
52. Shennan, Senior Pathologist, Royal Infirmary, Edinburgh. *Tuberculosis in Children, Particularly with Reference to Tuberculosis of the Lymphatic Glands.*
53. Sill, E. Mather, New York. *The Value and Reliability of Calmette's Reaction to Tuberculin for the Diagnosis and Differentiation of Tuberculous Lesions from Other Diseases in Infants and Young Children.*
54. Sondern, Frederic E., New York. *Diagnostic Value of Lumbar Puncture in Acute Tuberculous Meningitis of Children.*
55. Stiles, Ch. Wardell, Ph.D. *A Proposition to Introduce a Public Health Week into the Public Schools.*
56. v. Szabóky, Johann, Budapest, Gleichenberg. *Hereditary Disposition as a Factor in the Etiology of Tuberculosis.*
57. Teissier, J., Professor of Clinical Medicine at the University of Lyons. *Intermittent Albuminuria of Childhood Considered in Its Relation to Hereditary Tuberculosis.*
58. v. Unterberger, Simon, Surgeon-General, St. Petersburg. *Heredity in Consumption.*
59. Wachenheim, Frederick L., New York. *The Hygienic and Climatic Prophylaxis of Tuberculosis in Childhood.*
60. Wall, Joseph S., Washington. *Tuberculosis of the Pericardium in Children.*
61. Warthin, Alfred Scott, Ann Arbor, Michigan. *The Placental Transmission of Tuberculosis.*
62. Weeks, Stephen H., Portland, Maine. *Tubercular Arthritis of the Hip Joint.*
63. Willard, De Forest, Philadelphia. *Outdoor Treatment of Surgical Tuberculosis.*
64. Wilson, H. Augustus, Philadelphia, Pennsylvania. *The Treatment of Tuberculous Hip Disease by Weight Bearing and Fixation of the Lorenz Short Hip Spica.*

65. Winship, A. E., Boston. *Elementary Instruction as to Tuberculosis.*
66. Wolff-Eisner, Berlin. *The Early Diagnosis of Tuberculosis.*
67. Wollstein, Pathologist to the Babies' Hospital, New York City. *The Distribution of Tuberculous Lesions in Infants and Young Children: a Study Based on Post-mortem Examinations.*

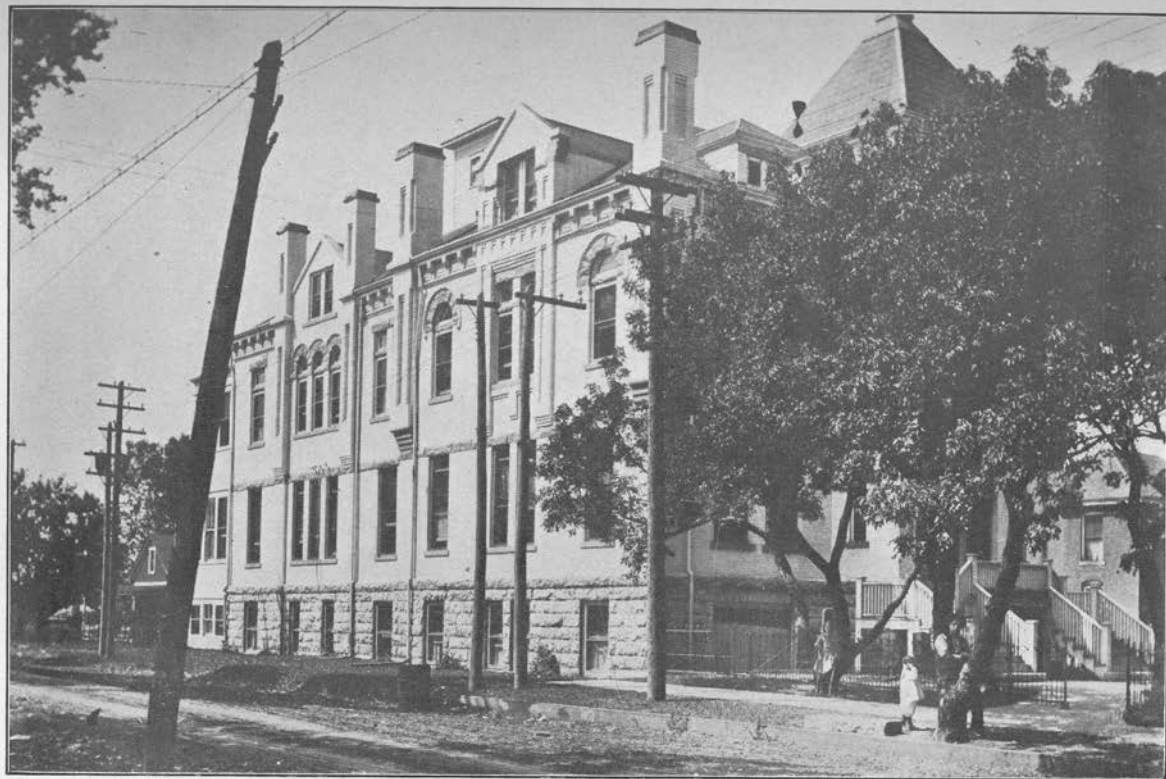


PLATE I

THE NEBRASKA ORTHOPEDIC HOSPITAL.

Space in this building was set aside for the hospital by the legislature of 1905. The hospital now occupies the entire basement and the second and third floors, which have been remodeled and converted into entirely modern hospital quarters. An electric push button elevator has been installed and the building otherwise completely equipped.



PLATE II

A GROUP OF PATIENTS IN THE HOSPITAL YARD TAKEN IN AUGUST, 1908.

The first patients were admitted October 1, 1905. The entire number cared for during the first period ending November 30, 1906, was the equivalent of about 8,000 hospital days. For the second period ending November 30, 1908, patients have been cared for the equivalent of almost 25,000 hospital days.

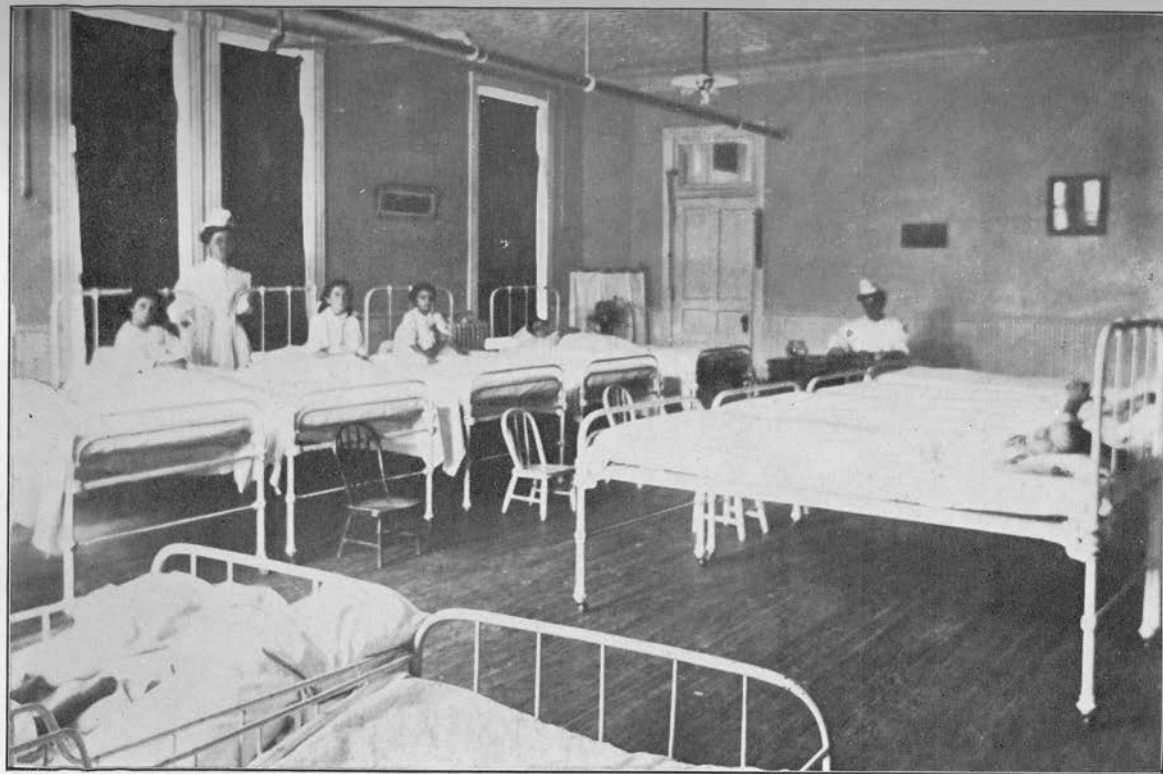


PLATE III

THE GIRLS' WARD

On the second floor is one of two wards almost exactly alike. This ward will accommodate about eighteen beds and is used for sleeping quarters or for patients who are only temporarily bed patients. Chronic bed patients are as far as possible given beds in the solarium at the south end of the building.



