

FIG. 4129.—Calculi in the Pelvis of the Kidney. Radiograph made with intensifying screens—exposed one second. (Ziemssen-Rieder.)

For the detection of calculi the character of the tube is of the greatest importance, a "critical tube," giving the maximum of differentiation, being necessary. The difficulties incident to this work are well known to all practical workers, but advances are constantly being made, and here it is well to mention the work recently done with the aid of intensifying screens. In this method a photographic film is placed in a light-tight envelope, between two screens coated with fluorescent salts. When exposed to the Roentgen rays the intensifying screens fluoresce and so greatly shorten the time of exposure. In this way almost instantaneous exposures may be made through the thickest part of the body (Fig. 4129).

With improved technique much has been done in determining the pathological conditions of the organs within the thorax. The value of the rays in determining tuberculous changes in the lungs is now fully recognized, and must rank with, if not higher than, auscultation and percussion. In fact, by the rays tuberculous changes

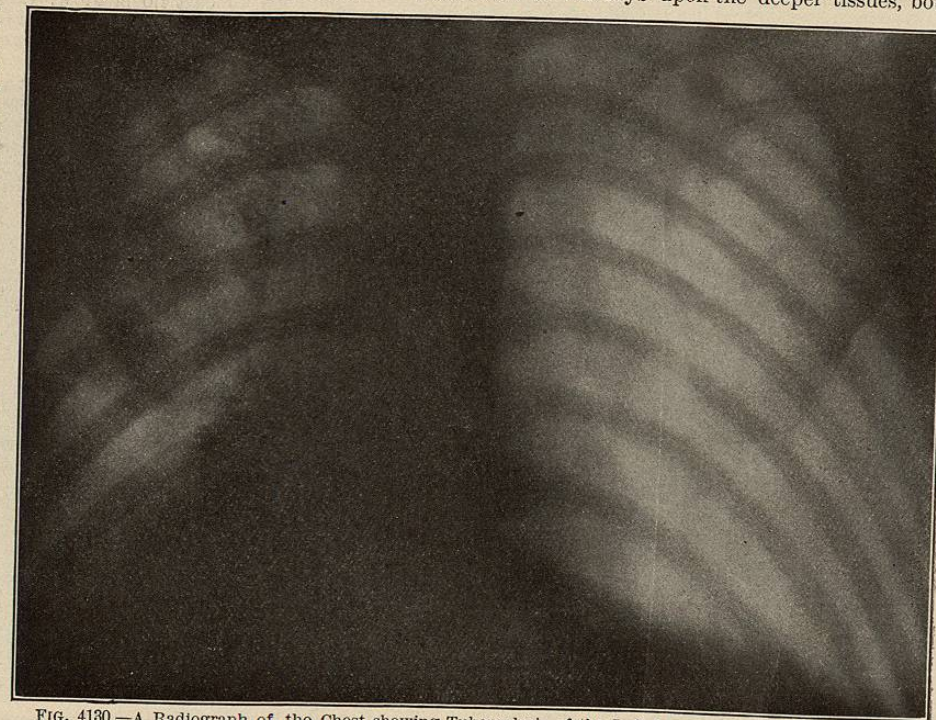


FIG. 4130.—A Radiograph of the Chest showing Tuberculosis of the Left Lung; the Right Lung Normal. (Ziemssen-Rieder.)

may be determined fully as early in most cases as by physical signs, while the location and extent of the pathological changes can be definitely shown (Fig. 4130).

Similarly, empyema and pleurisy with effusion can be shown by the shadows given by the fluids in the pleural cavity.

In diseases of the heart and aorta the alterations in form of these organs are plainly and accurately shown, thereby enabling the observer to determine definitely the condition present. In valvular disease the shape and size of the heart are more accurately determined than is possible by most careful percussion. Likewise in aneurism of the arch of the aorta, the abnormality in form of the aorta is shown, so giving invaluable aid to the diagnostician (Figs. 4131 and 4132).

**RADIOTHERAPY.**—The therapeutic uses of the Roentgen rays depend upon their ability to affect the metabolic action of the body cells. When living tissue is exposed for a sufficient length of time to rays having considerable power, peculiar changes are effected in the cells, these changes being expressed first by increased cellular activity, and afterward by cell death. These cell changes are not produced at once, as when ordinary heat is applied to a part, but appear only after a considerable time has elapsed. Thus in the *x-ray burn*, due to exposure of the skin to too powerful or too prolonged exposure to the Roentgen rays, the first signs appear usually about the third day after the exposure. The first evidence of the effect of the rays is a slight redness of the skin. This deepens and extends, and in a day or two small blebs appear, which break, and from these tissue destruction extends by cell necrosis until finally large denuded areas may form, which are very painful and slow to heal. The action of the rays upon the body cells has been ascribed to the true light rays given off from the vacuum tube, but it is really due to the Roentgen rays, as the skin is affected when covered by a sheet of hard rubber, which shuts off all light rays, but allows the Roentgen rays to pass readily.

