When you plunge a trocar into a monocystic or oligocystic tumor, the fluid, being there, generally runs away rapidly. You will notice that in these varieties of tumors there is a foam or bead on the surface of the fluid, especially if it is drawn away rapidly. In tapping either variety just mentioned you will see that the abdomen decreases in size equally in all directions. But, on the contrary, in peritoneal dropsy the enlargement decreases first from above. The fluid from peritoneal dropsy is lighter than that from a monocyst, but is not viscid.

After you have drawn off the fluid which has accumulated in the peritoneal space, you can by palpation and careful manipulation map out pretty plainly the abdominal viscera. But this cannot be so well done in case of ovarian tumor. The walls of the tumor may sometimes be grasped by the hands, while in dropsy, after tapping, we can find nothing of the kind. The fluid from the cyst feels viscid between the fingers, although it may be thin. In tapping a polycyst we very often get a dark-colored, viscid fluid, which runs in a stream like a string, and does not fall and produce a splashing sound like a thin fluid. Its viscosity, too, is more marked than in monocystic fluid. Where we have a polycyst and tap the main tumor, we get a collapsed condition of the abdominal wall over the spot where the cyst has been evacuated, and the fact that after the tapping of the main cyst the small cysts still remain full is proof that we have to do with a polycystic growth. Now, when we tap a fibrocystic tumor of the uterus the walls do not collapse and sink in to such a marked degree as in a polycyst of the ovary. The fluid does not run out readily. The reason for this is that the walls are less elastic. Even with an aspirator you can draw out only a small quantity of the fluid from a fibrocystic growth.

The fluid from a monocyst or a polycyst, after standing for a time, does not change, but you will notice that the fluid drawn from a fibrocystic tumor contains a coagulum of lymph, for these tumors are enlarged lymph spaces. The fluid from an ovarian tumor will coagulate on the application of heat or nitric acid. The microscopic properties of the fibrocystic fluid are cells that bear a resemblance to broken-down blood corpuscles. When the dermoid tumor is tapped it sometimes collapses pretty thoroughly, but more frequently only partially. When this latter is the case there is an irregular mass left behind, in which we may detect by palpation more or less solid material. The fluid is sometimes thin and entirely devoid of viscosity, and when examined in bulk has a bluish tinge. The specific gravity is light, and it is not coagulable by heat. In most specimens of fluid withdrawn from this variety of tumor there will be found floating on top of it a yellow, fatty material, generally collected in small masses, and usually there may be seen fine hair in it. In other cases hair will protrude from the canula or after the withdrawal of the instrument from the orifice of the puncture. In some other cases the fluid will be wholly fatty in character, very strongly resembling melted lard, which becomes hardened sufficiently to look like this same substance when cooled. I once tapped a tumor of this kind behind the uterus, and drew from it the watery fluid. One year afterward I tapped it again, and the fluid was wholly of the fatty character. When the parovarian tumor — the tumor of the broad ligament — is tapped, the abdomen collapses almost as completely as in cases of peritoneal dropsy. The fluid

runs out with great readiness, and in appearance resembles pure water. It has a very low specific gravity, from 1000 to 1005, and has no microscopic characteristics. It does not coagulate when nitric acid is mixed with it, or on the application of heat.

With reference to the microscopic appearance of the fluid, there is considerable difference of opinion. Many ovariectomists do not place much reliance upon the cell formation found in the fluid, while others rely upon the microscope to decide in doubtful cases. I am inclined to believe in that cell described by Dr. Thomas M. Drysdale in Dr. Atlee's work on the Diagnosis of Ovarian Tumors.

Original Articles.

THE TREATMENT OF POTT'S DISEASE BY THE PLASTER-OF-PARIS JACKET.

BY E. H. BRADFORD, M. D.

DURING the past three years many of the patients under my care at the Children's Hospital, suffering from caries of the spine, have been treated by means of plaster jackets. I have also applied this method to a few cases at the Carney Hospital and in private practice. The number in all amounts to forty; of these many have not remained under treatment for a very long time, but enough have been continuously observed for a sufficient period to warrant some generalization.