PLATE IV

THE OPERATING ROOM

In the northeast corner of the basement is finished and equipped in the most approved modern fashion. During the period since the opening of the hospital something more than 200 operations have been performed.

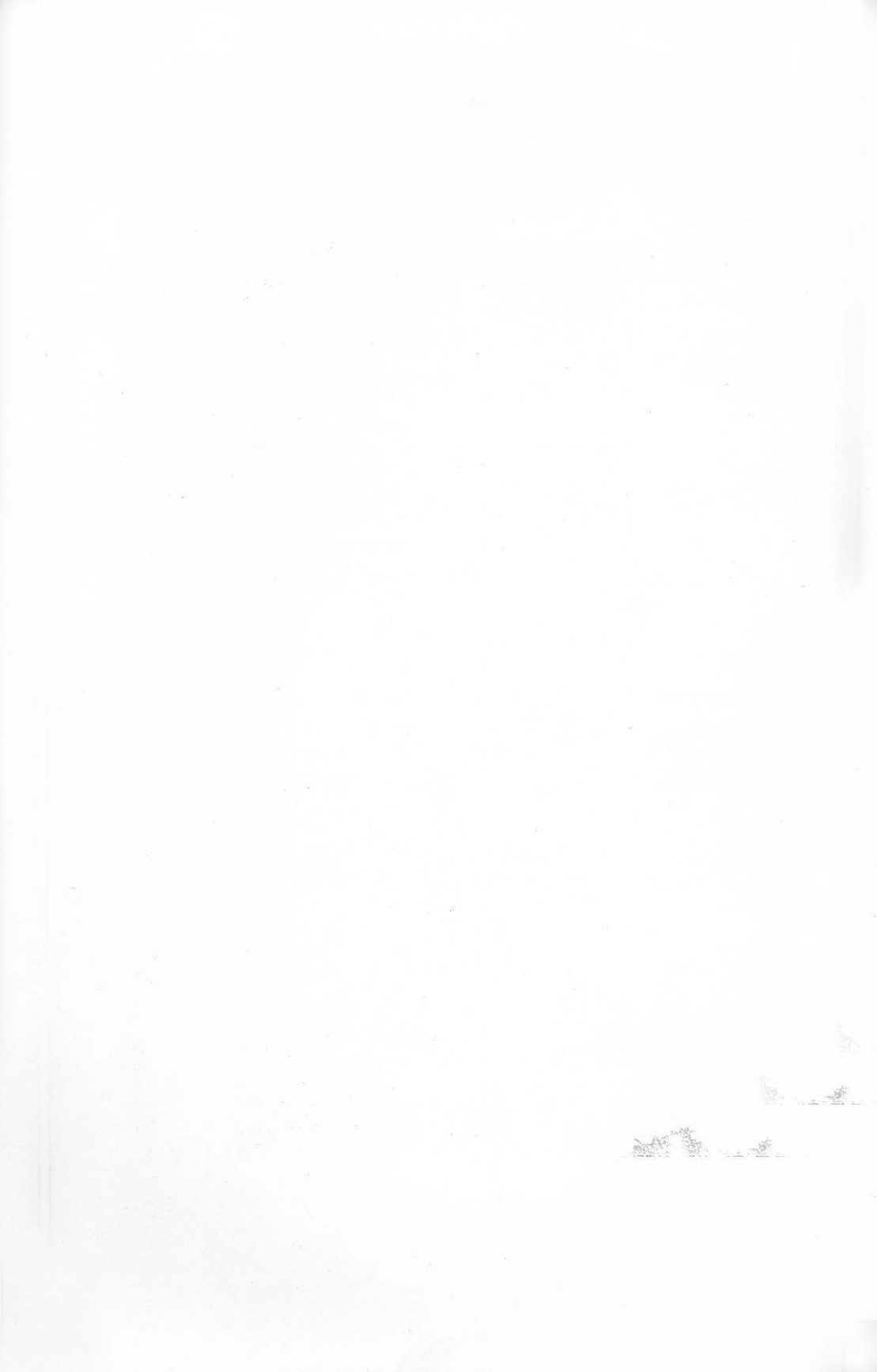




PLATE V

THE SCHOOL ROOM

Grammar school work and instruction in basket weaving, lace making, clay modeling and other branches of manual training are regularly carried on in this schoolroom, which is the basement portion of the solarium. Those children who are confined to their beds are provided with suitable instruction in such work as they are able to carry on.

Some Recent Discoveries Regarding Trypanosomes and Sleeping Sickness

BY HENRY B. WARD, LINCOLN, NEBRASKA

Among all the diseases which have come into attention in recent years no one has a more remarkable history than sleeping sickness. Nearly a century ago the first cases were noted among slaves imported into Brazil and the West Indies. The disease seems to have been confined originally to a limited region on the equator near the coast of West Africa, extending only a few miles in any direction. Today it has spread thruout the entire Congo basin to Central Africa, thru Uganda and the Sudan, and as far as Portuguese and German East Africa. It is found now as far north as Bahr-el-Ghazal and as far south as Cape Colony. More than that, this tremendous spread over the entire width and almost the entire length of a great continent is chiefly a matter of a score of years. With the recent establishment of great trade routes thru Africa and the movement of exploring parties and caravans back and forth across long distances this disease has spread like a prairie fire thru the country. The opening of the Dark Continent and rapid transit have made of a relatively insignificant disease a continental scourge.

Unfortunately the limit has not yet been reached. On this point recent investigators are unanimous. It is certain that sleeping sickness will continue to spread in Africa with the opening up of the country and the consequently increased movement of natives over long distances, until its dispersal is coextensive with that of the tse-tse fly. It is also clearly the duty of Europeans to do all that is possible to prevent this extension of the disease which largely results from their presence.

The cause of the disease is a minute blood-inhabiting protozoon of the flagellate type known as *Trypanosoma gambiense*. In the blood it gives rise to the clinical symptoms classed together as trypanosome fever. Later the parasite makes its way into the cerebrospinal fluid and there excites the symptoms known as sleeping sickness or West African lethargy. While possibly seen earlier, this organism was first recognized as such in 1901 by the

English investigator, J. E. Dutton, who later sacrificed his life in the effort to solve the problem of the disease. Somewhat similar parasites occur in many other hosts, and certain of the species are the cause of epidemics which ravage domestic animals in various regions. Among such diseases are the surra of India, the mal-de-caderas of South America, the nagana of Africa, and the mal-du-coit found among horses in southern Europe and introduced into our own country. It is important to note that the species which causes human trypanosomiasis has never been found in the blood of any other host. Its reported occurrence in horses, cattle, and other animals is due to confusion with the similar parasites mentioned above, which in fact are perfectly distinct species. To be sure Koch is said to have discovered the human species in the blood of the crocodile which infests the shores of Victoria Nyanza, but the indefinite preliminary announcement has not been confirmed and is improbable at least. It has been established experimentally that the various trypanosomes are transmitted from host to host by the intervention of blood-sucking flies, and for the human host the tse-tse fly (*Glossina palpalis*) functions as vector. Some investigators regard the tse-tse fly as a purely mechanical agent, but others look upon it as an intermediate host in which the parasite passes thru certain parts of its life cycle. If the latter alternative be true, the fly will play in this disease precisely the same rôle as the mosquito in the malaria. Minchin has demonstrated clearly that the parasites live only a short time in the proboscis of the fly and that during this period they can be inoculated into a new host. There remains much to be determined before the exact agency of the fly in transmitting the disease can be stated; now only this much is fixed: the disease is transmitted primarily if not exclusively by this single species of tse-tse fly.