So far, the therapeutic use of the rays has been mainly confined to diseased conditions of the skin, the mucous membrane, and the tissues lying directly beneath them.

The effect of the rays upon the deeper tissues, both

normal and abnormal, is a field having many possibilities, but one in which no definite results have yet been recorded.

In certain pathological conditions of the skin and subcutaneous tissues many brilliant cures have been made, and radiotherapy is now acknowledged to be a most valuable aid to the practitioner. Thus, cases of lupus,

3. The "normal exposure" in a single sitting, and await reaction.

Treatment by any of these methods is appropriate under proper conditions. The second is the method to be preferred, inasmuch as the first is tedious for both patient and physician, and the third demands a certain experience on the part of the operator. After the first

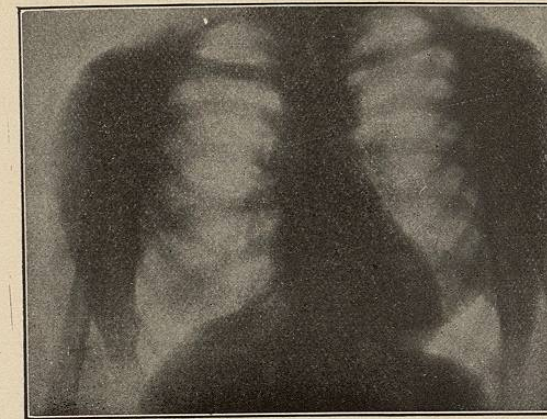


FIG. 4131.

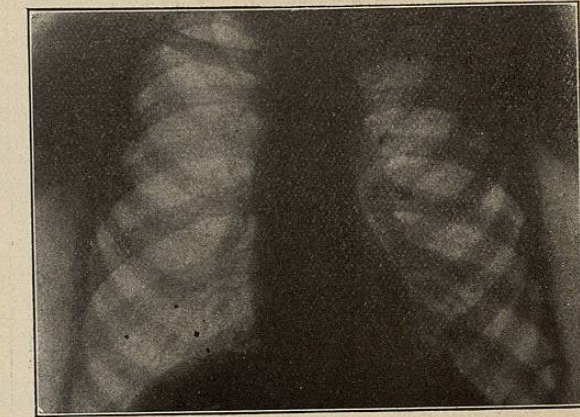


FIG. 4132.

FIGS. 4131 AND 4132.—Radiographs showing Normal Heart and Aorta (Fig. 4131), and an Aneurism of the Arch of the Aorta (Fig. 4132).

eczema, sycosis, favus, epithelioma, rodent ulcer, and carcinoma have been relieved or cured without producing any inflammatory reaction or inconvenience to the patient.

**Practical Application of Radiotherapy.**—Radiotherapy requires a complete armamentarium consisting of an induction coil of at least twelve-inch spark length, an interrupter capable of adjustment, and a suitable vacuum tube, preferably of the regulating kind. In treatment much depends upon the tube used. With a low tube the radiant energy is not powerful, penetrates but little, and in consequence its action is largely confined to the superficial tissues. With an extremely high tube the radiation is very penetrating, and appears to pass too deeply, or through the part exposed. A medium tube is, therefore, best in that its radiation penetrates sufficiently and yet is largely absorbed by the tissues.

The tube used should be capable of producing a good picture of the thorax of a medium-sized man, when viewed through the fluoroscope at a distance of 60 cm. from the focus. With a tube of this kind the time required for each sitting will be between five and twenty minutes. Although a five-minute exposure will produce a slight effect, a radiance lasting twenty minutes may be regarded as the "normal exposure." Such an exposure will have the following results: On normal skin, after a period of latency of fourteen days, the hair will fall out, accompanied by an erythema lasting a few days; on skin affected with sycosis the loss of hair will occur as early as the eighth day, accompanied by the formation of numerous pustules; lupus tissue will become exfoliated after a lapse of a week. On the other hand, the effect of a normal exposure of twenty minutes can be produced by dividing the action of the radiance over several sittings of shorter duration.