In a number of cases I have used Taylor's spinal splints, and a few have been treated by complete recumbency in a *gouttière de Bonnet*, or in bed. In avoiding exclusive treatment according to any one method I have been able to judge in a measure of the comparative merits of each.

In some cases by wearing plaster jackets there seemed to be little or no improvement from the treatment, and this where there appeared to be no doubt that the jacket had been properly applied. But in the main the evidence was conclusive as to the great benefit to be obtained from plaster jackets in suitable cases. This was evident in various ways; from the improved condition of the patients, their statement, or the testimony of parents and relatives.

In most of the cases the jackets were applied exactly according to Dr. Sayre's method. Suspension did not appear to have any serious effect; it was, however, always employed with care. Dr. Sayre's rule that suspension should not be carried beyond the point of relief to the patient is not generally practicable with young children, who are frequently too frightened to relate their sensation. In one adult suspension caused vomiting. In another adult fainting was said to have occurred during a previous application of plaster jacket. Nothing of the sort happened when the jacket was put on by me. During the first application, according to his statement, the patient, a heavy adult, was hung free of the floor for some little time, and fainted in this position.

Two children, who had worn plaster jackets for two weeks without discomfort, were attacked with dyspnoea so severely that it was necessary to remove the jacket. The disease in one case was in the upper dorsal region, and the patient was wearing a jury-mast; in the other the disease was in the middle dorsal. One child was three years old, and the other six. The attack in the second case was quite alarming: the child lost con-

sciousness and became cyanotic, and the condition was only relieved by removing the jacket. A "dinner pad" was applied in both cases.¹ There was no paralysis in either case.

A third patient, on whom a plaster jacket was applied without a dinner pad, but after a hearty meal and a glass of milk, suffered so much the following night from difficulty in breathing that she could not lie down. After the application of a second jacket, with a dinner pad, there was no discomfort. In several cases I have made use of Dr. Reid's method of suspension with adhesive plaster,² which did admirably with children but not with adults. I have applied plaster jackets while the patients, if children, were supported, belly downwards, by the hips and shoulders, if adults between two tables, as recommended by Dr. Andrews;³ also according to Mr. Walker's and Dr. Lee's method.⁴ I was unable to see that the jackets put on in this latter way were less efficient than those made by Dr. Sayre's method. In one case of extreme curvature in the upper dorsal region, and apparently ankylosis, a plaster jacket was applied without suspension, the patient standing during the application, the object being to procure fixation. The jacket appeared to give a good deal of relief during the six months the child was under observation. In a second case, however, a jacket put on in this way did no good whatever, and was taken off the next day on account of the discomfort it occasioned.

Chafing can usually be prevented from becoming a serious trouble by carefully padding on each side of the prominent vertebral processes, and removing the jacket on any complaint of soreness, and reapplying with new padding. For pads I have found thick English saddler's felt more convenient than anything else. In three cases it was necessary, on account of eczema of the skin, to discontinue the treatment by plaster-of-Paris jackets. This was during very warm weather, and the patients were children in poor condition.

For bandages "crinoline muslin" is much better than "cheese cloth" or coarse cotton cloth. Coarse muslin, such as is used for mosquito netting, can be made, if rolled properly, to hold a good deal of plaster. This sets quickly, but is more liable to chip in use than the finer cloth. It can be used for a middle layer in a jacket.⁶

In suspending, Dr. Sayre's head-piece seemed more convenient than Mr. Golding Bird's or Dr. Glazier's.⁶ I found it an advantage to have the head-piece and the bar holding the straps under the axillæ connected with two different cords playing over different pulleys whenever it seemed advisable to regulate readily the strain on the neck and under the axillæ. Plaster jackets without a "jury-mast" appeared to be useless

in cases of disease of the spine in the upper dorsal region.