The rapid spread of the disease, together with its terrible fatality, makes it of tremendous economic importance, and nations holding colonial possessions in Africa have rushed scientific expeditions into the field to solve the problems it offers. Commissions appointed by England, Germany, France, and Portugal have done splendid work in determining the infected area, means of transmission, and associated factors. The Schools of Tropical Medicine at Liverpool, London, Hamburg, and Paris have, on

their own initiative, put into the field investigators who sometimes at the cost of their own lives have worked out the pathology of the disease and have made extended experiments on its treatment. Last spring a second International Congress on Sleeping Sickness met in London and established a bureau with headquarters in that city for education, investigation, and prophylaxis under international cooperation. As prophylactic measures the villages of the natives will be moved away from stream banks where the tse-tse flies are most abundant and the infected are to be isolated in central lazarets guarded by troops to prevent their escape. The task is tremendous and is rendered more serious by the difficulty of diagnosing early cases and by the concealed opposition of the natives to such quarantine measures.

Many measures must be employed, but the most important one, and that which offers the greatest hope of absolute success, is believed to be quarantine. Its efficiency will be dependent upon the application of gland palpation supported by other methods of examination to detect early cases. Thru it some persons will doubtless be wrongly suspected, and will suffer inconveniences which must be supported; other cases will doubtless remain undetected. It is believed that the number of cases which will escape diagnosis by this method is exceedingly small, and if a nominal percentage does escape, that is no reason why the huge percentages which may be detected by it should be allowed untrammelled intercourse with uninfected countries when such frightful examples of the result of such uncontrolled emigration already exist in the sleeping sickness epidemics of Uganda and the Congo Free State.

Of the probable outcome of the disease Todd says that advanced cases may be expected to die within three to six months. Cases in which only a few symptoms of an indefinite nature are observed live for about a year. Cases which seem apparently well, and in which, on continued examination, nothing can be found save slight, irregular, intermittent fever and enlarged glands, may live for very long periods, but they commence to die in a year, and two-thirds of them die within three years.

Recent extensive investigations which have been carried out in foreign research laboratories with the primary object of ascertaining some mode of drug cure for sleeping sickness and other trypanosome diseases have resulted in demonstrating certain fea-

tures in the biological conduct of these protozoa towards chemical stimuli which are of extreme interest. Thus far only three groups of chemicals have been discovered which are at all efficient in the treatment of trypanosome infections. They are: (a) benzidin dyes, (b) basic triphenyl-methane dyes, and (c) arsenical compounds. In experimental animals complete cure has apparently been effected by maximum doses of these compounds. With lesser doses and prolonged treatment the parasites may disappear from the blood for a time, but later on make their appearance again. Those which recur have undergone a pronounced change in their biological characters and constitute a strain resistant to the therapeutic agent employed. Such a strain manifests chemo-resistance of a specific character towards the particular substance used to develop it and an increased resistance towards other compounds of the same group. On the other hand, the development of resistance towards one group causes no increase whatever in the resistance towards other groups. By continued experimentation, however, a strain has been produced manifesting a triple resistance.

Chemo-resistance once acquired persists unchanged, while the resistant trypanosomes are passed thru normal animals even for one hundred and forty transfers extending over fourteen months. This has been cited as strong evidence of the transmission of acquired characters. As Gifford has pointed out this means rather the origin of a resistant strain by artificial selection. The specificity of the resistance is very striking. After an experimental animal has been inoculated with a mixture of two resistant strains and is then treated with a substance towards which one of the elements is resistant, the other element will disappear from the blood, but the resistant strain will remain and develop unchecked. Indeed the two strains remain separate and capable of isolation after repeated passages thru infected animals. Or, in other words, a strain with double resistance or with modified resistance does not arise as the result of infection with a mixture of two resistant strains.

Arsenical preparations have been most extensively used in treatment of trypanosomiasis. Koch regards the therapeutic value of atoxyl as demonstrated and holds it to be specific in this disease. Heavy doses do cause the trypanosomes to disappear

for thirty to forty days, but in some cases at least they return, and the final outcome is uncertain. Atoxyl followed by mercury perchloride is said by others to give better results than atoxyl alone. The severe effects are probably due to a toxin produced by the parasites, which induces serious and even permanent changes in nervous tissue, so that the entire destruction of the trypanosomes would be unavailing in the later stages of the disease. The parasite and with it the disease may be transmitted to the chimpanzee and some monkeys, and in them one can observe all the characteristic features of the disease recorded for man. The results of experiments on such animals and also of the administration of drugs to man must be accepted with great caution since in many cases the disease is prolonged and a positive verdict regarding the outcome of the experiments can not be given until a long time has elapsed. The number of cases under consideration in such experiments is naturally small and the disease is known to have been prolonged as much as seven years before death ensued where no medical measures were taken.

Game as well as native African cattle and other domestic animals are supposed to acquire in some cases a tolerance for certain strains of trypanosome. From conditions in Gambia, where sleeping sickness has been endemic for more than a century, some investigators are led to believe that many may acquire a similar tolerance for *Trypanosoma gambiense*, but so far as positive evidence goes the outcome of the disease is universally fatal. The former supposed racial immunity which whites enjoyed has proved to be only greater freedom from infection on account of the use of clothing and of other habits that reduce the chance of fly bites to a minimum. As little dependence can be placed upon supposed immunity, racial or acquired, as upon the various types of drug treatment so highly commended by some investigators.

The Physiological Aspects of Shock¹

BY A. E. GUENTHER, LINCOLN, NEBRASKA

In an attempt to form a conception of the altered physiological functions which are involved in the clinical expression "shock" one is met at the outset by a looseness of application of the term and by an array of contradictory symptoms which are confusing. Apart from conditions which follow acute infection, inspissation of the blood, fat embolism, etc., there are apoplectic shocks, cardiac shocks, deferred shocks, epigastric shocks, erethismic shocks, fetal shocks, mental shocks, paralytic shocks, secondary shocks, sense shocks, sexual shocks, surgical shocks, testicular shocks, torpid shocks, and traumatic shocks. These may be slight and transient, profound and at times fatal. The slight or transient conditions seem to be closely allied to syncope, in which, with a transitory loss of consciousness, heart and respiration show no marked disturbance. The prodromal symptoms which usually precede syncope, such as dizziness, ringing in the ears, darkening of the visual fields, are absent in shock. In the more profound conditions there exist weakened energy of heart beat and irregular breathing, which lead to a decrease of body temperature and in a diminution of gaseous exchange, so that the venous blood of persons dying of shock is lighter in color than normal blood (Roger quoted from Ziegler). Consciousness is usually preserved, the skin and visible mucous membranes are pale, the pulse is often irregular or intermittent. In severe shock the prostration may amount to immobility or coma. With sunken countenance and evidences of weakness of sensory and motor functions, death takes place from stoppage of the heart and cessation of the respiration. But a depression of vital activity is not an invariable accompaniment of shock. In the so-called erethismic shock the patients are restless and excited,—they groan, shriek, and complain of a fearful anxiety associated with dyspnea. This complex of symptoms has, obviously, fundamentally, an alteration of the central nervous system as its basis. Given such an

¹Read before the Pathological Club of the University of Nebraska College of Medicine.

alteration, primarily, the various other symptoms characteristic of clinical shock may follow secondarily.

As early as 1850 Marshall Hall wrote, "If in a frog the spinal marrow be divided just behind the occiput, there are, for a very short time, no diastaltic actions in the extremities. The diastaltic actions speedily return. This phenomenon is shock." He, however, was not the first to describe shock, since this phenomenon had been reported by Whytt a century previous without giving it a special name.

It is a very striking condition as seen in the frog. The animal is completely flaccid. The injury to the central nervous system has given rise to a depression of nervous function which passes away only gradually; *pari passu*, the ordinary reflexes which had been abolished, reappear.

