

ening by the immunity due to previous disease and further hereditary transmission of this immunity in the course of many generations.

#### IV. GLANDERS.

For the description of "glanders" malleus I refer to the paper by Bollinger in Vol. III. of this Handbook. A detailed discussion appeared superfluous, because Bollinger shares our conviction, culminating in this, that in glanders we have to deal with fixed, *i. e.*, organized contagia, and because, since the publication of his essay, our knowledge of the nature of the contagium has, unfortunately, not been widened.

#### POSTSCRIPT.

I abstract from the *Deutsche Medicinische Wochenschrift* a "preliminary communication on the labors of the Imperial Board of Health by Dr. Struck, which have led to the discovery of the bacillus of glanders:"

In the first place, a certain form of bacteria was searched for in the specific products of glanders, the so-called farcy buds, by staining sections of tissue from the lungs, spleen, liver, and nasal septum of a horse killed on account of glanders. In specimens stained with a concentrated aqueous solution of methyl-blue, afterwards treated with greatly diluted acetic acid, dehydrated in alcohol, and embedded in oil of cedar, there were found now and then slender rods having about the size of the bacilli of tuberculosis; no other forms of bacteria were present in the specific products. In order to determine whether these bacilli stood in causal relation to glanders, cultivation was resorted to.

On the 14th of September, according to what Koch has taught with reference to the cultivation of the bacilli of tuberculosis, a number of sterilized reagent-glasses containing horse or sheep blood serum were charged with particles carefully selected from glanders tubercles from the lungs and spleen of a horse killed because of glanders. In the first two days no changes were noticed. But on the third day there were noticed in the majority of the glasses numerous small translucent little drops which had formed scattered on the surface of the serum. These contained, as shown by staining them on the covering glass, countless fine bacilli of the above-mentioned size. Inasmuch as the drop existed uniformly in nearly all of the culture vessels, and only this one species of bacteria had developed in them, the experimenters were inclined to test these bacilli immediately in reference to their original relations to glanders by reinoculation into animals receptive of the disease.

But in order to meet the objection, if the transmission should be successful, that the inoculating material perhaps still contained particles of the original charge of glanders material, the cultivations were continued for a month through four generations.

From the resulting fourth cultivation, containing nothing but the above-described fine bacilli, a small quantity was abstracted on October 14th, and inoculated into the pituitary membrane and into both shoulders of an old, otherwise apparently healthy horse. After forty-eight hours the animal began to be very feverish; at the points of inoculation deep ulcers developed, from which knotty cords of lymphatic vessels extended to the swollen glands of the throat and shoulders, so that about a week after inoculation the horse presented the pronounced clinical picture of glanders. After about one month, the ulcers began to cicatrize, the glandular swelling decreased, the animal appeared also to have improved so that it became doubtful whether the symptoms after inoculation should be actually interpreted as glanderous. On November 25th the animal was killed, and the post-mortem yielded a most surprising result. On the nasal septum as well as on the points of transition from the nasal into the pharyngeal cavity there were numerous white, in part stellate nodes; in the lungs, old fibrous, likewise calcified nodes, but, besides, some quite fresh gray nodes with a red areola, and at the root of the lung a glanderous growth about the size of an apple.

Judging from this result, the animal had formerly recovered from an infection of glanders. That the recent eruptions were to be attributed to the artificial infection could not be positively asserted. But, as it furnished recent glanderous material, the latter was used in securing fresh cultivations. From these were again developed, after three days translucent droplets containing solely the above-described bacilli.

The same bacilli were found, besides, in the recent glanderous products of the dissected horse, after they had been treated with methylene blue.

Again, in the course of November, the fresh organs of a horse killed on account of glanders were examined. It was likewise possible to cultivate the same bacilliferous droplets from the glanderous nodes present in the liver of this animal. Finally, on the 1st of December, successful cultivations were made from fresh glanderous nodes of a fourth case. The result was always the same.

