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Thesis on

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by

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M E A S L E S.

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II

DEFINITION.

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Measles is an acute, infectious, eruptive febrile disease, which commences with marked catarrhal symptoms, and later develops a characteristic rash of a maculo-papular nature.

Its highly infectious character is particularly noteworthy, as also its occurrence in childhood or near the age of puberty. The eruption usually occurs about the fourth day of the fever; and it can, in from thirty to forty hours, be seen to have overspread the entire body of the patient - accompanying which phenomenon will be observed catarrh of the air-passages and a greater or less degree of pyrexia. Furthermore, there are few individuals who escape the disease in early life, though it is sometimes to be observed at a later period - even in old-age. In the case of children especially, it is apt to be a very dangerous disease - the more so as mothers are apt to regard it as a malady from which there can be no escape, and which, in view of its frequency, is comparatively harmless in its occurrence.

SYNONYMS.

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The disease has been termed "Rougeole" by the French, and "Masern" and "Flecken" by the Germans. The Italians sometimes call it "Rosolia," and the Spaniards "Serampion." The former applied the term "Morbilli", or "little disease", to differentiate it from the "Il Morbo", or the "great disease" - i.e., the "plague".

ETYMOLOGICAL NOTE.

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For a considerable period after its adoption, the Italian name, "Morbilli", maintained a great popularity, and until recent years; and, at least in this country, the term "Rubeola" is preferred by many, as it is at least suggestive of the colour of the eruption, as are also the French "Rougeole" and the occasional Italian designation of "Rosolia." It is difficult to explain how the disease came to be termed "Measles." Skeat (Etymol. Dict.) connects the term with the Dutch "Maselen", and holds that it would have been written "Maseles" in the fourteenth century or thereabouts. Creighton (Lancet, 1896, Vol. i., p. 1096) insists upon the derivation of the word being from "Miselli", a diminutive of "Miser" - a term applied to lepers; and he accounts for its extension

to measles by stating that John of Gaddesdon had confounded the eruption of measles with the largish dusky-red spots seen on the lower extremities of the poor and emaciated. In spite of the already indicated preference of many for the name rubeola, the writer prefers that of measles, as practically everyone in this country knows exactly to what affection this term refers.

HISTORICAL INTRODUCTION.

Though the disease has prevailed in epidemic form ever since the eighteenth century, it is impossible to accurately trace its occurrence further back into the remoter ages. Nevertheless, the writings of the ancients would seem to indicate that measles was in all probability introduced into Europe contemporaneously with small-pox. Moreover, it was long held to be only a variety of modification of the latter affection, as certain Arabian writers - e.g., Avicenna (Canon: Lib. iv., F. i., T. iv., C. 8) and Rhazes (Liber de Variolis, and Continens, Liber xxiii., 486, F. Bl. viii.) - affirm, holding that it was a kind of "bilious small-pox." Sennertus (1640) and Diemerbroeck (1687) insisted upon the identity of the two affections; but Sydenham demonstrated the erroneous nature of this theory in his narration of the London epidemic in 1670-1674. Nevertheless, for nearly a hundred years afterwards, it was believed by many good observers that measles and scarlet fever had many points of identity; and, of this theory of the identity of the two diseases named, Morton (1696) was perhaps the strongest advocate. Indeed, it was not until 1793 that his teachings on the point were abandoned, and those of Sydenham definitely established. To the observations of this great clinician very little of importance has been added, and the same chiefly by Willan. Others have introduced several varieties of the disease, which ~~same~~ will receive consideration in due course.

ETIOLOGY.

If not the most frequent, measles is one of the most frequent diseases of childhood. Climate and geographical distribution seem to have no influence whatever upon it; and it develops equally well wherever the infectious principle has access to the populace. It has a decided tendency to prevail in epidemics, which come on at intervals of two or three years. In large cities, however, cases occur nearly every year, although even in them the epidemic influence is very distinct; and in some years the disease will be far more prevalent than in others. Furthermore, in some years its severity is very much greater than in others.

AGE.