Shock appears in a great variety of animals, very characteristic in the higher but becoming less and less distinct in descending the animal scale until shock is with difficulty separable from inhibition phenomena. Among animals that may be used in the laboratory it is said that shock is most pronounced in the monkey, where it forms a serious experimental difficulty in the study of spinal reflexes. As studied in this animal, spinal shock appears to take effect in the aboral direction only. It makes but very slight difference whether the cord is sectioned in the dorsal, lumbar, or sacral region. Each section is followed by equal degrees of depression, but the area involved differs, of course, as far as the number of segments is concerned. Sherrington states:

"A section below the brachial enlargement hardly disturbs the reactions of the upper limb altho the number of channels running headward thru the tracts of Goll, Burdach, Flechsig, and Gowers, which are sectioned in such a case, are enormous, and the impulses sent cephalad must produce tremendous stimulation of structures placed at higher levels. A striking example of the absence of a headward spread of depression is given when the transection takes place just below the level of the fifth cervical segment. In such an instance the respiratory activity of the phrenic motor cells is hardly affected tho they lie in such close proximity to the cut. The depression on the aboral side of the section is profound. Let it be clearly borne in mind that the cutting off of all the stream of centripetal impulses which are con-

tinually passing up the cord from cutaneous, articular, and muscular sense organs of the tail, limbs, trunk, and viscera and which serve for conscious and unconscious elaboration in the brain does not disturb the reactions of the head or brain." According to Sherrington, if the section lie below the brachial region the animal will, immediately after section, "direct its gaze to sights seen thru the window or may amuse itself by catching flies on the pane." The aboral direction taken by shock seems to be universal in the nervous system. According to Loeb, the head-half of the worm *Thysanozoon* continues its movements of progression almost undisturbed by a quick cut across its middle. If, in the bee, while sucking honey, the abdomen is suddenly severed from the remainder of the body, it will rear itself for a moment and then continue sucking.

A very interesting contrast results from high cervical sections in the monkey and in the cat. In the former a tendency to drop off to sleep develops itself, but it is unlikely that this is due to any depression of nervous activity resulting directly from the section, but is due rather to the coincident fall of arterial blood-pressure and of body temperature. A similar transection in the cord of the cat leads, not to a depression, but to an exaltation of nervous function, so that the region of distribution of the trigeminal becomes hyperesthetic. A similar condition seems to be present in *Astacus*, judging from Bethe's experiments. The differences thus observed in the two classes of animals bring to mind forcibly the two kinds of clinical shock which stand in most vivid contrast—the torpid and the erethismic shock.

Sherrington in the article on the spinal cord in Schaefer's *Physiology*, vol. II, p. 846, gives the following account of the resumption of nervous activity following spinal shock. "For an hour or so it may be difficult to elicit any reflex movement from the skin innervated behind the transection, whether by mechanical, thermal, or electrical stimuli. An apparently crossed reflex is, at least in my experience, among the earliest obtainable, namely, the crossed adductor reflex and the crossed 'knee-jerk.' An early reaction to emerge from the spinal shock is adduction-flexion of the hallux, in response to stimuli applied to the third, fourth, and fifth digits (plantar surface or sides) or to the skin of the sole, especially on its fibular side. The movement of the

hallux is then slight and often tremulous. A similar reflex is obtainable in the hand. In the cat and dog and rabbit an equivalent reaction seems to be the arching of the digits, and this is not unfrequently bilateral. Anal protrusion in response to stimulation of the skin of the perineum, feeble abduction of the tail on pricking it, are also reactions which early emerge from the depression. The limbs at this time feel limp and the muscles more flaccid than they do later. Gradually these reflex movements become more vigorous and others are added, e. g., the cremasteric and the drawing up of the limb on stimulation of the foot. Extension of the limb is late to be obtained, and very rarely is obtained as a primary homonymous reaction. Crossed reflexes appear, and the march and duration of the individual reflexes get more extensive. The disappearance of shock is very variously rapid in different individuals. In the same animal the progress is usually not steady; on some days reflexes are absent which had been gained and reappear only later. The extensors of the hips and knees recover later than the flexors. In the spinal dog after brachial transection it can perhaps be said that in five weeks the depression of shock has usually worn off. It is not renewed by a second transection practiced behind the first one."

From a physiological point of view the most interesting phenomena in connection with shock are those that have to do with the provocation of movement in apparently reactionless limbs. Sherrington is authority for the statement that it can be especially well seen in the monkey that the motor root cell, tho in spinal shock profoundly inaccessible to stimuli applied via skin or afferent nerve trunks, lies perfectly open to any applied via the pyramidal paths. Also, excitation—mechanical, or by weak electric currents—of the central ends of the spinal afferent roots readily evokes reflex movements, tho far stronger stimuli fail absolutely when applied to the skin and afferent nerve trunks. This most extraordinary result can only be speculated upon at present.

By Goltz shock was looked upon as a collection of inhibition phenomena. With reference to this interpretation Sherrington in the *Integrative Action of the Nervous System* states: "The argument implies, if it does not explicitly state, that the trauma, by its damage and by its subsequent processes of inflammatory

reaction, formation of scar tissue, etc., acts as a stimulus, exciting inhibition that depresses or suppresses reflex activity in adjacent and even remote arcs of the central nervous system. Against this explanation militate several facts. Firstly, the shock takes effect almost exclusively in the aboral direction. Were the mere irritative action of the trauma the cause, it is not easy to see why the nervous centers near the trauma should not be depressed on either side of, for instance, a spinal transection, headward as well as backward. Secondly, experiments of the following kind give results difficult to reconcile with the view. When in the dog complete transection of the spinal cord thru the eighth cervical segment is practised, a severe fall in the general arterial blood-pressure ensues, and vaso-motor reflexes can not be elicited. But in the course of some days this is largely recovered from, and after some weeks the blood-pressure will, with the animal in the horizontal position, often be found practically normal. When the animal is then anesthetized and curarized, artificial respiration being maintained, it is usually easy to obtain on stimulation of the central ends of the divided afferent or mixed nerves, for instance of the internal saphenous nerve, good and often very large vasomotor reflexes, the blood-pressure rising fifty millimeters or more. These reflexes upon the vascular musculature are purely spinal, since the cord has been divided just headward of the thoracic region. Then, while these spinal vaso-motor reflexes are regularly elicitable and serve as a guide to the reflex activity of the cord behind the transection, I have transected the cord again a couple of segments behind the original transection. This section excites an immediate transient rise in the arterial pressure, lasting about a minute, and succeeded by a gradual fall. The arterial pressure, then, in my experience, sinks to an equilibrium of pressure hardly lower than its mean prior to this second transection. There is none of that deep depression which ensued on the first trauma, tho the second trauma has been practically qua trauma a complete repetition of the former one. If the fall of general blood-pressure be regarded as part, and a severe part, of the 'spinal' shock which ensues on spinal transection in the cervical region, the absence of that fall on repeating practically the same trauma must signify that the second trauma is not followed by the shock that followed the first

trauma. Moreover, reflex heightenings of blood-pressure such as were regularly obtainable just prior to the second transection, are obtainable immediately, i. e. four minutes after the second spinal transection. The first trauma causes temporary deep depression of the spinal tonus of the vascular system and temporary abolition of the vascular reflexes. The second trauma causes practically no depression, even transient, of the reestablished tonus of the vascular system nor of the pressor spinal vascular reflexes that have become similarly reestablished. It may perhaps be objected that the vascular tonus established subsequent to the first spinal transection is of peripheral mechanism and outside the spinal cord itself. That that is not its main factor is shown by the further deep depression of vascular tonus which occurs when the spinal cord in the thoracic region is itself not merely transected but destroyed."

"There remains the further question as to whether 'spinal' shock is a phenomenon of inhibition. A reflex during its depression by spinal shock does not present the features it shows when reduced by inhibition so much as features resembling those characteristic of it when fatigued. The scratch reflex under spinal shock shows irregularity of rhythm, slow, protracted, relatively feeble beats, and speedy onset of temporary inexcitability, features which characterize it when nearly tired out. So also with the flexion-reflex of the leg. In the period of depression by spinal shock the reflex is feeble even under strong excitation, is relatively short-lasting, and on cessation of the exciting stimulus shows little of the prolonged after-discharge that it is prone to show at other times: it also tires out then with abnormal rapidity. The scratch-reflex in spinal shock in pronounced degree fails to be elicitable by electrical stimulation at all, though still elicitable by rubbing. This indicates the greater efficacy of a stimulus more nearly like the adequate. The condition of the spinal reflex arcs in spinal shock appears to resemble a general spinal fatigue rather than an inhibition."