In the mean time the pure cultivations of the bacilli were also successfully inoculated into other species of animals that were at hand, namely, rabbits, mice, and guinea-pigs.

The rabbits reacted variously: while some animals on dissection exhibited merely local ulcers and swelling of the corresponding glands, others showed the pronounced picture of glanders. The inoculations with cultivated glanderous material into white mice, otherwise exceedingly receptive of infections of all kinds, gave negative results. Positive results, however, were obtained by the inoculation of field mice.

The results of the inoculation of guinea-pigs were surprising. Here the course of the disease varied in rapidity corresponding to the quantity of the cultivated material injected. Invariably by the third or fourth day an ulcer with greatly indurated margin developed at the point of inoculation; then the corresponding lymphatic glands began to swell to the size of a hazel-nut, or even to that of a chestnut. In many animals the process remained for weeks in this stage—probably the contagium was retained in the glands—but in others, especially those which had received a large quantity of bacteria subcutaneously, acute nodular swellings developed in the testicles, or else the ovaries or the vulva. At the same time some of the feet presented nodular swellings which latter also appeared on several parts of the skin, or else ulcerative processes developed in the nasal cavity which even led to perforation of the bone toward the outside. Finally, in some of the animals a general infection was suddenly developed which rapidly ended fatally. In such cases, especially the spleen and the lungs were interspersed with innumerable submiliary gray nodules bearing a great resemblance to miliary tubercles. These exhibited the fine bacilli found in glanderous products of the horse. All these alterations manifested their glanderous character, besides, by exhibiting the same phenomena which are observed in glanders of the horse—the metastases in the testicles of stallions, as well as the inflammations in the marrow of the bones which have their seat particularly in the ribs of horses, belong to the typical picture of glanders. The cultivations from all these organs—testicles, spleen, lungs, etc.—furnished always the same, above-described pure cultivations, which had been obtained in four different cases from the various organs of glandered horses.

Although these results rendered it exceedingly probable that the bacilli are the cause of glanders, the decisive reinoculation of pure cultures into horses was still lacking. Therefore two healthy horses were inoculated on November 28th with pure cultivated bacilli. The inoculating material for the older animal was the eighth generation cultivated for ten weeks outside of the animal body from the pure cultures obtained on the 14th of September; that for the younger animal was a cultivation which had been obtained from the testicle of a guinea-pig inoculated with the fourth generation of the culture from the 14th of September and which had died on November 8th, the cultivation having been continued through five more generations outside of the animal body. In order to obtain the most rapid infection possible, injections were made on both sides of the neck, the breast, in the flanks, and, in the younger animal, also on the dorsum of the nose. The Schneiderian membrane was not touched in order to ascertain whether secondary eruptions would develop on the intact mucous membrane. A few days later, the points of injection showed diffuse, doughy swellings on both animals. The animals were off their feed, their legs became stiff, and their coat rough. After about a week, cords like strings of beads could be felt extending along the skin to the corresponding glands, in both animals. The swellings had broken and secreted a turbid yellowish-green fluid. On the twelfth day, besides the former symptoms, there was observed on the young horse an ulcer in the skin of the forehead, about the size of a silver quarter, which had penetrated to the frontal

bone and exhibited elevated margins. Withal both animals had a discharge from the nostrils which dried on the edges into thin yellowish crusts; finally small ulcers with elevated margins had formed on the pituitary membrane.

Both animals continued falling off from day to day, and on December 13th the older one died.