Taking into consideration the intensity of the radiance, the number of sittings, and the length of intermissions, we may formulate the following three methods of radiotherapy:

1. Daily sittings, with a radiance of slight intensity, lasting five minutes, continued until the first symptoms of reaction appear.
2. (a) Sittings, with a radiance of medium intensity, twice a week until reaction begins to be manifest (about two weeks); or (b) three or four sittings, with a radiance of medium intensity, given on alternate days.

sign of reaction appears it is advisable to await the termination of the characteristic inflammatory process, and then, if necessary, repeat the exposure. If, in using the second and third methods, absolutely no reaction occurs at the end of three weeks, we may feel justified in repeating the "normal exposure"; if, however, a mild reaction, non-progressive in character, has taken place, an additional exposure, less than normal, can be applied. As stated above, the second "normal exposure" is made after the subsidence of the inflammatory reaction excited by the first; thus this treatment may involve, in accordance with the nature of the case, repetition of *x-ray* applications extending over months or even years. Often in cases of hypertrichosis, in some cases of sycosis, and in nearly all cases of herpes tonsurans and favus, a single "normal exposure" usually suffices, *i.e.*, by using method No. 3, a perfect cure results after a single sitting.

Finally, it may be stated that radiotherapy is as beneficial in the hands of an expert as it may be harmful if improperly used. Over-exposure or too frequent exposure to powerful radiation may induce a severe ulcerative process, which is very painful, slow to heal, which may even endanger life, and require surgical intervention before a cure can be effected.

The physician can no longer shield himself behind a supposed idiosyncrasy of his patient. It appears that patients in poor health, whose vital resistance is lowered, are more easily affected by the rays than are persons in full health, and this should be taken into account; but, in general, the tissue changes induced are directly in proportion to the amount of radiant energy which falls upon the part.

**THE THERAPEUTIC ACTION OF LIGHT.**—Actinotherapy, like radiotherapy, is based upon the effect which light produces upon living cells. This effect is mainly manifested in two ways: (a) the effect of light upon the organism generally; and (b) the local effect of light.

**The Effect of Light upon the Organism as a Whole.**—The effect of light upon living organisms is shown in nature in a multitude of ways, and is illustrated by the difference in appearance presented by plants grown in the shade and the same species grown in sunlight; also, it is well known that persons who live in dark or ill-lighted habitations lack the ruddy, healthful appearance of those who habitually live out of doors. It is true that while this difference in vitality is due not alone to the dimin-

ished amount of light, but is largely owing to other unfavorable conditions, such as lack of fresh air, exercise, etc.; still, light is a decided factor in favoring health, and is one of the agents which, combined with fresh air, exercise, sanitary habitation, and suitable climatic conditions, is of the greatest benefit in the treatment of debilitating diseases.

The efficacy of a combination of the above-named factors in the treatment of *tuberculosis* is too well known to require discussion, and the accentuation of the light factor by the use of "light baths" is an important addition to the therapy of this disease. It is true that the use of sun baths dates back to remote antiquity, but the fact that the skin and soft parts are more or less permeable to rays of ordinary light has not until recently been conclusively demonstrated. The bactericidal effect of the actinic rays has now been conclusively shown, and the beneficial effect of sun baths in pulmonary tuberculosis has been ascribed by some to the bactericidal action of light; but it is more probable that the good effect of sunlight is due to a general favorable stimulation of the body cells, whereby their metabolic activity is increased and the tissue resistance to bacterial action is raised.

*The Local Applications of Actinotherapy.*—The local use of light for the cure of disease is in many ways analogous to the use of Roentgen radiation.

Both light rays and Roentgen rays appear to act by altering the metabolic action of the cells upon which their energy is exerted, but the resulting cell changes caused by these agents appear to be materially different. The effect of Roentgen radiation upon living tissue has been discussed under radiotherapy, to which the reader is referred for an account of the tissue changes produced by that agent. The effect of light in the treatment of pathologic conditions appears to be largely, if not entirely, due to the chemical or actinic effect of certain of the light rays. Relative to the biologic and therapeutic effects of light, it is important to note that light is not a simple entity, but that every ray consists of a series of distinct parts, each of which has its particular properties. The effects of solar radiation may be arranged in three different groups—heat, light, and chemical action. The heat rays are mainly found in the infra-red, red, and orange of the spectrum; the yellow and green rays make the strongest impression upon the human retina, while chemical action is chiefly found in the blue, violet, and ultra-violet rays. While all solar wave lengths, even the infra-red rays, induce chemical change under favorable conditions, the ultra-violet, violet, and blue are the most powerful in the order mentioned. This chemical action of certain light rays is particularly shown in the action of light in reducing silver salts in photographic processes. The same rays of solar light which produce chemical changes in inorganic compounds produce vital chemical or metabolic action in living cells. The action of light upon the skin has been noted by mountain climbers, who suffer from "sunburn," due to the intense action of sunlight in high altitudes, where the cold is so great as to negate the supposition that the sun's heat could produce the condition. This inflammation of the skin, *erythema solare*, was formerly called *erythema caloricum*, as it was thought to be due to overheating of the integument. This heat theory of erythema was first combated by Charcot in 1859, and has since been entirely refuted by the fact that severe erythema occurred in persons travelling among ice fields and in the polar regions with the temperature much below zero, and in persons exposed to an electric arc light, where the light is intense and the heat faint.