From many of the reported cases published from time to time, illustrative of treatment by plaster jackets, the impression is natural that every case of caries of the spine does well immediately on the application of a plaster jacket, and that this application is a comparatively easy matter. The experience at the Children's Hospital, however, has led us to believe that in no procedure in minor surgery is experience, care, and a knowledge of detail more important for the cure of the patient than in applying plaster jackets. We have also learned that some cases do not improve at all, even though the jackets are apparently well fitted. There can be no doubt that plaster jackets are dirty and clumsy. This is the price which is paid for an apparatus which is not dependent for its efficiency or inefficiency on the leniency or neglect of the attending nurse.

Exactly how plaster jackets are efficient in the treatment of caries of the spine is a question which seems to be still open for discussion. Opinions of writers on the subject differ. The usual idea is that suspension supplies the means of extending the spine, and that the plaster jacket keeps the spine in an extended position. The pelvis furnishes the base and the thorax the point of resistance for counter-extension. "On account of the conical shape of the trunk and the close manner in which all the interstices are filled by the dressing [plaster jackets], the spine is rendered straight and immovable." An apparatus⁷ has been devised by Dr. Stillman and Dr. Wyeth⁸ by which the rate of extension and counter-extension can be controlled mechanically. In discussing the efficacy of this apparatus, Dr. Hamilton⁹ stated that, although the "alæ of the pelvis and the promontory of the sacrum" afforded a good basis of support, the point of resistance to counter-extension furnished by the thorax is not reliable, as the thorax, which is expanded during suspension, becomes smaller, "telescopes within the jacket, and all extension ceases" when the patient is not suspended. Dr. Shaffer¹⁰ writes, "It is absolutely impossible to apply a continuous extension and counter-extension which can be maintained with any degree of success. The change [during suspension] is apparent rather than real, and the great increase in height . . . is due to the extensibility of the unaffected structures and the obliteration and modification of the compensatory curves."¹¹ Dr. Hamilton thinks that if the patient is suspended no extension is made which reaches the seat of the disease.

Mr. Walker¹² believes that suspension is not a necessary part of the treatment. "That a jacket should be effectual it is a *sine quâ non* that it shall be applied when the spine is in such a position that the diseased vertebræ shall be free from all pressure. . . . This condition is found when the patient is suspended, . . . but also in an equal degree when the patient is laid flat on the back."

Some writers claim that the benefit of plaster jackets is that they furnish a means of fixation simply.¹³

¹ For similar cases see St. Bartholomew's Hospital Reports, xiv., 1878, Willett; also Madelung, Berl. klin. Wochenschr., February 5, 1879.

² JOURNAL, May 8, 1879, page 638.

³ Chicago Medical Examiner, April, 1879.

⁴ JOURNAL, May 8, 1879, page 638; also, Remarks on Horizontal Extension, Lee, Transactions of the Medical Society of the State of Pennsylvania, vol. xii., 1879.

⁵ Mr. Squires, of the Harvard Medical School, has found that a cylinder of plaster bandage, formed by rolling six layers of crinoline muslin (with plaster well rubbed in) around a bottle, and removing the bottle when the bandage is hard, will sustain a weight of one hundred and sixty pounds pressing upon either end without being crushed. A cylinder of the same number of layers of bandages of coarse cotton will be crushed under the weight of a few pounds.

⁶ British Medical Journal, September 21, 1878; New York Medical Record, May, 1879, page 450.

⁷ Sayre, JOURNAL, February 12, 1880, page 146.

⁸ New York Medical Record, February 8, and February 22, 1879, and Hospital Gazette, January 30, 1879.

⁹ New York Medical Record, February 22, 1879.

¹⁰ Pott's Disease, page 39.

¹¹ Ibid., page 40.

¹² British Medical Journal, March 1, 1879, page 306.

¹³ Owen, British Medical Journal, February 8, 1880.