The post-mortem yielded the following results:

On all the points of inoculation, ulcers, the size of a quarter-dollar and larger, had formed. The ulcers were covered with thick crusts consisting of the dried products of secretion and hairs, and a yellowish-white fluid exuded by the side of the crusts. The soft parts beside and beneath the ulcers were pasty and fluid. The corium around the ulcers was infiltrated with purulent fluid and had become detached from the underlying parts. The ulcers on the neck were connected with cords of lymphatic vessels the thickness of a finger which extended to the glands of the shoulder. The latter had nearly the circumference of a hen's egg and their reddened and moist tissue contained small yellow or yellowish-white patches. From the other points of inoculation, too, cords of lymphatic vessels could be followed as far as the neighboring lymphatic glands. On the former, it was possible to demonstrate here and there a soft, yellowish-white, almost fluid node ranging from the size of a pea to that of a bean. The axillary and inguinal glands were swollen, soft, and likewise interspersed with the above-mentioned yellow patches. The mucosa of the nasal septum and of the turbinated bones was the seat of ulcers having eroded borders. In the latter and at the bottom of the ulcers, small yellow or gray nodules were found. The submaxillary lymphatic glands contained nodes the size of beans and up to that of a hazel-nut which inclosed yellow patches. In the mucosa at the anterior surface of the epiglottis was an ulcer the size of a dime which had elevated margins. In the lungs were found countless nodules from the size of a millet-seed to that of a pea, of which the larger were due to the confluence of smaller ones. The latter contained a gray, turbid centre surrounded by a reddened areola. In many of the muscles of the body were nodes of different sizes consisting of a yellowish-white, pasty, often fluid mass.

Inasmuch as the result in the older animal was so positive, the younger one, which then already exhibited great debility, was killed on December 13th. At the post-mortem, performed immediately afterward, the following alterations were found.

At the points of inoculation, large ulcers secreting a thin, yellowish-white fluid. The sore on the dorsum of the nose was as large as a dollar, and extended down to the periosteum of the upper maxilla and of the nasal bone. The ulcer which had formed close to this point of inoculation in the skin of the frontal region was somewhat smaller, and its bottom covered with bloody masses. Several smaller ulcers were also found in the skin of the right thigh, and one on the sheath. From the ulcers situated on the upper part of the neck, cords of lymphatic vessels, set with nodes and as thick as a finger, could be followed as far as the swollen glands of the shoulder. The nodes, which lay partly in, partly alongside the lymph-vessels, contained a pus-like fluid. The shoulder-glands were the size of a hen's egg, soft, and inclosed a number of small grayish-yellow patches. From the sores which had formed on the chest after inoculation, the ulceration extended deeply into the corium and the muscles. From them several cords of lymphatic vessels the thickness of a goose quill extended to the axillary glands. The latter were as large as a walnut and contained several yellowish-white patches the size of a millet-seed. The ulcers at the points of inoculation in the region of the flanks were shallow, and the tissue in their neighborhood was infiltrated with a turbid fluid. The lower end of the right thigh was swollen, especially near the ulcers which had their seat on the external side of the posterior metatarsus.

The right inguinal gland had the circumference of a hen's egg; it was soft, juicy, and reddish in color; the left inguinal gland, though similarly altered, was of smaller dimensions. The subcutaneous tissue of the sheath was of a gelatinous consistence, and the lymphatic glands situated therein were enlarged. The ulcer on the sheath extended into the subcutis. Several muscles contained cavities of different size which were filled with a yellowish-white turbid fluid. A cavity in the semi-membranosus was as large as a fist, and contained also a necrotic piece of muscle the length of a digital phalanx.

The mucosa of both nostrils was set with numerous nodules and ulcers; the former partly gray, partly yellow in color. Here and there, by the deposition of the nodules, flower-bed-like swellings, with undulating surfaces, had formed; the ulcers due to disintegration of the nodules had their eroded margins and bottoms covered with fresh nodules. The mucosa around the ulcers was

injected. The edges of the spongy bones and the uppermost portions of the nasal passages were most largely affected. The submaxillary lymphatic glands were the size of walnuts, firm, movable red on section, and interspersed with several yellowish-white patches. In the lungs were found six nodules of millet-seed size, having a gray centre and a reddened periphery. In the latter the parenchyma of the lung was rather firmer and moister. The anterior mediastinal and the bronchial lymphatic glands were enlarged, soft, and juicy. The spleen was slightly enlarged, and its parenchyma soft and blackish-brown. Liver, kidneys, heart, and the muscles of the trunk presented the appearances of a slight cloudy swelling.