Widmark, of Stockholm, by the use of glass and rock-crystal plates, demonstrated experimentally that the power of light to affect living tissue rested mainly in the violet end of the spectrum. Glass absorbs most of the ultra-violet rays from an electric light, but rock crystal allows them to pass through. With a rock-crystal lens Widmark caused the rays from a twelve hundred candle power arc light to become parallel. When the rays were

directed upon the skin and a glass plate interposed, so obstructing the ultra-violet rays, no inflammation was produced, but when a rock crystal plate was used which allowed the ultra-violet rays to pass, a severe inflammation was set up.

The experiments of Widmark were corroborated by those of Finsen; and the latter's application of the principles adduced to the treatment of certain pathological conditions of the skin, notably lupus vulgaris, gave rise to the so-called Finsen treatment of skin diseases and the red-light treatment of smallpox.

The treatment of *smallpox* by red light has given remarkable results. By the exclusion of all except the red rays of light the course of the eruption and of the disease itself in many cases is markedly changed. The unfavorable action of light upon the course of smallpox was noted by Picton in 1832, by Black in 1867, and by Barlow and Waters in 1871, but it was reserved for Finsen (1893) to define a treatment based upon the deleterious effect of the actinic rays. Arguing from the fact that the actinic rays are able to produce inflammation in the healthy tissues, he arrived at the conclusion that their exclusion in inflammation of the skin might be beneficial. This view

is supported by the fact that in smallpox the deepest eruptions are found on the hands and face, which are the parts of the body most exposed to light. Total exclusion of light or the exposure of the skin to those rays only which are not harmful (non-actinic rays) is therefore indicated. As total darkness is not conducive to the patients' well-being, it is preferable to let them lie in a room lighted by red light only, the red rays being non-actinic and therefore harmless. The arrangement of the red room is very simple, being similar to that of the dark room used in photography. The window panes should be of red glass, or, where a room has to be extemporized, the room may be darkened by thick curtains at the windows and illuminated only by the light from red lanterns, such as are used for photographic purposes. Upward of two hundred cases of smallpox treated by this method have been reported, and all physicians who have given their experience with the method state that the results are remarkably good. If the patients were brought into the red light before the beginning of the suppurative stage, as a rule no suppuration occurred. The vesicles continued clear and after a few days dried to crusts, which fell off without leaving a scar. By the non-appearance of suppuration all the symptoms dependent upon that condition were absent. When the primary fever disappeared, the temperature remained about normal and the secondary fever of suppuration did not occur. In consequence the duration of the disease was shortened and the mortality lessened.

Recently Finsen's red-light treatment has been tried in other infectious exanthemata, and Backmann and Chat-

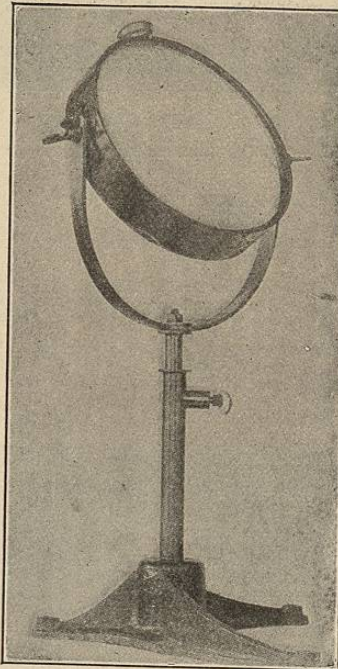


FIG. 4133.—Finsen Apparatus for Use with Sunlight.

nière have obtained especially satisfactory results with it in the treatment of measles.