To determine the effect of suspension on the spinal column I made the following experiment; being enabled to do so through the kindness and assistance of Dr. M. Richardson, assistant demonstrator of anatomy at the Harvard Medical School:—

A portion of the spinal column, consisting of six dorsal vertebrae, was taken from an adult cadaver, including the muscles and ligaments untouched, but not the skin. A stout iron wire was passed through the upper vertebra and another through the lower vertebra at the level of the articulation. The upper wire was fastened to a hook, and on the lower wire a weight was fastened, removable at pleasure. Two pins were driven into the bodies of the two adjacent vertebrae in the central part of the fragment of the spine, and the space between them carefully measured with a pair of compasses. If the two vertebrae were pulled apart this would necessarily be made greater. It was found, however, that after a weight of one hundred and ninety pounds was hung upon the lower wire the distance between the two pins remained precisely the same. The intervertebral cartilage between the two vertebrae was cut half through. When ten pounds were then hung upon the lower wire this space was increased one millimetre; when forty pounds were applied it was increased two millimetres; and when one hundred and ninety pounds, the increase was three millimetres. It was found that if the portion of the spine be bent backwards (towards the spinous processes), the weights having been removed, a slight amount of force, such as could easily be exerted by the hands holding on at each end of the portion of the spinal column, was enough to increase the separation of the pins two millimetres.

It would appear, therefore, that if the spinal column is straight and intact it will sustain practically any amount of weight without permitting the bodies of the vertebrae to be pulled apart. If, however, the column is weakened at any point between the bodies, the bodies at the weakened portions can be pulled apart. But the amount of this separation is no greater when a force of forty pounds is applied than when the spine is bent slightly backwards. If a healthy adult be placed in a suspension apparatus and suspension applied, just enough not to raise the heel of the person in the swing from the floor, it will be found that he has been elongated in height from one inch to an inch and a half. From the experiment just mentioned it is evident that this elongation cannot come from stretching of the ligaments; it therefore must come from the obliteration of the physiological curves of the spine.

The following facts show that straightening of the physiological curves in other ways will also increase the height. The height of two male adults in health was taken while standing erect. Their heights were sixty-seven and one fourth and sixty five and three fourths inches. They were then placed upon their backs upon the floor, their limbs kept straight, and their heels pressed upon the wood-work on the wall of the room, at right angles to the floor on which they lay. The lengths from head to sole were then measured, and found to be sixty-eight and one fourth and sixty-seven and one half inches. When placed upon their faces the measures were sixty-seven and one half and sixty-six and three fourths inches. The spine is evidently straightest when the body is lying upon the back; when on the face the arching backward of the spine, generally present in the erect position, is exaggerated.

In Pott's disease the spine is usually curved with the concavity forwards. The effect of suspension would be, if the laws of gravity were not interfered with by bony union or muscular action, to straighten the curve, and the bodies being on the concavity would be freed from pressure. If the disease were enough advanced to have separated the connection between the bodies by the intervertebral substance, and to have weakened or destroyed the anterior ligament, the bodies at the diseased point would be actually pulled apart, but only to a degree which could not be appreciated by ordinary measurement.¹

The amount which the bodies can be pulled apart is slight, and it seems as if that could not be maintained for any length of time, when the disease is in the dorsal or lumbar region, for the reason that, as Dr. Hamilton says, the thorax does not remain of the same size after suspension, and may readily "telescope" to the extent of a sixth of an inch within the jacket, no matter how tightly this may be applied, or how closely it might fit into the interstices between the ribs mentioned by Dr. Sayre. Suppose, however, that the thorax does not "telescope," and that the amount of force exercised during suspension does still persist after the jacket has become hard and the suspension is removed, this force must be exerted upon the pelvis as its base. The amount of this force would be equal to the weight of the body below the point of disease of the spine. In the case of a heavy adult, with the disease in the middle of the back, where suspension was complete (that is, when the patient was suspended so as to support no weight on the foot), the amount of this force would be between forty and sixty pounds. It seems impossible that the skin over the pelvis could stand for months this amount of pressure without sloughing. Dr. Shaffer believes that the change during suspension is due to the "obliteration and modification of the compensatory curves,"² and that the pathological curve is not affected. That the pathological curve is not changed in many cases is manifest. The benefit which may be expected from a plaster jacket, in these cases is that the spine, which is made as straight as possible before the jacket is applied, is prevented by the jacket from curving farther forward, as would otherwise inevitably happen. When the spine is curved, with the concavity forward, the weight of the head and upper part of the trunk acts like a weight on the end of a curved spring, and on any jar tends to increase the curve and the pressure at the diseased portion. This is less so the straighter the spine is, even if the pathological curve remain, and of course if the spine is bent with concavity backward the effect is reversed. In other words, the spine is held by an efficient although clumsy antero-posterior support. In certain cases the pathological curve is altered by suspension as by recumbency.