These investigations have been quickly confirmed by a work undertaken by Israël at the Pathological Institution in Berlin.

#### V. TRACHOMA.

This affection occupies one of the principal places among contagious diseases, in spite of some exceptional conditions. Recently Sattler has also described micrococci (as well as experimental inoculations with their cultures), which he interprets as the pathogenic micro-organisms of trachoma. Anatomically, the granulating disease of the conjunctiva can be set down as a type of a leucocythoma: spherical patches of round cells, between which extends a network of the most delicate fibrillæ, spring up between the epithelial cones penetrating into the depth which probably represent also the septa between the microscopically recognizable granules. The vascular dilatation and formation of mast-cells in the deeper, loose connective tissue is of a very high degree. The development of vessels into the granulomata seems to be very sparse. I have not seen a true necrosis of coagulation in the small nodules, but have observed in its stead another degenerative process affecting the protoplasm. The nuclei perish and can no longer be stained, some of them disintegrate into the smallest particles; the protoplasm of the cells clears, only the outlines of the cells remaining visible, so that one of these spots makes the impression of a network composed of exceedingly delicate fibrillæ, which has taken the place of the granuloma aggregation.

Sattler had seen his micrococci in the tissue of the granulations, had described them as resembling the cocci of gonorrhœa, produced pure cultivations, and with these again had effected trachoma in man. Krause and I have examined numerous specimens of trachoma with absolutely negative results.

Therefore, the question of the bacteria of trachoma may still be considered an open one.

#### VI. YAWS, FRAMBOESIA TROPICA.

Framboesia tropica, unknown among us, is a disease closely resembling syphilis, and termed by some authors a pseudo-venereal affection.

The disease is endemic among the negroes of the west coast of Africa. According to Lancereau, it is met with also in Senegal, Congo, Sierra Leone, and Nigritia. Milroy ascribes to it even a larger territory. Slavers transported it from Africa to the West Indies and the South American states. Besides, it is now spread among all the inhabitants of the Indian archipelago, the Malays (especially on Java), under the name of yaws or pian. In Peru it is known by the names of bubas and verrugas.

In general, the black and colored races are more subject to the disease than the white race—a fact which is easily explained by the better care of the skin and more favorable conditions of life in the latter.

In reference to the course of the disease, I follow the description of Pontoppidan.

The affection is a contagious disease of the skin, which appears in the shape of small nodules rising beneath the epidermis, without material disturbance of the general health; when the nodules have reached the size of peas, the covering epidermis desquamates, and the round, elevated, as it were nummulated tumors acquire a thick, firmly adherent, yellowish crust, resembling a dirty ivory faro check, or a round, smooth, button-like structure of cheese. When the crust is detached, there appears a weeping reddish, but not ulcerating, elevated surface, looking almost like a mucous papule. If it be greatly elevated and proliferating, or if it be treated with irritant drugs, it may approach the appearance of a raspberry. If the tumors have their seat in the ano-genital region, they may easily simulate mucous papules; but on parts more exposed to the air, the face and the extremities, for which they exhibit a preference, they always have their dirty-yellow, smooth crust.

Recently Charlouis has proposed the title polypapilloma tropica, and I can confirm the anatomical observations of this author from the microscopic specimens kindly forwarded to me. Anatomically, the tropical form is identical with the frambœsia occurring with us, which was described in 1869 by Kaposi as "frambœsia non-syphilitica" sive dermatitis papillomatosa capillitii, and which I myself have seen several times.

In both we find broad, not very high, flesh-red excrescences sessile on a flat base, with an uneven, raspberry-like surface, which bear the greatest resemblance to dry, syphilitic, broad condylomata, and microscopically, like them, prove to be proliferations of the rete Malpighii combined with inflammatory processes and enlargements of the corium and the papillæ. Therefore, neither the tropical form nor that observed among us belongs to the class of granulation tumors. But, inasmuch as we have laid down from the beginning the factor of infection with chronic course as the main characteristic of this entire group of affections, we claim that this disease has the right to be considered in this place.