*Actinotherapy after Finsen's Method.*—The Finsen method of the local treatment of skin diseases has for its

penetrated those tissues which are deprived of blood. His treatment, therefore, consists of concentrating actinic light through rock crystal lenses upon living tissue made ischemic by pressure. Sunlight or artificial light may be used, but the latter is most generally useful, as it is always available and controllable. When sunlight is used it is concentrated on the part by a large hollow lens composed of a flat and a convex glass enclosed in a brass ring (Fig. 4133). The lens is filled with a watery ammoniacal solution of copper sulphate. The water absorbs the infra-red (dark heat) rays and the blue solution absorbs a part of the red, yellow, and green rays.

In treatment by electric light an arc lamp, taking sixty to eighty amperes of current, is used. Current from an electric-light circuit is used, the amperage being raised and the

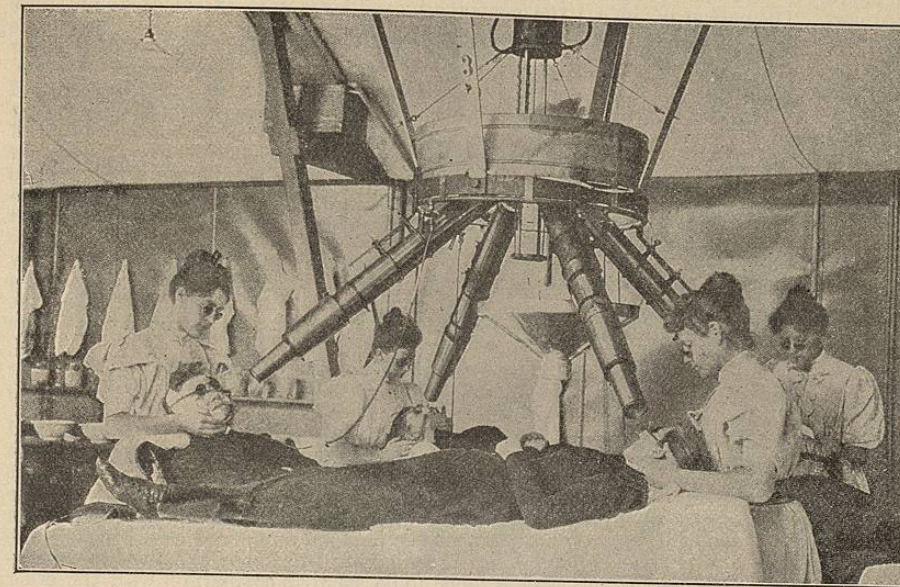


FIG. 4134.—Finsen Apparatus for Treatment with Electric Light. (Bie.)

practical basis the experiments made by himself and Widmark in producing local inflammation of the skin by the ultra-violet rays. In theory this treatment rests upon the many experiments showing that the chemical rays affect the metabolic action of living cells and cause the death or inhibit the growth of bacteria. The investigations of Bie and others have shown that the bactericidal power of light resides almost exclusively in the blue, violet and ultra-violet rays, and that only a small percentage of such potency exists in the red, yellow, and

voltage reduced by a converter constructed for the purpose. The apparatus consists of three parts: (1) the light; (2) the cooling apparatus; (3) the light-concentrating apparatus (Fig. 4134). The arc light is surrounded by a shade to prevent the eyes of those present from being dazzled. From this light there radiate four or more telescopes, each telescope conveying the light to a patient. The telescope lenses are of rock crystal, as this obstructs the active rays less than any other material. The space between two of the lenses is filled with water

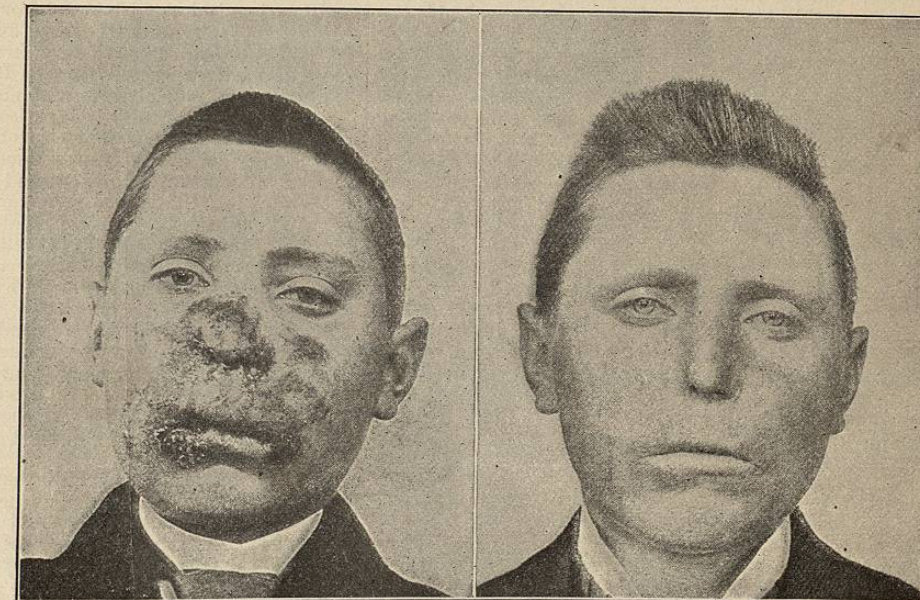


FIG. 4135.