In disease of the cervical region the action of the jury-mast is that of simple suspension, with such fixation as the suspension effects. As the weight of the head is comparatively small, it is easy to imagine that suspension enough might be applied to "lift the bodies apart," and, what is probably more important, to prevent, on any jar, the head from falling forwards,

¹ Mr. Owen, British Medical Journal, February 28, 1880, mentions having experimented on the cadaver of a case of caries of the spine. He drove pins into the bodies of the vertebrae above and below the point of disease, measured this distance between, suspended the body, and found that there was no increase in this distance.

² Shaffer, Pott's Disease, page 40.

and by its weight curving the cervical spine and crowding the affected structures, that is, the bodies, together.

The ideal position for fixation in caries of the spine is not with the spine straight, but, if it were possible, with the spine above the point of disease curved backwards, so that the weakened bodies be not crowded together on the inside, but separated on the outside of the curve. This position is frequently assumed by patients in the early stages of Pott's disease, — the back is arched backwards and the head thrown back. In a case of this sort which lately came under my care, there was disease of the lower dorsal vertebræ and marked lordosis. While the jacket was applied the patient was not suspended, but was put in a position to increase this curve backwards. The relief caused by the jacket was very marked, the pain in the limbs and the inability to walk any distance disappeared entirely. The disease in this case, however, was at an early stage, and it seemed possible to separate the bodies of the vertebræ at the affected point more by exaggerating the position assumed by the child than by suspension.

The following patient illustrated the efficacy of a plaster jacket in preventing the spine from curving forward.

X—, a delicate, intelligent boy, ten years old, a patient of Dr. Moses Gunn and Dr. Andrews, of Chicago, with disease in the upper dorsal region, near the junction with the middle third, visited Boston for a few months during the summer. He was wearing a plaster jacket applied by Dr. Andrews. This consisted of an ordinary plaster jacket, to which an addition had been made which passed over the shoulders, encasing all above the ordinary jacket, except at the head and neck. This, of course, threw all the weight of the jacket upon the shoulders, and removed it from the pelvis, the base for extension. The boy had not worn a "jury-mast." On reapplying the jacket, the old one being broken, I determined not to add the shoulder part, thinking on theoretical grounds that it was unnecessary and injurious. The bandages were, however, put as high on the sternum as possible. Two days later the boy begged me to include the shoulders, as without that fixation he felt much less comfortable than in the old jacket, although it was much broken. After making this addition the jacket seemed to give the required support.

CASES.

The following few cases are selected as illustrating certain features of treatment:—

Case I. is one treated successfully by means of plaster jackets. Case II., unsuccessfully treated by plaster jackets. Case III., previous treatment by plaster jacket not successful. Treatment progressing favorably with a Taylor's apparatus. Case IV., treated successfully by absolute rest in bed, Taylor's brace, plaster jacket. Case V., a light case, treated successfully by fixation of spine.

CASE I. H. A., aged four, patient at Children's Hospital. Caries in lower portion of the middle dorsal region of the spine. Treated for six months by confinement to bed. A plaster jacket was first applied by Dr. Ingalls in September of 1877. This was worn a short time. Child remained without treatment for several months. Patient reapplied for treatment in the spring of 1878. There was a sharp, angular projec-

tion; the child suffered pain, and walked with difficulty; there was contraction of the psoas and iliacus on the right side, and thickening could be felt deep in the right inguinal region, suggesting the formation of an abscess. The child was fretful; her condition had been becoming rapidly worse in the preceding two or three months.

