tion must be fixed at ten days, or from nine to eleven days. During the incubation period there is no recognizable departure from the normal, and the symptoms of the invasion stage come on rather abruptly. Together with the symptoms above mentioned as indicating the approach of measles, there is an intense nasal, pharyngeal, and laryngeal

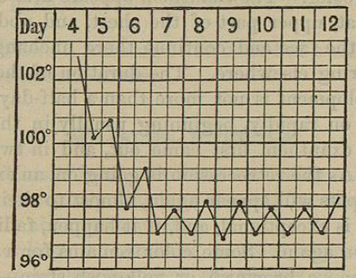

FIG. 53.—Range of Temperature in Uncomplicated Measles.

catarrh, which usually appears on the first, but may be postponed to the second day. The fever rises to 102°, where it usually remains for the first day or two, and its intensity furnishes a measure of the severity of the attack. On the second or third day—usually the second—a remarkable remission takes place, the temperature descending to normal or nearly so. On the evening of the third or the morning of the fourth day the fever rises again to the original height. With this decline in temperature, there ensues an improvement in the general condition: the headache ceases and the general discomfort lessens; but the catarrhal condition does not moderate; the nasal mucous membrane swells; breathing through the nose is difficult; there are frequent paroxysms of sneezing, and presently an abundant secretion of mucus is poured out from the membrane. The eyes are swollen, the conjunctivæ injected, the lids œdematous, and hot, scalding tears flow over the cheeks. During this time epistaxis is frequent, especially in children. By the third day the catarrh reaches the larynx, and then the voice becomes hoarse and husky, the cough harsh, resounding, metallic, stridulous. At first there is no expectoration, and only sibilant *râles*, but more or less præcordial oppression and anxiety are felt.

Eruption Stage.—The characteristic eruption of measles makes its appearance on the fourth day, and is rarely postponed to the fifth. In the milder cases the eruption appears on the morning of the fourth day; in the severer cases, in the after part of the same day; and it is seen first on the face, forehead, chin, and cheeks, spreading thence often, after an interval, over the body and extremities. The fever attains its maximum on the appearance of the eruption, or on the fifth

day, or there may be remissions—the maximum on the evening of the fourth, and a remission on the morning of the fifth. The color of the spots is deepest when the temperature is highest. The condition of the mucous membrane continues the same, but the cough soon becomes easier because of the abundant secretion of mucus, soon assuming a muco-purulent character. Complications may arise at this point; considerable bronchitis may develop; diarrhœa comes on; albumen (usually a trace) appears in the urine. These symptoms were usual and constant at this period of army measles. About the seventh to the ninth day the eruption on the face begins to pale, and the turgescence and redness of the visage lessen. With the retrocession of the eruption the temperature declines somewhat, and the normal is reached in a day or two. The defervescence may be sudden and without interruption, the normal being reached in a day, or it may be gradual and varied by exacerbations and remissions. The slight desquamation that takes place is soon completed. Convalescence may be retarded by an irritable state of the intestinal canal.

Course, Complications, and Anomalies.—The course and behavior of measles are much affected by the character of the epidemic influence, by the susceptibility of the individual and the hygienic surroundings. As it prevails in armies, measles comes to be a formidable disease, comparable only to typhoid; sporadically, under favorable conditions, it is of very minor importance. In some epidemics many of the cases are very mild—cases of measles without the catarrh; other cases, in which the catarrh and other symptoms are present, but the eruption is absent. On the other hand, some epidemics are characterized by the severity of the cases. Thus, in some epidemics, the hæmorrhagic diathesis complicates many cases, and they present the usual phenomena significant of profound alteration of the blood. Before the eruption makes its appearance, or subsequently, hæmorrhages take place in the skin from all the mucous surfaces, and into the parenchyma of organs. Profound adynamia sets in; the pulse is rapid and weak; the lungs are disabled by an extensive broncho-pneumonia; the abdomen is tympanitic, and profuse watery and offensive stools are discharged; the tongue is dry, the teeth covered with sordes; and low-muttering delirium ushers in death. A fatal result is not invariable, although usual in the hæmorrhagic form. The eruption may be absent in the mildest cases; it may pursue an irregular course, appear on the trunk before the face, remain on a very short time, or continue much longer than normal. Very high fever during the invasion stage, or great prostration, is significant of a severe case. The temperature furnishes the most certain guide to the actual state. Sometimes the eruption returns, the fever lights up, and all the phenomena of the disease are repeated. Various cutaneous eruptions may appear with the normal exanthem: as miliary vesicles, pustules, bullæ, and urti-