There can be no doubt that the central nervous system may, as the result of stimulation, not only be excited to increased activity but may at times respond by a diminution of its activity. It would be impossible to form any conception of the coordinated spread of impulses thru the central nervous system without ac-

knowledging its effects. E. H. Weber, in 1845, after experimentally demonstrating the phenomenon of inhibition in the effect of the vagus on the heart, immediately extended the notion to the case of increased spinal activity witnessed after ablation of the brain. He suggested that removal of the brain removes a nervous mechanism which inhibits the reflex spinal machinery, but as a working hypothesis in physiology it only became accepted after the experiments of Setschenow in 1863. The latter found that stimulation of the midbrain and bulb, especially of the corpora quadrigemina, prolongs the reflex time. A frog, its cerebral hemispheres having been removed, withdraws its foot from a bath of acidulated water, if the above mentioned parts are at the same time excited, much later than it does otherwise. The postulation of an inhibitory center in the mesencephalon (and myelencephalon) was the first interpretation put upon Setschenow's observations. Then it was shown that similar inhibitions of spinal reactions could be obtained from foci in various other parts of the brain and of the cord itself. The inhibitions are obtained either mediately from sensorial surfaces or by immediate excitation of the foci themselves. Goltz introduced the view that a reflex center, engaged in a particular reflex function, suffers impairment in that activity when it receives incitation from any other afferent channel. Certain it is, a nerve cell thrown into activity may throw others not only into action but also out of action. Schiff and Herzen state that each spinal segment exerts an inhibitory influence on all segments lying further backward. Where, as in the higher mammals, the cord possesses an immediate path from the region of the cerebral cortex, it is considerably influenced in its reflex functions by the activity of that cortex. Reflexes purely spinal are facilitated by the removal of this cortex or by rupture of the descending path. The scratching reflex, which is easy to provoke from puppies and from the adult dog after high spinal transection, can, after ablation of the cortex cerebri, be abnormally, easily, and even uncontrollably elicited on the side of the body contralateral to the cerebral lesion. Instances might be multiplied indefinitely illustrating the activity of inhibitions in the nervous system. If, however, we turn our attention to other phenomena we are forced to the conclusion that excitations of the central nervous system are

most readily elicited. In the familiar experiment of tapping the patellar tendon it can be shown that the kick under given environmental conditions soon reaches a general average extent. The slightest cutaneous or sensory stimulation of any kind, applied at this time, as a gentle stroke on the skin of the neck with a feather, is followed usually by a tremendous exaggeration of the kick. The excitation spreads thru the central nervous system and increases its irritability. Excitation being so familiar a result, further examples are not necessary. It need only be said that the continual excitation of the cord produces a constant minimal activity designated as spinal tone, but at all times excitations or facilitations of impulses are taking place. Either process may be retarded or accelerated. Particularly is this true of that collection of nerve cells or mechanisms situated in the medulla, known as centers.

The effect of incoming impulses over sensory nerves when the stimulation is weak is usually a rise of blood-pressure, which is due to increased rate of heart beat and presumably largely the result of inhibition of the vagus center. Experimentally strong stimulation brings about a fall of blood-pressure.

In surgical shock there is much evidence to show that this peculiar vital depression is usually accompanied by changes in blood-pressure. A moderate or slight traumatism causes a rise of blood-pressure—if the injury is severe or oft repeated, then there follows a fall of blood-pressure. Crile's experiments were taken to show that surgical shock is due to exhaustion of the vasomotor center, which renders it unable to maintain the tonus of the arterioles. But the cause of shock can not be due entirely to a fall in blood-pressure, for even when the section lies anterior to the second thoracic segment, and thus involves a fall of blood-pressure, the head shows no typical shock symptoms. Furthermore, whether the section is high or low the depression of functions of the caudal portions of the cord is equally severe. Section of the splanchnics, which produces a profound fall of blood-pressure, does not occasion shock. The loss of temperature is not sufficient to explain the phenomenon, for such a loss is easily avoided.

It has been affirmed repeatedly by investigators that continued sensory stimulation leads first to a stimulation of the vagus cen-

ter and then to a paralysis. Paralysis of this center means, of course, a rapid rate of heart beat. A rapid heart beat in itself should lead to an increase in blood-pressure, so that other factors enter into the condition. The vaso-motor center is not unlikely affected like all other medullary centers. Excessive stimulation is said to lead to its paralysis. We have, then, in the vaso-motor center a mechanism whose failure to act would lead to the fall of blood-pressure which so often is the accompaniment of shock. Crile and the vast majority of investigators in this subject have as a matter of fact taken such a view of the case to the entire exclusion of purely nervous factors. Both enter into the production of the condition shock, but the nervous alteration is the primary factor. If it could be shown that the vaso-motor paralysis affects primarily the higher levels of the central nervous system, producing in these higher levels a loss of influence such as they normally exert on the lower centers, thus acting substantially like a section of the cord, which also does away with the activity of the higher centers, then we would have made a marked advance in an explanation of shock.

This method of reasoning, based as it is upon an exhaustion of the vaso-motor center, is rendered very uncertain and doubtful by the work of Porter and pupils in a series of papers published in 1907 in the *American Journal of Physiology*. These authors state (*Am. Journ. Physiol.* 1907, xxi, p. 504) that their experiments "demonstrate that the vaso-motor cells are not thus depressed or inhibited, and experiments published in the last number of this journal (1907, xx, pp. 444-49) show that excessive stimulation of afferent nerves does not materially lessen blood-pressure. The present hypothetical basis of shock is thus removed."

Recently tremendous light has been thrown upon the problem of surgical shock thru the publication of Yandell Henderson in the *American Journal of Physiology*, 1908, xxi, 1. This investigator was able to show that in dogs under artificial respiration the development of shock is not dependent upon the extent of the injuries and the intensity of the stimulations to afferent nerves, but upon the extent of pulmonary ventilation. It is well known that dogs are, ordinarily, with difficulty thrown into a condition of shock. Violent procedures are necessary. In Henderson's

preliminary experiments, without violent operative insults and apparently under most careful treatment, dogs repeatedly passed into conditions resembling shock after having developed an introductory tachycardia.

The cause of these phenomena was traced to the method of artificial respiration used, leading to excessive ventilation of the lungs, so that finally they were able to induce or prevent shock at will. Their method proved also an excellent means of varying the heart rate from less than 40 to more than 200 beats per minute. The hypothesis was, therefore, formulated that acapnia is the cause of surgical shock. In operations the diminished carbon dioxid in the blood and tissues results from hyperpnea or from the exhalation of carbon dioxid from exposed viscera. It appears from the investigations of Henderson that the carbon dioxid content of the blood not only exercises a regulative influence upon the heart, but influences also vascular tonus, the peristalsis of the alimentary tract, the mental condition, and other functions of the body.

The rate of reduction of carbon dioxid in arterial blood exercises an important effect upon the subsequent phenomena. If the reduction takes place rapidly the tachycardia passes into a condition of the heart resembling tetanus, so that its efficiency as a pumping organ is abolished. Arterial pressure falls and death results. If the reduction in arterial carbon dioxid is less extreme and is maintained for an hour or so, the arterial pressure falls to a very low level. This fall is not due to tachycardia alone, for the heart rate is not always extreme, but is due to a loss of tonus in the peripheral veins and capillaries. Reflexes are greatly reduced. Stimulation of afferent nerves causes no rise in arterial pressure. The nervous depression, however, is said to precede the fall in blood-pressure. Coma is pronounced and the respiration shallow. The latter is the direct result of the reduced carbon dioxid tension in the respiratory center. In extensive investigations on surgical shock Crile found that 90 per cent of the subjects died of respiratory failure. The interesting review of literature by Henderson indicates that carbon dioxid as a hormone deserves a position of importance far greater than is usually attributed to it.

How long shock may persist is a question on which very dif-

ferent views have been held. Goltz believes that shock may persist for months or years. Sherrington, as the result of his work on spinal transection, believes that the cord is often more normal a short time after section than it is later on. The phenomena of shock seem to merge into the symptoms which result from the withdrawal of normal influences on the spinal nerve cells. This more permanent alteration he calls "isolation dystrophy." In cold-blooded animals these two periods hardly overlap, but in man clinical experience shows that shock is severe and "isolation dystrophy" arrives speedily.

THE BULLETIN

OF THE

UNIVERSITY OF NEBRASKA

COLLEGE OF MEDICINE

HENRY B. WARD, Dean, Lincoln

HAROLD GIFFORD, Associate Dean, Omaha

THE BULLETIN is published quarterly in January, April, July, and October, by the University of Nebraska, at Lincoln, Nebraska

COMMITTEE OF PUBLICATION

H. WINNETT ORR, LINCOLN, CHAIRMAN

W. O. BRIDGES, OMAHA

R. H. WOLCOTT, LINCOLN

W. F. MILROY, OMAHA

A. E. GUENTHER, LINCOLN

Single numbers of THE BULLETIN may be had for 50c each. Complete volumes or subscriptions by the year \$1.00.