FIG. 4136.

FIGS. 4135 AND 4136.—Case of Lupus Vulgaris, before (Fig. 4135) and after (Fig. 4136) Treatment by the Finsen Method. (Bie.)

Finsen then demonstrated that actinic light better

to moderate the temperature, and an enclosing water-jacket still further reduces the heat. The lenses are so arranged as to render convergent the divergent rays from the arc light; these rays then being brought to a focus by a lens cooled by water and held by a nurse and pressed by her firmly on the affected part. The patient lies on a table or is seated in an adjustable chair, the position of which can be varied so that the light will fall perpendicularly on the surface to be treated. Each application lasts about an hour and is repeated daily. Although the light is cooled in its passage through the concentrating apparatus, it is yet too hot to be directed on the skin without detriment; hence the water-cooled lens, applied to the skin, is used in all cases, whether sunlight or electric light is used. The effect of the treatment on the patient is in no way painful. A few hours after the first application there is a certain amount of "reaction"; the part swells, becomes reddened and tender, but there is little pain. The reaction varies in degree in different cases, being always seen in lupus vulgaris, but does not occur in lupus erythematosus. The beneficial effects of the treatment are often manifested in a few days, and recovery sometimes follows a very few applications. Generally fifteen to twenty-five applications must be made before a cure is effected. The results are very satisfactory; the skin becomes soft, smooth, and pliable, and scarring is hardly noticeable, other than to the extent dependent upon the tissue destruction caused by the disease (Figs. 4135 and 4136).

The Finsen method has been most successfully used in the treatment of lupus vulgaris, but recently encouraging reports have been made of the treatment of alopecia areata, epithelioma of the skin, and naevus vasculosus.

William Cline Borden.

**ROETHELN.**—DEFINITION AND HISTORY.—Roetheln is an exanthematous disease of mild character, attended with a slight elevation of temperature, propagated by contagion, and bearing a close resemblance to measles and scarlatina. It is widely known in this country under the above appellation, and also, in common parlance, by the term "German measles." The latter name, being English, is generally used. Thus in its nomenclature Roetheln resembles the other exanthemata, which have each a technical and a common name. The Germans, however, use the names Roetheln and rubeola as synonyms; and this tends to confusion, since we signify by rubeola the different disease, true measles or morbilli. Various other names have been given to the disease by different writers, prominent among them being epidemic roseola, rubeola scarlatinosa, rubeola morbillosa, rubeola notha, and rubella. The last-mentioned name has been suggested as most appropriate, since it is a diminutive of rubeola, and thus the two words express the analogy existing between the two diseases, just as do the terms variola and varicella. For the reason, however, that Roetheln is more widely recognized, the writer retains it in this article.

Roetheln is, so far as definite knowledge is concerned, a new disease. As late as 1886 the "Index Medicus" gives it no separate place, and the articles on the subject are grouped under the heading of measles; yet the number of communications, treating of this affection, which have been written during the past ten years or so (1877-1887), will aggregate more than one hundred. Before that time, however, the disease had been from time to time spoken of, as far back as a century and over; though until the time of the present generation the greater number of observers did not consider it a distinct disease, but believed it to be a modification of measles, generally, and, in some instances, of scarlatina. Mention was made of epidemics in 1845 and 1853, and in 1873-74 the disease was carefully described, though under the name of epidemic roseola. In Germany attention was given to the subject many years before any English or American writings appeared. Now almost all physicians grant its individuality, and the arguments supporting this view will be presented hereafter.

**AGE OF PATIENTS.**—Roetheln is generally classed as one of the diseases of childhood; and, since there are no clearly proved instances of its second appearance in the same individual, it follows that those affected are usually young in years; the general rule being that any one of the contagious exanthemata is experienced but once in the lifetime of an individual. Still, it is much less prominently an affection of infants and children under five years of age than are the other eruptive fevers. Adults are frequently attacked, but the majority of those who suffer from this disease contract it some time before the age of puberty. In other words, the time of life when susceptibility is greatest is between the ages of two and fifteen years. Young infants do not seem to contract it, and it is believed that sucklings are not susceptible. As, however, it is a disease of less frequent occurrence than measles or scarlatina, and as it seems to be less actively contagious than those diseases, many growing children escape it; and these facts constitute a possible explanation of the circumstance that adults are not infrequently attacked during the prevalence of an epidemic.