caria. Serious complications on the part of the eye must be noted—such as conjunctivitis, keratitis, iritis, etc. The larynx is the seat of ulcerations and erosions. Inflammation of the middle ear, succeeded by chronic otorrhœa, also takes place. But the most frequent and serious complications are capillary bronchitis, pneumonia, catarrhal pneumonia, etc. In some epidemics these complications are more numerous than in others, but the constitutional state and the hygienic surroundings are chiefly responsible. Capillary bronchitis and pneumonia occur during and after the stage of eruption. In strumous subjects catarrhal pneumonia may undergo the transformation into caseous, which is the explanation of the frequent occurrence of phthisis after measles. The constant association of enlarged follicles and intumescence of Peyer's patches in measles with the other morbid altera-

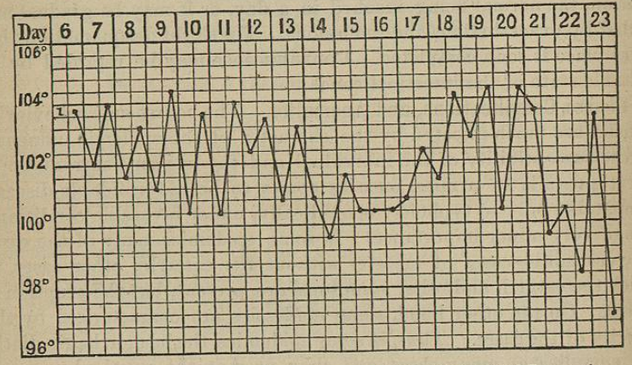

Fig. 54.—Range of Temperature in Measles complicated with Catarrhal Pneumonia.

tions characteristic of the disease, observed by the author in numerous autopsies, seems to justify his conviction that the former are really incident to the disease. An obstinate diarrhœa and dysentery (ileo-colitis) may occur at any point in the disease, but are especially troublesome from the period of retrocession of the eruption. Death is often due to this complication, or the convalescence is made very tedious. Simple uncomplicated cases of measles are free from danger. The indications that bode danger to life are an excessively high fever during the period of invasion; sparseness and dimness of the eruption while the general state is bad; confluence of the eruption and hæmorrhagic diathesis; anomalies in the development of the eruption, the other symptoms being unfavorable; capillary bronchitis, broncho-pneumonia, etc.; intestinal disorders, severe ileo-colitis, etc.; and cerebral complications.

Treatment.—Mild cases require confinement in-doors or to bed, on a regulated diet, and a little paregoric to quiet a troublesome cough. If