I abstract from the Charlouis' treatise the following most essential points in the pathology of this disease.

1. Frambœsia is an infectious disease.
2. It is inoculable both on the patient and on healthy men.
3. The same person can be attacked several times by the disease.
4. Frambœsia patients, inoculated with matter from themselves or from others, develop either an ulcer resembling a soft chancre, or else a fungous tubercle. But these inoculations do not exercise the slightest influence on the existing disease.
5. Both the secretion from the disintegrating neoplasms (tubercles) and the blood from the same is infectious, and the consequences of the inoculation of both are alike.
6. The virus is a fixed contagium, and can cause infection only by direct contact with the skin.
7. The neoplasms or their products are infectious only in their developmental stage or when at their acme; whenever they begin to dry up, infection is no longer possible.
8. The stage of incubation may last from three to five months.
9. Fever, accompanied by gastric disturbances and pains in the bones, precedes the eruption, and is associated with it for some time.
10. While the general infection is still recent, it is usually possible to approximately locate the place where the virus entered the body, because the nearest gland is the most enlarged.

I wish to add that the assertion formerly made, that frambœsia and syphilis are

identical, is erroneous. Both clinical observation and experimental inoculation have shown that both diseases may exist side by side or succeed one another. That the contagium of frambœsia is a bacterium will not be doubted in the present state of bacteriology, although the demonstration still remains to be furnished.

Indeed, wherever the disease is known it is recognized as contagious. "In Domingo it had spread so much that some years ago all yaws patients were seized by the police and immured in special hospitals until they were cured. It was found that when this procedure was rigorously carried out, the disease was materially diminished and its spread largely prevented. Almost invariably transmission from other yaws patients could be demonstrated as the cause of the affection."

In connection with frambœsia tropica we shall discuss the anatomically related frambœsia sive dermatitis papillomatosa capillitii (Kaposi).

By dermatitis papillaris capillitii we mean larger and smaller, many-furrowed, lobulo-acinous tumors, several millimetres in height, of very firm consistence, generally covered with thick epidermis, weeping only at some points, and usually situated on the hairy parts of the occiput and the borders of the nucha. Their size varies from that of a lentil to that of a quarter-dollar or even a dollar; at times the several nodes merge together into proliferations which may cover the surface of half the scalp. The surface shows a rose-red or bluish-red color; it is either bald, smooth, glossy, or covered with yellow crusts; now and then it secretes a sticky viscid fluid. The hairs project here and there, crowded into wisps or isolated, from the grooves and furrows of the uneven mass, but are lacking over the greater part of the latter. The individual hairs could be withdrawn only with difficulty. If some portions of the morbid tissue are removed with the scissors or knife, they creek on section. An abundance of blood exudes from numerous points on the cut surface. The patient feels no great pain either on pressure or on section. Hyde states that when an incision is made into the centre, a considerable quantity of pus wells forth. A sort of subcutaneous cavity forms which again and again fills with bloody fluid. Hyde believes the disease to be an inflammation of the deeper layers of the scalp. The duration in the cases observed was several years.

This affection belongs to the large class of new-formations termed frambœsia by Willan-Bateman, under which name these authors delineated only the tropical infectious disease resembling it anatomically. Besides it corresponds to the mycosis frambœsioides erected by Alibert who included it under syphilis. Really, however, it has nothing to do with syphilis. Hebra employed the name frambœsia for all irregularly verrucose papillary proliferations, no matter on what base they had arisen—on chronic ulcers of the foot, on lupus, on syphilitic ulcers, etc.

The ETIOLOGY is quite unknown. In a few cases the beginning of the new-formation followed a traumatic lesion leading to cicatrization.