The season of the year does not seem to exert any influence on its prevalence. Epidemics occur indifferently in hot and in cold weather.

**ETIOLOGY.**—Roetheln is propagated by contagion, and by this means alone. The materies morbi is believed to be portable, but the cases in which the source can be traced point toward the necessity of close contact for the transmission of the disease from the sick to the well. In a single epidemic the total number of cases among those unprotected by having previously experienced the disease is found to be small in comparison with the other contagious exanthemata. Especially is this noticeable with reference to measles, which will attack, simultaneously or successively, all the susceptible children in a household almost with certainty; while we generally meet with a single, or perhaps two, cases of Roetheln, and the greater number of those exposed, in greater or less degree, escape. J. Lewis Smith, in one epidemic, saw forty-eight cases in twenty-one families—an average of a little more than two to each family. In an institution, such as an orphan asylum, the number of cases would be comparatively larger, since the exposure would be of necessity greater at first. Isolation, therefore, can be expected to accomplish more in the direction of prevention than it does with measles or scarlatina.

Roetheln is encountered almost exclusively in epidemics, and sporadic cases are very rare. This is probably more decidedly the case with this disease than it is with scarlatina, and possibly also with measles.

Considerable difficulty is experienced in tracing cases of Roetheln to their sources—largely, no doubt, because affected persons are frequently unconfined, owing to the general mildness of the disease, and the absence of alarm concerning it. Undoubtedly, however, if its origin could always be traced, an exposure to contagion would be discovered. In other words, it is practically certain that the disease does not originate *de novo*; nor is it produced by general causes, such as improper hygienic surroundings in the matter of poor ventilation, overcrowding, or insufficient or improper dietary conditions. On the contrary, it is not found to be a disease of greater proportionate prevalence in tenement-house districts, where the conditions referred to are in prominent existence. A large proportion of the cases are encountered in the families of the better classes, and, most of all, in institutions, such as orphan asylums.

We may reasonably conclude that Roetheln is less actively contagious than measles or scarlatina, since so many of those exposed escape. Under the same conditions of exposure the number of cases arising of either of those two diseases would probably considerably exceed those of Roetheln.

The age at which susceptibility is greatest has been mentioned, being considerably more advanced than that which obtains with the other exanthemata; but as yet there is little definite knowledge as to the stage of the

disease itself in which propagation by contagion is most likely to occur. We can only say that the probability is in favor of contagiousness during the whole course of the disease—from the time when prodromal symptoms, if present, appear, until the eruption has entirely disappeared.

**CLINICAL HISTORY.**—*Stage of Incubation.*—Much attention has been given to the duration of the stage of incubation—the time elapsing between a traceable exposure and the onset of the disease. This is frequently made difficult of accurate investigation for the reason before mentioned, that isolation is not observed because of the mild character of the affection, and sometimes even confinement within doors is not enforced. The general experience is that this stage occupies from fourteen to twenty-one days; though in some epidemics the duration has been considerably less. Shuttleworth had the opportunity of ascertaining, in an asylum, that twenty-one days lapsed after the first case appeared before the second occurred, isolation being enforced, and two days later two fresh cases developed. Goodhart says that the incubation, in twenty-three out of twenty-five cases, was from fourteen to twenty-two days. Edwards gives six days as the shortest and twenty-one days as the longest. Cheadle ascertained it to be eight days in one instance, nine in another, and (approximately) twelve days in five more. Griffith's experience was that in twenty-six cases the eruption appeared between the fifth and twelfth days after the first case was discovered. Therefore it must be granted that considerable variation exists in the length of this stage, although we may consider that a period of fourteen days represents the average. The incubative stage of measles is much more constant—standing, as it does, at thirteen and fourteen days.

*Stage of Invasion.*—In very many instances the eruption is the first thing which calls attention to the existence of sickness. Since many of the patients are old enough to describe any subjective symptoms which may be present, it follows that the stage of invasion is frequently attended with little or no disturbance of general health. With children too young to describe their own sensations, the attention of parents is often attracted by no manifestation whatever—such as restlessness, or crying, or digestive disturbance—until the eruption becomes visible. It is, however, probable that there is always present a slight rise of temperature, not sufficient to cause discomfort; and close questioning might elicit an admission of a feeling of malaise. But, as stated, the breaking out of the rash is what causes uneasiness, and leads patients or parents to consult a physician for the purpose of ascertaining the nature of the sickness.