All communications relating to THE BULLETIN should be addressed to

DR. A. E. GUENTHER, Station A, Lincoln, Nebraska

EDITORIAL

Tendencies in Medical Education

"The rôle of a prophet is hazardous. If the would-be seer essays to depart from the commonplace, he is sure to be flayed if not guillotined by those who, as he thinks, thru prejudice or lack of foresight, do not have his views. He must leave his justification to the coming race, and among its numbers only the anti-quarian will know he lived and thought.

"Why, then, should one prophesy? To the ruler of today, the financial leader, the lord of Wall street, such divertisement is time-wasting and unprofitable. Yet even he has made his pile by calculating three moves ahead in the game instead of only one, the measure of the ordinary mortal. In truth, every one essays the task of the prophet, but to down opposition joins in the clamor against the man who proclaims another gospel than his own.

"This is, then, the real value of prophecy,—to arouse criticism and perhaps, thru argument, often heated, to try out the gold in new ideas. The residue which has stood the test, small tho it often be, is the permanent possession of the race. By such slow accretion the wealth of knowledge is built up.

"What is the most remarkable, the most fundamental factor in the changes of the last decade or so in medical education? I write it down with some assurance as the elimination of individual profit and individual control. Proprietary medical education is ceasing to exist, even more surely than patent medicines, tho the crusade against the latter is led by men and journals that do mould public opinion, and the movement against the former is only an unknown undercurrent. Half a century back every medical school was a private corporation; even those few which in name were affiliated with great universities paid dividends to their stockholders—truly an absurd and anomalous condition in education. Americans are fond of fair play, so the public virtually said, Let there be as many schools as the doctors will that all may share alike in this profit, and schools multiplied. But to be profitable schooling must be inexpensive, and cheap schools turn out a poorly trained product, as contact with other nations promptly showed even the men themselves.

"Conditions have changed, and every year sees a reduction in the number of medical schools. There may yet be some which are declaring dividends, but they are few, and better still are generally condemned. Proper medical training is known to be expensive, and to give it schools are looking for endowment. They have given up proprietary control to become integral parts of great universities. They have found in many cases money for laboratories, apparatus, and research, and they have demonstrated their ability to employ wisely such trust funds. It is of peculiar interest to the Academy to note that this advance has been gained thru association with institutions primarily organized and endowed for academic instruction. No great medical school can continue to exist apart from a college, and the college atmosphere and ideals make proprietary schools and methods impossible. There can be no profit and hence no cash dividends; the college faculty is an oligarchy which comes very near being a true aristocracy. Individual views are seldom in complete control, and sectarianism does not thrive. The results of the change are worth examining in detail later, but now let us record only the evident general effect.

"The American medical school is fast assuming a true academic character."—*Dean Ward in Bulletin of the American Academy of Medicine.*

COLLEGE NOTES

Dr. C. H. Willis of Omaha has located at Wymore, Nebraska.

Dr. Irwin L. Thompson of West Point has located in Monroe, Nebraska.

Dr. Lawrence Pilsbury of Lincoln has gone to Europe for an extensive trip of four or five months.

Dr. A. C. Stokes has recovered from a recent attack of appendicitis which was relieved by operation.

Dr. A. P. Fitzsimmons of Tecumseh, Nebraska, is candidate for congressional nomination for the first Nebraska district.

Dr. George H. Bicknell of Omaha, Nebraska, was recently operated on for appendicitis at the University Hospital in Charlottesville, Virginia.

Dr. Lehnhoff recently spent some time at Rochester, Minnesota, studying the methods of diagnosis and the business organization of the Mayos.

Dr. G. A. Ireland of St. Edward has formed a partnership with Drs. Martyn and Evans at Columbus, Nebraska, and has removed to the latter place.

Ruth Eleanor Willard, who arrived at Grinnell, Iowa, on August 24 is a baby daughter gladdening the hearts of her parents, Professor and Mrs. Willard.

Dr. G. L. Strader, of Cheyenne, Wyoming, has been elected president of the Wyoming State Medical Society, and Dr. R. C. Knode, of Sundance, Wyoming, first vice-president.

Dr. R. A. Lyman attended the annual meeting of the American Pharmaceutical Association at Hot Springs, Arkansas, September 5 to 12, in the interest of the School of Pharmacy.

Dr. Barker had charge of a nature study class for boys given under the auspices of the city Y. M. C. A. of Omaha during July. August was spent at Milford prosecuting a research on the parasites of the soft-shelled turtle.

The absence of Dr. Alfred Schalek from his classroom during the first week of the present semester was due to his attendance upon the meeting of the American Dermatological Association. The meeting was held in Baltimore. This society is very select, the membership being limited to thirty-five. Dr. Schalek is the only member residing in this part of the country.

The teaching staff of the anatomical department has been increased by the addition of three demonstrators. They are Dr. Walter G. Hiltner of St. Elizabeth's Hospital; Dr. Geo. H. Walker of the Sunlight Sanitarium, and Dr. Henry P. Wekesser of 1105 O street, Lincoln. The assistants in this department for the coming year are Henry B. Boyden, Willis H. Taylor, and J. L. Wilson.

Dr. Henry B. Ward is a corresponding member of the American Academy of Medicine and upon him has been placed the task of interpreting the trend of affairs in the work of medical education. The latest pronouncement in this direction under the title *Tendencies in Medical Education* appears in the October number of the Bulletin of the American Academy of Medicine which, owing to the well-recognized fitness of Dr. Ward to speak on matters of medical education, we are taking the liberty of quoting in our editorial columns.

As the work advances it becomes evident that the new building of Clarkson Memorial Hospital will be a landmark in Omaha. While centrally located at Twenty-second and Howard streets, it is yet in a secluded spot. Crowning a hilltop, its five stories of buff-colored brick have become conspicuous from every direction. The building is now ready for the roof.

The addition to Immanuel Hospital is progressing rapidly, having reached the top of the third story. When completed this addition will more than double the capacity of the institution.

Dr. H. W. Orr has been appointed by the board of education of Lincoln to serve with Dr. J. F. Stevens and Superintendent Stephens of the city schools as a board of medical inspection of the schools for 1908 and 1909. The plan for inspection of the schools is to be modeled after that in other cities and is designed to provide proper care or suitable methods of teaching for those who are sick or physically defective in any way. It is the desire also to protect well children by promptly excluding from the schools those afflicted with any form of communicable disease.

At the International Congress on Tuberculosis in Washington, Dean Henry B. Ward was one of the prominent members of the committee on prizes. This committee classified the exhibits displayed during the congress to decide in what departments they might compete for the prizes offered. On the committee of judges Dr. H. Winnett Orr served and was assigned to duty in the competition between exhibits of states and exhibits between countries and states, the United States excluded.

Dr. A. S. von Mansfelde, of Ashland, and Dr. C. O. Giese, of Holdrege, were also in attendance at the congress.

Dean Henry B. Ward attended the International Tuberculosis Congress in Washington as delegate from the University and also from the state of Nebraska. The University was honored in his appointment as member of the Committee on Awards, and also as Vice-President of Section VI. This section was presided over by Surgeon-General Walter Wyman and dealt with State and Municipal Control of Tuberculosis. Dr. Ward by invitation read a paper before Section V on *Educational Propaganda thru Local Lay Agencies, especially in Schools, Settlements, and Charity Organizations*. Dr. Ward also attended the International Fishery Congress which was in session at the same time and contributed to its proceedings a paper on the parasitic diseases of the salmon.

Dean Ward went to Carson City, Nevada, June 20, where he gave a lecture and also delivered the commencement address for the Carson City high school. This is the only four-year high school in the state, and its present high position is due to the effective and untiring energy of two Nebraska graduates, Superintendent W. J. Hunting and Principal A. Russell Moore.

After a walking and fishing trip thru the Sierras Dr. Ward spent some days in San Francisco, and a week later went to Seattle, Washington. In both places he made a careful study of the measures inaugurated by the municipalities and the United States Marine Hospital Service for the elimination of plague and the destruction of the rats. He had the opportunity of seeing specimens of the native rodents in which it has been conclusively demonstrated that bubonic plague also occurs on the Pacific Coast, and by which the disease has apparently been carried some distance beyond the cities into the country itself.