the temperature is high during the initial stage, and the cough troublesome, a combination of aconite, ipecac, and opium is highly serviceable (tinct. aconiti rad., ʒ j, ext. ipecac., fl ʒ ij, tinc. opii deod., ʒ iij. M. Sig. Six drops every hour or two). If the aconite fail to reduce the temperature (the remission occurring during the invasion stage should not be overlooked), a tea- to a tablespoonful of infusion of digitalis may be given three or four times a day in addition. During the time of eruption, if the temperature is high, the skin should be rubbed every four hours with lard, or suet, or vaseline, or cacao-butter; and, if the fever is moderate, three times a day. If the bowels are confined, a simple saline laxative ought to be given. Free action of the kidneys can be maintained by cooling drinks. The temperature of the apartment should be about 70°, and, while it is well ventilated, all draughts must be excluded. The popular notion that measles requires a close room and blankets is a very pernicious one. The other extreme is equally dangerous. Such are the simple measures required in uncomplicated measles. When very high fever obtains through the prodromal stage, or subsequently, the antipyretic treatment most effective is the wet pack. The bed is protected by a rubber cloth, and over this is placed folded flannel of sufficient dimensions; a sheet wrung out in water, each time beginning at 95° and gradually cooled to 80°, is laid on the flannel; the patient is placed on the sheet and quickly wrapped up. This operation is repeated every half-hour until the heat is reduced. Besides the diminution of fever-heat, the wet pack develops the eruption, and exercises a most favorable influence on the course of capillary bronchitis and pneumonia, whence it is to be especially commended when the high temperature is the result of the pulmonary complication. Quite irrespective of the temperature, local wet packs are of very considerable importance in the treatment of measles. The vapor of water allays the nasal stuffing and the sneezing, and tepid-water compresses best relieve the irritation of the conjunctiva. Tonsillitis and laryngitis are much benefited by enveloping the neck in a tepid pack, and frequently renewing it. Packs and compresses are especially efficacious in the treatment of inflammatory affections of the chest and abdominal organs. If baths can not be utilized to reduce temperature, quinine comes next in point of efficiency, but it must be given in antipyretic doses. Antipyrin may be used instead of quinine, and digitalis can be combined with these antipyretics should a renal complication require it, and an irritable state of the stomach not prevent. In the hæmorrhagic form, quinine, the mineral acids, tincture of ferri chloridi, turpentine, etc., are especially indicated. The most important, as it is the most frequent complication, requiring careful therapeutical handling, is capillary bronchitis, with atelectasis, broncho-pneumonia, etc. The salts of ammonia, especially the carbonate and iodide, are of immense value in this state.

The plasticity and adhesiveness of the exudation are lessened by them, and thus the access of air to the alveoli is favored. They may be administered in an emulsion together, or the carbonate may be dissolved in solution of the acetate. The vapor of water is an important adjunct to the other means for lessening the obstruction of the tubes, and hence steam should be freely disengaged in the apartment. The volatile expectorants are very serviceable, in that they diffuse out of the blood through the lungs, and thus act locally on the affected surface. The most efficient of these are eucalyptol and turpentine, especially the latter, which is particularly indicated when the capillary circulation is feeble, the eruption pale, and the skin bluish. If the means resorted to fail to remove the obstruction in the capillary tubes, emetics become necessary. The subsulphate of mercury, alum, or sulphate of zinc, may be employed for this purpose—their repetition being determined by the results. Tartar emetic, which is often used, is greatly too depressing, and is dangerous. Apomorphine may also be given, but the remarkable effect which it now and then has on the heart is a serious objection to its employment. In the intestinal complication the author has had the best results from the conjoined administration of Fowler's arsenic (two drops) and opium (deodorized tincture, five to ten drops) every four hours, and from sulphate of copper and sulphate of morphine ($\frac{1}{20}$ to $\frac{1}{10}$ grain of the former, and $\frac{1}{16}$ to $\frac{1}{8}$ grain of the latter, for adults, three times a day). Very careful alimentation should be directed from the beginning, and should consist largely of milk, especially if there is a trace of albumin in the urine.

ROSEOLA—ROETHELN (GERMAN MEASLES).

Definition.—By the modern German authors the term *rubeola* is restricted to this disease, which is usually called *roseola* in this country. Following the course usually taken by American authorities, the term rubeola has been applied to true measles. Roseola is a self-limited eruptive disease, pursuing a course similar to measles.

Causes.—This is a disease of early life, appearing equally in the two sexes, and propagated by infection. It does occur in adults, but less frequently. One attack procures an exemption against future attacks, but this is not an absolute rule. That a peculiar materies morbi, virus, or germ exists is probable, but thus far it has not been isolated.