The disease appears to be most nearly related to those cases of sycosis in which syconoid, fig-like proliferations have formed. But Kaposi disputes the relationship of the two processes. "There is an absence of all the essential symptoms of sycosis, *i. e.*, pustules from the points of which the hair projected which could have been pulled out with the greatest facility; the root-sheath of which appeared impregnated with pus; there is an absence of the reddened, slightly desquamating, almost eczematous parts of the skin." From the beginning we meet with firm nodules, of uniform consistence without pus.

(Mycosis fungoides Alibert, or the beer-fungus-like multiple papillary tumors of Kœbner, are altogether different from this affection.)

TREATMENT.—Rationally this is purely surgical, viz., ablation of the neoplasms. Em-plastrum hydrargyri is often very effective.

## PARANGI.

Under this name Dr. Kynsey has described a disease prevailing for years in Ceylon. It begins with a period of incubation during which an ulcer develops on some part of the body, and which is followed by a stage of invasion accompanied by fever and arthritic pains. This is succeeded by an eruptive stage which may last for weeks or months, and ends either in recovery or leads to the development of ulcerations, etc. This affection is contagious, being propagated by contact with the secretions of the ulcers (even on the intact skin); heredity is also assumed. After one attack there exists, it seems, immunity against fresh infections. Dr. Kynsey thinks the disease is certainly to be separated from syphilis and would rather suppose an identity with yaws.

## VII. RHINOSCLEROMA.

In reference to the etiology of rhinoscleroma, Prof. A. v. Frisch has made the following communication:

"My investigations on rhinoscleroma comprised twelve cases. By the kindness of professional friends, there were placed at my disposal excised portions of the diseased tissue, stained in alcohol, of six cases; the other six cases I had the opportunity of examining in the fresh state.

In all the cases, I found both in the cells and between them in the interfibrillary fissures of the connective tissue a certain species of bacteria which, under appropriate staining-methods, could be rendered visible.

These bacteria have a pronounced rod shape, but the individual rods are exceedingly short. The longitudinal diameter is about one and one-half times the dimension of the width. They were mostly found in rows of two. These relations are clearly recognized only by employing very high powers (Reichert's oil immersion  $\frac{1}{6}$ ). Under low powers, they appear almost spherical, and they would be at once held to be cocci, were it not that attentive observation shows that their grouping into larger masses permits the recognition of an arrangement unusual with cocci.

The rods lie almost exclusively within the cells. Between the cells and in the fissures of the connective tissue they are rarely found. They are present most numerous and distinctly in those distended cells which exceed the diameter of the ordinary round cells three or four times. Mikulicz, who describes these peculiarly distended cells in detail (l. c., p. 509), believes them to be round cells in regressive metamorphosis. It seems to me quite probable that this metamorphosis is to be traced directly to the reception and the influence of these bacteria. It is easy (often in the same field) to follow all the transitions from the ordinary round cell to the terminal stages of these altered cells. Round cells containing but few (two or three) rods, and exhibiting a well-stained nucleus, lie by the side of such as have but little increased in size, but the protoplasm of which shows more or less distinct granulation, and the nucleus of which is only faintly visible, or has entirely disappeared. Close by are cells of double, treble, or even quadruple and quintuple the size, in which the granulation of the protoplasm and the nucleus are no longer visible, and which are filled by larger quantities of bacteria. Very frequently the rods in these cells appear arranged around the walls, at times rows of cells extend radially from the periphery toward the centre of the cell; finally cells are found which are tensely filled with a closely-packed mass of bacteria. Between these distended cells free hives of micrococci are sometimes seen.

Vertical sections of rhinoscleroma nodes convince us that those altered cells are quite singularly distributed in the tissue. In the deeper layers we find over larger stretches of apparently uniformly granulated round cells but a single cell or a few such filled with bacteria and greatly distended. These then form the centre of a region in which the above-described alterations can be followed step by step from the periphery, on more careful inspection. In the superficial layers the yellowish cells increase in number, and in some places we find the layers immediately beneath the epidermis or the epithelium almost exclusively composed of these distended forms. In recent or unstained

sections, these portions of the tissue bear the greatest resemblance to adipose tissue; the large round, sharply contoured cells, with their strongly refractive and, with peripheral arrangement of the rods, almost homogeneous contents, can hardly be differentiated from fat-cells. I must emphasize that this arrangement is not seen in all its details in every node and at every part of it. These far advanced alterations are obviously found only in the oldest foci. Should we accidentally strike a node at the periphery, it may happen that in a large series of sections we find nothing but small-cell inflammatory infiltration.