In the course of this trip Dr. Ward visited a dozen colleges and universities and discussed opportunities at the University of Nebraska with special reference to professional training in medicine.

Among recent changes in the College of Medicine none is more worthy of note as contributing towards an effective course of study than the ap-

pointment of Dr. Paul G. Woolley as associate professor of clinical pathology and director of the Omaha laboratories. Dr. Woolley will do all the pathological work in the Junior and Senior years and will inaugurate an effective course in post-mortem examinations. He comes to his post with the highest recommendations and with an educational experience which promises much of advantage to our students. Dr. Woolley began his college education at Ohio Wesleyan University and received the B.S. degree from the University of Chicago in 1896. He obtained his medical degree at Johns Hopkins University in 1900, and was resident in the Johns Hopkins Hospital for the following year, and a year later in the Montreal General Hospital. In 1902 he went to Manila as the government bacteriologist, becoming in 1904 director of the Serum Laboratory, and pathologist to St. Paul's Hospital in Manila. In 1906 he was called to Siam as director of the government Serum Laboratory, chief health inspector and medical advisor. Dr. Woolley has published extensively in American and foreign journals on bacteriology, pathology, and tropical diseases. Some of the most important publications from the government laboratories in Manila are results of his investigations. Dr. Woolley has already entered upon his work in Omaha and the college has made a special appropriation for refitting the laboratories properly in order to carry on the work he has planned. He attended the International Tuberculosis Congress in Washington, D. C., as official delegate of Siam.

The fall meeting of the Alumni Association of the College of Medicine was held in the building of the clinical department in Omaha, September 30. The following program was presented. Each paper elicited so much valuable discussion that the thirty alumni present felt it was one of the most valuable meetings the Association ever held.

PROGRAM

President's Address—Dr. B. W. Christie, Omaha.

Acute Infections of the External Ear—Dr. R. A. Knode, Omaha.

Report of a Case of Gall-Bladder Trouble—Dr. A. P. Overgaard, Fremont.

The Necessity of Stricter Quarantine Regulations in Contagious Diseases—Dr. J. M. Curtis, Calhoun.

The University of Nebraska School of Pharmacy, What It Means to the Medical Profession—Dr. R. A. Lyman, Lincoln.

Report of a Case of Surgical Kidney—Dr. C. W. M. Poynter, Lincoln.

Demonstrations of Gross Pathology—Dr. C. R. Kennedy, Omaha.

Intestinal Obstruction—Dr. W. H. Betz, Bellevue.

Psychotherapy—Dr. Alfred Jefferson, Omaha.

CHIENGMAI HOSPITAL AND DISPENSARY,
Chiengmai, Siam,
July 15, 1908.

Dear Doctor Ward:

I am most heartily ashamed of myself for not writing to you many times before, and my only excuse is, too busy to write, and really that is no excuse at all. There are so many duties crowding one upon the other that research work is simply crowded to the background. Worms! Yes, we have them out here. Only yesterday I was called to see a little girl twenty-one months old who was vomiting the *Ascaris*, and while there I pulled three out of her mouth. An awful sight. She died; they lived within a quarter of a mile of the dispensary, but waited and waited. My! how I pity the wormy youngsters of this country. And the *Taenia*, the *Ascaris*, and the *Oxyuris*, all of which are so common, are about all of the human parasites I have seen or had time to look for. Again pardon me.

I was so pleased to learn by your last letter to Dr. McKean that so large

a percentage of the students were looking forward to foreign medical missions. I have not been long on the field, but every day is a satisfaction, and there is no question in my mind but that it is one of the grandest agencies for 'good the Master has ever used.

Our great work here is stone in the bladder, and it has been my fortune (or misfortune) to have operated on fifty-five cases already in my short experience. The largest stone I have removed weighed $4\frac{1}{2}$ oz. Dr. McKean has removed one weighing 8 oz., while last January Dr. Hausen of Lakawn removed one that weighed 36 oz. from a man over seventy years of age. He lived over a week and then failed and died.

Well, I must close for this time. With best regards and wishes for yourself and yours. May the College grow and prosper in every way.

Yours most sincerely,

C. W. MASON.

The Pathology club of the College of Medicine met on October 10 at the Lincoln hotel. Dr. H. Winnett Orr presented a paper on *Tuberculosis in Children*, in which he reviewed sixty-seven of the more prominent papers delivered before the recent International Congress of Tuberculosis at Washington, D. C. Dr. Orr's paper has been accepted by the publication committee and appears in this number of the College MEDICAL BULLETIN.

The second meeting of the club was held at the Lincoln on October 24. Dr. C. W. M. Poynter superseded Dr. Orr as president for the ensuing year. Dr. R. G. Clapp was reelected treasurer. The paper of the evening was delivered by Dr. H. H. Waite, embodying the results of original work on infection with the bacillus *pyocyaneus*. The experiments in this paper referring to immunity against this germ had been demonstrated to the club during the preceding year. Dr. Waite's paper is being published in the *Journal of Infectious Diseases*.

Announcement has been made of a series of popular medical lectures to be given during the winter by men of the University faculty and others from out of the city. The first of the series will be given at a regular convocation hour in about two weeks. Others will follow at intervals of ten days to two weeks until the last of the series in April. These lectures, while primarily of a medical nature, will be of such a popular nature as to be readily understood by all students. Among the speakers are State Superintendent McBrien, Dr. McClanahan, Professors Ward, Waite, Howard, and Dr. Wellman of Chicago.

Thru the efforts of the medical faculty in Lincoln an auxiliary section called "The Conference on Popular Medical Education" has been added to the Nebraska Teachers' Association. The following program was given at the annual meeting on November 5.

1. *How May the Spread of Infectious Diseases be Prevented in Our Schools?*—Dr. H. H. Waite.
2. *What Teachers Can Do to Develop Healthy Children*—Dr. S. R. Towne.
3. *The Experimental Evidence Which Explains the Nature of the Action of Narcotics*—Dr. R. A. Lyman.
4. *A Plea for the Addition of Sexual Physiology to the Curriculum*—Dean Charles Fordyce.

The attendance was much larger than was anticipated, it being necessary to use three lecture rooms and repeat the program three times in order to accommodate those present. About six hundred teachers heard the program. At the close a permanent organization was effected with Dr. R. A. Lyman of the University as president, and Miss Caroline Stringer of the Omaha high school as secretary.

INDEX TO VOL. III

- Acapnia, 137
 Alumni reunion, 64, 90
 Amino-acids, 19
 Anesthesia, in ileus, 39
 Anti-diastase, 85
 Auriculo-ventricular bundle, 12, 13, 14
 Bayliss, 48
 Bayliss and Starling, 18
 Bicknell, 35
 Blood, reaction of, 11
 Blood-pressure, 6, 14
 Bowel obstruction, 40, 51
 Brown-Séquard, 1
 Cannon and Murphy, 48
 Compensatory mechanisms, 1, 7
 Center, vaso-constrictor, 4, 5
 vaso-dilator, 4
 vaso-motor, 2
 Charlton, 1
 Circulation, 12
 Claude Bernard, 1
 Coagulation of milk, 18
 College of Medicine, 27, 65, 67, 90
 Cohnheim, 19
 Crile, 4, 135
 Curtius, 21
 Davis, Byron B, 38
 Depressor nerve, 3
 Diet, 58
 Dilatation, 61
 Dittmar, 2
 Dolinsky, 18
 Drugs, purity of, 79
 Ear, foreign bodies in, 33
 Edkins, 17
 Enterokinase, 19
 Enzymes, 85
 Erepsin, 19
 Erlanger, 14
 Ewald-Boas, 62
 Eyster, 15
 Ferien-Kursus, 67
 Fick and Wislicenus, 22
 Findley, Palmer, 24
 Finsen light, 102
 Fischer, 21
 Folin, 23
 Foods, preservation of, 76
 Food supply, 75
 Gastrin, 17
 Gastrectasis symptoms, 56
 Gastric atony, 55
 dilatation, 54
 Gifford, H., 33
 Goitres, in dogs, 108
 Goltz, 131
 Guenther, 10, 128
 Hall, Marshall, 129
 Heart-beat, cause of, 13
 Henderson, Yandell, 136
 His, jr., 13
 Hollister, R., 107
 L. P., 85
 Hormones, 17
 Hospital training, 24
 for Sick Children, 103
 St. Mary's, 102
 Howell, 12
 Hygiene, 59
 Ileus, 38, 47
 Indicanuria, 53
 Inhibition, 133
 Intestines, handling of, 40
 Internship, 24, 26
 Intussusception, 43
 Isolation dystrophy, 138
 Jonas, A. F., 47
 Kastle and Loevenhart, 20
 Kirchoff, 85
 Knee-jerk, 135
 Kocher's dilation ulcer, 38
 Kühne, 19, 85
 Kuliabko, 14
 Lavage, 59
 Liebig, 22
 Lipase, reversibility, 20
 London, as Medical Center, 100
 Polyclinic, 101
 Locke, 14
 Lyman, 29, 95
 Magnus, 48
 Mathieu, 57
 McClanahan, 100
 Meal, fictitious, 16
 Medical aphorisms, 36
 atmosphere, 25
 education, 139
 profession, 73
 studies, 71
 Medicine, experimental, 28
 Monks, 40