Pathogeny and Symptoms.—The eruption consists of rose-colored spots, the size of a pin-head up to three or four pin-heads, well defined and somewhat elevated, so that, when a number are placed near each other, the skin is distinctly rough. An hyperæmia of the papilla takes place, and of the adjacent cells of the derma above, and the redness in spots and the elevation of the hyperæmic patch give the impression of roughness. The spots have a round or somewhat oval shape, disappear on pressure, to return immediately when the pressure is withdrawn. The spots vary a good deal in size, and are rarely confluent or coherent. On the face, where they are most abundant, they do not flow together. They are nearly as abundant on the neck, chest, and abdomen. The eruption is quite abundant on the scalp, and extends freely over the extremities. The maximum development of the spots is about half a day, but the whole duration of their existence is from two to four days. A very slight discoloration remains for a day or two at the site of the spots, and very little, if any, desquamation takes place. From the period of exposure until the onset of the disease there are from ten to fourteen days. No symptoms occur until the eruption appears; in other words, there is no prodromal stage, or invasion, or initial stage. There is no fever in a majority of the cases. The eruption appears first on the face and spreads thence regularly over the scalp, body, and extremities, in about the same order as measles. A light grade of catarrh comes on with or immediately succeeds to the eruption, and there are redness, stuffing of the nose, sneezing, conjunctivitis, photophobia, etc., but all of these symptoms are much less severe than the corresponding symptoms in measles. More or less diffused redness, with punctations of deeper color, is observed in the mucous membrane of the fauces, pharynx, and larynx. Disorders of the intestinal canal or of the kidneys do not occur. In general the symptoms are so slight that children object to any restraint or confinement. Even in the few cases characterized by fever the symptoms are by no means severe, and the complications which occur are usually unimportant. The prognosis is favorable, and the treatment need consist in nothing more than confinement in-doors and intelligent supervision.

SCARLATINA—SCARLET FEVER.

Definition.—*Scarlatina* is an acute, infectious disease, self-limited, characterized by a peculiar exanthem, an affection of the throat and albuminuria, and terminating in desquamation of the epidermis.

Causes.—Scarlatina, like the other members of the group, is propagated by a peculiar poison, which, by reason of the tenacity with which it adheres to articles of clothing, and other peculiarities, we have good grounds for holding is a solid. It is communicated by contact of the healthy with the infected, and by intermediation of various substances to which the poison adheres. It occurs both in the sporadic and epidemic form, but never arises spontaneously. The susceptibility to scarlatina is not by any means universal, and is less than to variola and measles. The time which elapses, from exposure until the objective signs of the disease are manifest, varies greatly, and is therefore very differently stated by authorities. The shortest period is that of a patient mentioned by Trousseau, in whom the dis-

ease appeared in a day after exposure. The other extreme is twelve to fourteen days. The most usual period is from four to seven days. The very slightest contact with the morbific principle suffices. It may be conveyed on or about the persons of the healthy to others at a distance. That it may be dissolved in articles of food or drink is rendered highly probable by the epidemics following in the wake of milk distribution, of which several very instructive examples have been reported from England. The poison is probably contained in the skin and its excretions and epithelium, and also in the breath and exhalations from the throat. The period of greatest activity of the poison is at the highest point in the disease; but it is present at any period, from the initial to the terminal symptoms. The susceptibility varies greatly, even in members of the same family, hence nothing is more common than for one member of a family to be attacked while all the rest escape. The susceptibility to it is increased by all causes lowering the vital forces; and hence those situated under unfavorable hygienic conditions are more apt to be attacked. Again, the susceptibility of the same individual may vary at different times. Within the first six months of infant life there is little liability to the disease; but the susceptibility attains its maximum from the second to the fifth year, and declines slowly to the tenth, and after this more rapidly; but it does occur in old age. The author had under his care a gentleman of sixty years of age, with scarlet fever, after caring for several of his children with the disease, and his was a typical example. Sex and race appear to have no influence. Negroes are said to be less susceptible than whites. The author believes that this is not true, the misconception having arisen from the difficulty of recognizing the disease in the negro. The disease but rarely occurs twice in the same individual. Those exposed anew, especially if brought into close relation, as in the case of mother and child, are apt to suffer from the angina, without experiencing any of the other symptoms. Cases of recurring scarlatina are by no means infrequent; the author has seen two, in which, from one to three weeks after the close of the first attack, the whole phenomena of the disease were repeated, even to the desquamation.