Not all the round cells of rhinoscleroma tissue undergo the described alterations. A large part of them assume a spindle shape and finally changes into fibrillary connective tissue. In the spindle-cells, too, bacteria can now and then be demonstrated. These, as well as the small groups found here and there between the fibrillæ, can probably be looked upon as necrosed.

The above appearance could be demonstrated equally on nodes from the lips and on those from the nostril or the soft palate.

As to the mode of examination, all the portions of tissue are hardened in absolute alcohol, and the sections are stained with anilin colors in the well-known manner. Methylene blue dyes the rods most intensely; gentian violet, methyl blue, fuchsin, Bismarck brown, and vesuvin likewise give good pictures. Throughout, one-per-cent aqueous solutions of the pigments were employed. Particularly distinct pictures are obtained if the sections, after being taken out of the pigment solutions, placed in distilled water and well washed therein, are transferred to a one-half-per-cent solution of potassium carbonate and left therein two or three minutes. If then they are clarified in the ordinary manner in alcohol and oil of cloves, the entire tissue becomes colorless; only the bacteria retain the pigment.

Pure cultivations of the bacteria of rhinoscleroma offer no particular difficulties. If a fresh node, the surface of which has been carefully cleansed, be incised with a sharp knife, and some of the tissue be cautiously scraped from the cut surface, we can convince ourselves, by spreading the fluid on the slide, drying and staining it, that there is present almost always a larger or smaller quantity of the characteristic rods. If a small quantity of the sap thus obtained be brought into a small moist chamber, it is possible to observe, after a few hours, under a temperature of 35-40° C. (95-104° F.), a great increase of the short rods. I could not demonstrate any lengthening into filaments or the development of persistent spores. The vegetations are visible to the unaided eye as a delicate whitish cloud. The rods show no spontaneous movements. The covering glasses were detached from the slides after twenty-four hours, thirty-six, and forty-eight hours, quickly dried over sulphuric acid, and stained. In no instance could I observe any accidental admixture of foreign organisms.

The bacteria increase plentifully also in blood serum and meat-water gelatin (R. Koch). Only the growth, corresponding to the lower temperature (25° C. = 77° F.), progresses more slowly.

Experimental inoculations unfortunately have given altogether negative results. The non-receptivity of the test animals employed by me naturally does not exclude the possibility that rhinoscleroma is transmissible, perhaps by direct inoculation into the nasal mucous membrane of man or else of some other animal.

It follows from these investigations:

1. That in the tissue of rhinoscleroma a certain form of bacteria is constantly present.
2. That these bacteria, furthermore, distinguish themselves by the peculiar arrangement in the tissue cells.

3. Finally, that these bacteria most probably produce the above-described regressive metamorphosis in all those cells into the protoplasm of which they have penetrated. This metamorphosis manifests itself by the disappearance of the cell nucleus, gradual enlargement of the cell with simultaneous lessening of the granulation of the protoplasm, and final change of the cellular protoplasm probably into a fluid substance. The formation of fibrillary connective tissue from that part of the round cells which have not suffered any invasion of bacteria, which takes place by the side of this regressive process, I think is a further essential characteristic of the morbid process, perhaps depending on the specific quality of the organisms. This connective tissue must be interpreted as a product of the chronic inflammatory irritation caused by these bacteria, just as the formation of connective tissue wheals around cheesy masses in tuberculosis, or the origin of many acute inflammatory forms and suppurative processes around certain necrotic patches produced by bacteria, is connected with some other kinds of schizomycetes. All observers emphasize the fact that rhinoscleroma never leads