- Murphy, 47
National Hospital for Epileptics, 103
Nebraska, University of, 95
Oppler-Boas, 57
Orr, H. Winnett, 111
Pawlow, 15, 17, 19
Peterson, A. O., 54
Pharmacy, relation to physician, 97
 school of, 89, 95, 98
 registration, 96
Physicians, work, 82
Polypeptids, 21
Porter, 136
Porter and Beyer, 3
Proteins, in plasma, 12
 digestion, 19, 22
Pflüger, 22
Physiology, 10
Quarantine, 80, 81
Quacks, 83
Reis, Emil, 42
Resection of bowel, 42
Respiration, Cheyne-Stokes, 15
Review course, 67
Riegel and Boas, 54
Royal College of Surgeons, 104
Schiff, 1
Secretion, salivary, 15
 gastric, 16
Secretion, pancreatic, 18
 psychical, 15
Secretagogues, 17
Setschenow, 134
Sewage, disposal, 74
Sherrington, 129
Sleeping-sickness, 123, 125
Shock, 4, 128, 130
 surgical, 135
Shockey, G. C., 91
Sphygmomanometer, 15
Starling, 17, 48
Stokes, A. C., 106
Stokes-Adams, 14
Stomach, 54, 58, 59, 60, 62
Summers, J. E., 45
Surgery, operative, 106
Tape-worms, 85
Tuberculosis, 81, 111
Trypanosomes, 123
Tse-tse fly, 124
University Hospital, 101
University of London, 102
Vaso-motor nerves, 1
Voit, 22
Ward, H. B., 90, 123, 140
Weber, E. H., 134
Weinland, Ernst, 85
Wiley, Harvey W., 71

FACULTY OF THE UNIVERSITY OF NEBRASKA COLLEGE OF MEDICINE

(THE OMAHA MEDICAL COLLEGE)

ELISHA BENJAMIN ANDREWS, LL.D., Chancellor, Lincoln.

HENRY BALDWIN WARD, Ph.D.
Dean, Lincoln.

HAROLD GIFFORD, B.S., M.D.
Associate Dean, Omaha.

Anatomy

ROBERT H. WOLCOTT, A.M., M.D.
ARTHUR C. STOKES, B.S., M.D.
C. W. MCC. POYNTER, B.Sc., M.D.
WALTER G. HILTNER, B.S., M.D.
GEORGE H. WALKER, M.D.
HENRY P. WEKESER, M.D.

Bacteriology and Pathology

HERBERT H. WAITE, A.M., M.D.
LAWRENCE B. PILSBURY, A.B., M.D.
HARRY H. EVERETT, B.Sc., M.D.
CLARENCE EMERSON, B.S.

Chemistry

SAMUEL AVERY, Ph.D.
BENTON DALES, Ph.D.
MARY LOUISE FOSSLER, A.M.

Clinical Pathology

PAUL G. WOOLEY, B.S., M.D.

Dermatology and Genito-Urinary Diseases

ALFRED SCHALEK, M.D.

Embryology, Histology, and Medical Zoology

HENRY BALDWIN WARD, Ph.D.
WILLIAM ALBERT WILLARD, A.M.
FRANKLIN DAVIS BARKER, A.M.
JOSEPH HORACE POWERS, Ph.D.

Gynecology

PALMER FINDLEY, A.B., M.D.
NORA M. FAIRCHILD, M.D.
ALFRED JEFFERSON, M.D.

History of Medicine

HIRAM WINNETT ORR, M.D.

Hygiene and State Medicine

OLON RODNEY TOWNE, A.M., M.D.
RAYMOND GUSTAVUS CLAPP, M.D.

Laryngology and Rhinology

FRANK STYLES OWEN, M.D.
WILLIAM PENALUNA WHERRY, M.D.

Medical Jurisprudence

ERNEST C. PAGE, Ph.M., LL.B.

Medicine

WILLSON ORTON BRIDGES, M.D.
WILLIAM FORSYTH MILROY, M.D.
HENRY BALDWIN WARD, Ph.D.
THOMAS TRUELSEN, M.D.
OSCAR SAMUEL HOFFMANN, M.D.

VERNON LAWRENCE TREYNOR, M.D.
ALFRED OLAF PETERSON, A.M., M.D.
JAMES SAMUEL GOETZ, M.D.
PAUL H. LUDINGTON, A.B., M.D.
RODNEY WALDO BLISS, B.S., M.D.
AUGUSTUS DAVIS CLOYD, M.D.

Mental and Nervous Diseases

RICHARD CHANNING MOORE, M.D.
JOSEPH MELANCTHON ATKIN, M.D.
GEORGE MOGRIDGE, M.D.

Obstetrics

ANDREW B. SOMEERS, M.D.
CHARLES W. POLLARD, A.B., M.D.

Ophthalmology and Otology

HAROLD GIFFORD, B.S., M.D.
GEORGE HAMLIN BICKNELL, M.D.
HENRY BASSETT LEMERE, M.D.
JAMES MCD. PATTON, A.M., M.D.

Pediatrics

H. M. McCLANAHAN, A.M., M.D.
BURTON W. CHRISTIE, B.Sc., M.D.

Pharmaco-Dynamics

RUFUS ASHLEY LYMAN, A.M., M.D.

Physiology

AUGUST ERNEST GUENTHER, Ph.D.

Therapeutics

H. LEROY CRUMMER, B.S., M.D.
HANS PETER JENSEN, M.D.
DANIEL FRANCIS LEE, A.B., M.D.

Surgery

AUGUST FREDERICK JONAS, M.D.
BYRON BENNETT DAVIS, A.B., M.D.
DONALD MACRAE, JR., M.D.
ARTHUR C. STOKES, B.S., M.D.
ELMER JAMES UPDEGRAFF, M.D.
AARON WELCH EDMISTON, M.D.
WILLIAM HULL RAMSEY, M.D.
CHARLES C. MORISON, A.B., M.D.
CHARLES AARON HULL, M.D.
HENRY JOHN LEHNHOFF, A.B., M.D.
ROBERT R. HOLLISTER, A.B., M.D.
ALFRED ONTAS HUNT, D.D.S.

The University of Nebraska

LINCOLN

ATTENDANCE 1907-8, 3237.

Graduate School

Graduate work leading to the degrees of Master of Arts and Doctor of Philosophy is offered. These courses may be pursued with or without reference to a degree.

College of Literature, Science and the Arts

Classical and literary instruction, under the elective system, leading to the degree of Bachelor of Arts.

Industrial College

Four-year courses in Agriculture, Forestry, Civil, Electrical and Mechanical Engineering, and special groups of studies in all sciences, lead to the degree of Bachelor of Science.

The Teachers College

Aims to provide thoroly prepared teachers for secondary schools. Prepares for chairs in Normal Schools, for Departments of Education in Colleges. Offers special training for supervisors.

College of Law

Combined six-year course leads to the degree of Bachelor of Arts or Bachelor of Science in four years and to the degree of Bachelor of Laws in six years.

Three-year course leads to the degree of Bachelor of Laws.

Graduates admitted to the bar without examination.

College of Medicine

Combined six-year course leads to the degree of Bachelor of Science in four years and to the degree of Doctor of Medicine in six years.

Four-year course leads to the degree of Doctor of Medicine. Extensive clinics. Personal training. Hospital positions for able students after graduation.

The School of Pharmacy

Two-year and three-year courses. Also a four-year course leading to the degree of Bachelor of Science in Pharmacy.

Write for catalog or information to

THE REGISTRAR,

The University of Nebraska,
Lincoln, Nebraska.