Pathological Anatomy.—The eruption may be distinct, and around each spot a border of normal skin; or it may be confluent, the whole surface of a vivid red, with punctations of a somewhat deeper tint. The eruption is due to an intense hyperæmia, which is limited to the area of the spots, but which is general when the spots coalesce. At its first appearance the eruption is less vivid than it becomes when fully developed. The spots appear first on the neck and upper part of the chest, then on the face, where they are also most perfectly developed. They are nearly circular, are not elevated above the general surface, and do not therefore impart a roughness to the surface. They

are also nearly equal in size, and when discrete uniformly distributed, about as much of the integument being covered by the eruption as free from it. When confluent the whole surface is a vivid, brilliant red, marked, as may be seen on close inspection, by minute points of deeper color. The eruption having reached the maximum of intensity, remains stationary from a half-day to a day, and then slowly declines. When the eruption first appears on the face, the redness of the temples, forehead, and cheeks contrasts vividly with the pallor of the lips. The eruption may be partial, or occur in particular localities, leaving large portions of the integument uninvaded. Thus, it may appear on the face only, on the trunk only, or on the extremities, especially around the joints. The individual spots may be two or three times as large as the usual eruption. A miliary eruption of minute vesicles may appear on parts so situated as to sweat freely, and a very fine papular eruption on all parts, notably on the forehead. In some cases the cutaneous appearances are diversified by hæmorrhages, and the formation of petechiæ and vibices. Other forms of eruption may complicate the scarlatinal eruption, such as herpes, urticaria, pemphigus, and other vesicular and pustular affections. As the eruption disappears, boils may be observed, and more or less gangrenous sloughing may occur in low states of the system, merely from pressure. Desquamation of the epidermis may succeed immediately to the eruption in a few days, sometimes in a few weeks, after it has disappeared. The exfoliation of the epidermis occasionally, in severe cases, takes place several times, and it is usually general over the body, but the intensity of the desquamation is not a measure of the intensity of the exanthem. The desquamation may consist of fine furfuraceous scales, and of large masses of exfoliation. The thick and hard epidermis of the hands and feet peels off in large flakes, and a cast of the hand or foot, like a glove or stocking, is not uncommon. Not unfrequently the hair and nails, and warts on the fingers, drop off. The skin is left red and sensitive by the desquamation, but its natural state is soon restored. Not less significant than the eruption is the affection of the fauces and of the pharynx. The mucous membrane of the fauces is intensely hyperæmic, of a deep-red color, and marked by conical elevations—swollen follicles—which rarely in simple cases suppurate and discharge. In the severer cases, instead of a simple redness there is a more or less deep, livid redness, involving not only the fauces, but the whole mouth to the lips, the pharynx, and the nares. Besides the deep coloration, there are increased secretion and œdema of the mucous membrane, especially of the soft palate. The tonsils are also deeply inflamed, much swollen, and are liable to form enormous purulent accumulations. There is a still more formidable affection of the throat, in which, besides the changes mentioned above, there are œdema of the throat, deep-seated