There are, on the other hand, cases in which there is more or less decided disturbance of health prior to the appearance of the eruption. Epidemics undoubtedly vary greatly in severity, as do individual cases in a single epidemic; and from the average of descriptions it would appear that the disease is more severe, as well as of more frequent occurrence, in Europe than in the United States. These more severe cases present certain indications of sickness, before the rash appears, which, taken in connection with known exposure, point toward Roetheln as the oncoming disease; but in themselves they have little value as regards the differential diagnosis, especially, from scarlatina and measles. The symptoms, when present, have special reference to the mucous membranes of the air passages, and to the digestive system. They are: mild inflammation of the throat and tonsils, shown by swelling and redness on examination, and by pain and slight cough; a slight degree of coryza; conjunctival irritation, lachrymation, and a little tendency to oedematous swelling of the eyelids. Nausea and anorexia have been frequently observed, and in rare instances vomiting. Frontal headache in a few instances is the source of much discomfort. The digestive disturbances appear to have been prominent in some and absent in other epidemics. With these symptoms—and, it is not improbable, in their absence—there is a rise of temperature to 99° or 100° F. in mild, and as high as 103° F.

in severe cases. In addition to these indications there is one symptom highly characteristic of the fully developed disease, as will hereafter be seen,—a symptom which has been observed in the prodromal stage. This is enlargement of the post-cervical lymphatic glands—not those at the angle of the jaw, as obtains in scarlatina and diphtheria, but those in the back of the neck. This enlargement should always be looked for, since it is the only feature of diagnostic value in the stage of invasion. Jaccoud found it, in five out of thirty-two cases, four or five days before the efflorescence. Associated with this, stiffness of the neck with pain on movement of the head, in slight degree, should be sought for.

Any throat inflammation present might easily be accounted for in expecting scarlatina to develop; and coryza, cough, and conjunctival irritation belong to the clinical history of measles. Rise of temperature also, of course, accompanies the onset of both these diseases; and consequently, excepting only the glandular enlargement, so far as these general symptoms are concerned, it is only in their lesser degree of severity that they are characteristic of Roetheln rather than of the other two affections.

These indications, when present, precede the eruption by a period, in the great majority of cases, of less than twenty-four hours; although in some instances malaise is present for three or four days before this stage is ended. Cheadle, in describing a severe epidemic, observed that the prodromal symptoms persisted longer in severe than in mild cases. Edwards gives the average duration as three days.

It is therefore observable that the stage of invasion, when present, is subject to considerable variation—both as to length and severity—and is, in fine, a much more uncertain quantity than is that of scarlatina or measles.

*Stage of Eruption.*—The prominent feature of the disease is the eruption, often, as before stated, being the only phenomenon perceptible, and generally being by far the most prominent manifestation of a condition of sickness. Very great differences, in different epidemics and in individual cases, are to be found; and, considering the eruption alone, a diagnosis might well be difficult, if not impossible. As the symptoms other than the eruption, such as those found in the prodromal stage, present considerable variation, and as this fact holds with the eruption itself, we may conclude that the disease, as a whole, is far less stable than scarlatina and measles. These are more than variations of degree—they affect the essential characters of the symptoms and of the eruption.

Scarlatina, for instance, may be very mild or very severe as regards the throat inflammation and fever; and its eruption may be difficult of detection, or as marked as a pronounced rash of erysipelas; but these are differences of degree, and the sore throat and eruption are uniformly present, and are *sui generis*. The same rule holds with measles. The essentials of the disease—the catarrh of the respiratory tract, and the characteristic eruption—may, one or both, be very mild or very severe; but they must both be present in any case in which the diagnosis is undoubted. Roetheln, on the other hand, may consist, from beginning to end, of the eruption only, or may present some of quite a variety of symptoms affecting the mucous membranes of the air passages or of the digestive apparatus.

Regarding the eruption itself, its characteristic points are as follows: Its color is generally a pale rose, less distinctly rose-tinted than that of measles. It is very frequently brownish, brownish-red, and sometimes quite distinctly brown, with no tinge of rose or pink to be detected, and giving the general effect of duskiness.

As to location, no part of the surface is entirely exempt. The palms of the hands, the soles of the feet, and the scalp have been observed to present it; although usually it is not to be found in those regions. As a general rule, the face, trunk, arms, and legs break out successively before the final disappearance of the rash; although cases are often described in which the affected area is much less extensive.

Either the face or the upper part of the body may be