Plaster jackets were applied, with suspension in the usual way at an interval of every two or three months. The improvement soon began to be quite marked. The treatment was continued up to the present time, one and a half years. The psoas contraction gradually disappeared, together with the thickening in the inguinal region. The child improved greatly in general health, attended school, and played about like other children.

At the end of a year the character of the projection had changed. Instead of a sharp, angular projection it became rounded, though occupying the same number of vertebræ (three), and without having increased in prominence.

The child has been without the jacket recently for a month or so at a time, and can walk about and stoop readily without it. She, however, wears a jacket (applied without suspension) as a precaution against a relapse.

CASE II. W., aged five, patient at the Carney Hospital, a scrofulous child with hip disease of several years' standing, with several sinuses discharging. Patient able to go about with crutches. A prominent spinous process discovered in the lower dorsal region, but no active symptoms were to be found; patient remained without treatment for nearly a year. A second prominent spinous process was then noticed below the first. Grunting respiration became marked at times. A plaster jacket was applied in the usual way, and the treatment continued regularly without intermission for nearly two years. The patient became gradually worse and died. At the autopsy, made by Dr. A. T. Cabot, no attempt at repair was found, the body of one vertebra being entirely, and another partially, destroyed.

CASE III. W., a boy aged four, was brought to me with caries of the spine in the middle dorsal region, which had been treated for a year at home by means of plaster jackets. The child was in a pitiable condition. The skin of the back and belly was chafed and covered with the scales of a dry eczema, with spots of a moist eczema. He was scarcely able to walk, was in a fretful condition, suffered from nocturnal pains, and had been becoming much worse during the past few months. A Taylor's apparatus for caries of the spine was applied. Improvement in the general condition became quite marked in a comparatively short time. The nocturnal pains gradually diminished, and finally stopped. The boy became able to walk about freely, and gained steadily in weight. He has now been under observation for eight months since the application of the brace, and has improved uninterruptedly during that time.

CASE IV. D., aged twenty-five. Caries of spine, lower dorsal vertebræ, with slight projection. A patient of the Carney Hospital, treated by absolute rest for two years. She was at first unable to sit up or move, though while in bed was free from pain. A Taylor's apparatus for caries of the spine was applied; the patient was then able to get up and walk about. This was worn for a year. Owing to a change of nurses,

the application of the apparatus was less carefully attended to at the end of that time, and she became somewhat worse. A plaster jacket was applied and worn by the woman for eight months without change. For several months the patient remained in the hospital under observation without treatment. She then returned home, and six months later reported by letter that she had remained well.

CASE V. A., girl, aged eleven. Caries of the spine in the upper dorsal region, with slight projection of two spinous processes, pains in side and hip. The patient was under the care of Dr. C. P. Putnam and myself. It was decided, instead of applying a jury-mast, to imbed in the plaster jacket, on each side of the spine, steel strips with a buckle at the top of each, and long enough to be a little above the shoulders. Straps were fastened into the front of the jacket and smooth wooden pads were secured, so that when the straps were buckled to the steel uprights pressure would be exerted just beneath the clavicle on each side. In this way quite thorough fixation of the spine could be made. The pain stopped on the first application of the apparatus, and the patient began to improve in general condition. The appliance was worn for a year and a half, being renewed every three months. The patient has now been without the apparatus for several months and her condition has remained excellent. The projection has not increased. The two spinous processes which were sharply prominent are much less so, but appear involved in a slight gradual curve.

CASE VI. The following case deserves mention. Mrs. G., aged twenty-five, a patient of Dr. Chamberlain, of Lawrence, was referred to me for advice. A sharp angular projection in the lower dorsal region was discovered, and a plaster jacket advised, but the patient declined. This was, however, afterwards applied by a medical student in Lawrence, and the bandages were subsequently renewed with great care by the woman's husband, who had but little money to spend upon physicians. After six months of treatment the symptoms of pain, which had been quite severe, had entirely disappeared, and the husband consulted Dr. Chamberlain as to the propriety of leaving off the jacket, as the woman considered herself well.