inflammation of the tonsils, inflammation of the sublingual, submaxillary, and parotid glands, and simultaneous œdema of the areolar tissue of the neck, the whole forming a great mass of induration bulging out from the parotid region, and forming a broad band of induration filling in the whole space from the chin to the neck. The difficulties of the case are much enhanced by œdematous swelling and inflammation of the retropharyngeal connective tissue and that of the larynx. At the same time the tonsils may suppurate and slough, or become gangrenous, and from the tonsils the suppurative and gangrenous process may extend in all directions, and extensive abscesses form in the neck, followed by immense sloughing and loss of tissue. A diphtheritic process may also ensue in the fauces; and so common is it that a close relationship is supposed by many to exist between them. The tongue has a peculiar and very characteristic appearance. It is coated uniformly, except at the tip and edges, with a heavy whitish or yellowish-white fur, increasing in depth toward the base. Through this coating the enlarged papillæ project. On or about the third day an entire exfoliation of the coating, and of the epithelium also, takes place, leaving the surface of the tongue raw and red, and roughened by the elevated follicles, presenting the appearance of a fully ripe strawberry—whence the term "strawberry-tongue of scarlet fever." Troublesome affections of the ear occur with those of the throat. Inflammation of the middle ear, perforation of the drum, and in severe cases caries, preceded by periostitis of the squamous and petrous portions and of the mastoid process, take place. Also, in severe cases, the tissues about the ear externally are swollen, and pus dissects down the neck between the muscular planes. Inflammation of the larynx and œdema of the glottis during general dropsy, bronchitis, and pneumonia, are the lesions of the pulmonary organs occurring during the course of the severer cases of scarlet fever. Pericarditis, endocarditis, simple and ulcerative, with or without joint implication, are complications in many severe cases. There are no constant and uniform lesions of the digestive tube, pancreas, or spleen. The kidneys present, next to the skin and throat, the most constant anatomical changes. The tubules of the kidneys, like the skin, cast off their epithelium, which for a time may block the passages, until at length washed away by the urine (desquamative nephritis, tubular nephritis, etc.). Besides this, changes take place in the parenchyma (parenchymatous nephritis), already sufficiently described, succeeding to the other form, and occurring in the second to the third week. General dropsy and the accidents due to uræmia are usual concomitants of the kidney-disease. Closely connected with the condition of the blood due to the kidney-disease, if not dependent on it, are the attacks of inflammation of the serous membranes and of the synovial cavities of the joints. Meningitis, pleuritis, and peritonitis are the forms of serous inflammation, and acute rheumatism of synovial. The joint affection may consist only of a little pain and stiffness, or it may be a severe attack of rheumatism in which all the principal joints are affected in turn, peri- and endocarditis also occurring.

Symptoms.—By the older authors,* scarlatina was divided into *scarlatina mitis vel simplex*, *scarlatina anginosa*, *and scarlatina maligna* —scarlatina without any affection of the throat; scarlatina with decided implication of the fauces and adjacent lymphatics; scarlatina of the severest type with extensive suppuration, possibly gangrene. As these distinctions are rather artificial, we purpose describing first the ordinary, well-defined form, and mention subsequently the variations. *The period of invasion* is sudden and violent. A strong chill is the initial symptom in adults; in children, a violent convulsion or a succession of them, or a severe attack of vomiting, with prostration. Headache of a very intense character, general muscular pains and high fever succeed to the chill. In a short time the temperature rises to 104°, 105°, or higher; the skin is hot and mordicant; the throat burns, and, on inspection, the palate, tonsils, and pharynx are red and somewhat swollen; the tongue is coated with a thick yellowish fur. The fever is nearly continuous in type, and there are no strong remissions or intermissions, as in measles. The eruption makes its appearance usually at the termination of the first exacerbation of the fever—at the end of the first or beginning of the second day. It appears on the neck and upper part of the chest, and then on the cheeks and forehead, pale, rose-red, rapidly becoming brighter, and at first contrasting strongly with the white lips. Very quickly, in scarcely a half-day, has the eruption spread well over the body. In the more severe cases the eruption is not completed until the third or even fourth day. When the eruption is completed promptly, it is punctiform, each spot distinct and surrounded by an area of normal skin; when slower to reach its maximum, the eruption becomes confluent and diffused, the whole surface being of an intense scarlet hue. The tongue is thickly coated, but the coating with the epithelium peels off about the fourth day, leaving a red, raw surface, dotted with swollen follicles—the strawberry-tongue. There is no longer any vomiting, but the appetite is wanting, and there may be constipation or diarrhœa. Severe headache is experienced in the more decided cases; there are apt to be delirium at night and some confusion or somnolence through the day. On examination of the urine then, it is found to be scanty, high-colored, smoky, and contains more or less blood and albumin. The eruption is barely completed before it begins to fade on those parts where it first appeared—certainly, it does not stand at its maximum longer than half a day to one day. The gradual disappear-

* Gregory's "Lectures on the Eruptive Fevers," American edition by Dr. H. D. Bulkley, p. 151.