CONCLUSIONS.

The conclusions which I have drawn from the above facts are, that —

- (1.) Plaster jackets are efficient in Pott's disease when the caries is below the level of the middle of the scapula.
- (2.) The efficiency is not due to fixation alone, nor to extension, in the proper sense of the term, but to fixation in an improved position. This improved position is usually obtained by suspension, but also in many cases by recumbency.
- (3.) The treatment by plaster jacket requires care in the application of the bandage. A poor plaster jacket will do harm, deceiving patient and physician.

— Dr. Sawostizki, of St. Petersburg, has improved the preparation of sticks of nitrate of silver. He melts together five parts of nitrate of silver with one part of nitrate of lead, forming an *argentum plumbonitricum*. Thus prepared the stick is not easily broken, and can be pointed like a lead-pencil.

RECENT PROGRESS IN PATHOLOGY AND PATHOLOGICAL ANATOMY.

BY E. G. CUTLER, M. D.

REMARKS ON THE PENETRATION OF PARTICLES OF DUST INTO THE AIR-PASSAGES AFTER TRACHEOTOMY.

In examining a number of lungs from children dead of croup, where tracheotomy had been performed, Balzar¹ was astonished at the comparatively large quantity of particles of dust and other foreign bodies which he found in them. In some cases the surface of sections were black, as in a lung affected with anthracosis. These foreign bodies penetrate different parts of a pulmonary lobule, and often form real plugs, which almost entirely fill the alveoli. With a low power of the microscope they are seen to be distributed through the bronchi to a greater or less extent, and are also found in the exudation, in the walls of the alveoli and blood-vessels. The larger bodies remain isolated, while the smaller ones become imbedded in the protoplasm of the cells. The quantity of foreign particles varies: thus, in three cases where death occurred once forty-eight hours and twice thirty-six hours after operation it appeared large, while in three others it was much less. These bodies may be seen with the unaided eye as blackish plugs springing forth from the surface of a section after the lung has macerated for a while in alcohol. The cause of this striking appearance is probably to be found in the introduction of the canula, which excludes purification of the air in the mouth, nasal sinuses, and larynx; the child after operation is in the same condition as an animal whose larynx is paralyzed by section of the recurrent. Moreover, it is possible that the bronchial walls, having been rendered somewhat rigid through the pseudo-membranous deposit, have aided this entrance of these foreign bodies, while as no less weighty factors are to be mentioned the greater or less amount of dust contained in the air of the room, and also, from the defective ejection of mucus, the drying of the inner wall of the tube. Whether now the entrance of these foreign bodies into the air-passages is the only cause of the inflammation which appears in the lungs, or whether the diphtheritic bronchitis which is present in the lobular inflammations in by far the majority of cases does not play an equally important part, it would be difficult to determine. One finds just as often foci of lobular hepatization in the midst of those foreign bodies as in places where the latter have not penetrated. Next, it would be well to determine also whether many of the consecutive-appearances after tracheotomy, namely, slight broncho-pneumonia and other affections of the lungs of an inflammatory nature, might not be referred to these penetrating irritants; and perhaps also in cases of croup without tracheotomy, as well as in many other diseases which interfere specially with the function of the glottis.

To prevent these occurrences and to guard against the penetration of such foreign bodies into the air-passages, it is necessary that children who have undergone tracheotomy should wear some porous substance covering the mouth of the tube, which at the same time also serves to warm the inspired air. In the selection of such a covering it is well to see that nothing be used which may of itself furnish dust. Then, too, the cleaning and airing of the sick chamber must be per-

¹ Bulletin de la Société anat. de Paris, 4 Ser. iii., page 72, 1878. Schmidt's Jahrb., Bd. 184, 1880.