In the etiology of measles the influence of age is not quite so great as would at first appear. Although principally a disease of childhood, its greater rarity

in adults depends upon the fact that most individuals have suffered from it before reaching adult life. There is no reason to believe that any degree of immunity is conferred by advancing years. Numerous well-known, and often quoted, instances prove the susceptibility of adults to it. As regards childhood, it is generally believed that, in the case of every infant during the first five months of its life (and from the comparative rarity of its exposure to infection at that time), a partial or temporary immunity exists: nevertheless, it is somewhat difficult to prove this from statistical compilations - though the theory would seem to attain a certain approach to substantiation from the epidemic of 1847-48 at Hagellock, a hamlet near Tübingen with a population of some 500 persons, 197 being below the age of fourteen. Of these latter, 185 suffered from measles; but only three of the older inhabitants, the same being all three of fifteen years of age and immunised by a previous attack. This observation can be supplemented by the statistics of Bartels (Virchow's Arch., Vol. xxi., pp. 26 et seq.), comprising 673 cases which occurred during the epidemic at Kiel, and commencing with the month of March, 1860. From the same it would appear that under 1 year 5.4 per cent. (31 cases) were attacked; from 1 to 5 years, 47.8 per cent. (274 cases); from 5 to 10 years, 39.4 per cent. (226 cases); from 10 to 15 years, 5.6 per cent. (32 cases); from 15 to 20 years, 0.8 per cent. (4 cases); from 20 to 30 years, 0.7 per cent. (3 cases); and above 30 years of age, the same percentage and the same number of cases as in the last-mentioned age-period. In view of our present knowledge, it is entirely supererogatory to attempt to prove a comparative susceptibility after the first or second year, at which time a full susceptibility to measles is established - any apparent immunity after that period being due entirely to lack of opportunity for infection, as can be instanced in the case of the epidemic at the Faroe Islands, in which persons of all ages suffered with equal severity. In addition may be mentioned the prevalence of measles among the soldiers in the American Civil War and in the Franco-Prussian War. It is indeed a truism that a person failing to contract measles in childhood can only attribute this to his avoidance of the contagion. Numerous instances of this are on record; but, apart from it, some authors hold that certain nervous diseases (especially of the brain) have the power of immunising the individual against measles, or at least to considerably modify the illness from the latter - more especially in a diminution of the degree of pyrexia observed. Consequently, it may be confidently affirmed that no age is wholly exempt from measles, and that, as a rule, it is rarer in infants under one year - especially from one to five months - and in elderly persons. To still further strengthen this opinion one may adduce the statement of Mayr (Measles, p. 40) that of 10 nurslings exposed to infection only one contracted the disease. Barbillier's report of the epidemic at the Bordeaux Foundling Hospital (Schmidt's Jahr., 92, p. 90) is instructive in that it instances 33 children, between 1 and 7 years of age, of whom 24 were attacked by measles, whilst, of 40 children under 1 year, only 7 suffered. According to Bartscher, attacks in the case of sucklings

under six months of age were very rare in Osnabrück. Mayr says that only one fell ill in ten among the newborn and nurslings. About this time (1860), Bartels saw 274 patients between one and five years of age, but only 31 under one year; nurslings frequently escaped altogether. Brown saw, in the epidemic at Leith, among 170 cases of which 129 were less than five years of age, only 12 patients under one year; 24 from one to two years; 49 from two to three years; 22 from three to four years; 22 from four to five years; and 18 from five to six years. In the Pfeilstickers epidemic - except 3 totally secluded children - only 8 escaped, of whom 7 were six months old or less. Spiess recorded only 15 cases in the first year, and 52, 68, 62, 81, 71, and 82 in each of the following years; Treßling - 72 in the first year, and 147, 142, 151, 139, 189, and 198 in each of the later years; Kellner - 18 in the first year, and 61, 84, and so on in the next; Gummers - 11 in the first year, and 30, 33, 25, 25, 24, 22, in those following, out of 25 patients under fifteen years of age. According to Geissler, there fell ill in Meerane, in 1861, out of 2,926 not previously affected children, 1,754 or 59.6 per cent.; the proportion of children under three months was 12.7 per cent.; from the third to the sixth month of age, 56.5 per cent.; from four to five years, 70.9 per cent.; from five to six years, 72.5 per cent.; from six to seven years, 77.0 per cent.; from ~~seven~~ ~~eight~~ ^{seven} to eight years, 81.3 per cent.; from eight to nine years, 78.0 per cent.; from nine to ten years, 68.0 per cent.; from ten to eleven years, 55.0 per cent.; from eleven to twelve years, 30.1 per cent.; from twelve to thirteen years, 20.0 percent.; and from thirteen to fourteen years, 63.6 per cent. It should be noted that most of the children having already had the disease, the figures of the later years are based upon small numbers: they are consequently of little value, partly for this reason and partly because, at this age of the children, the parents might have forgotten an attack that had occurred in earlier life. In the experience of the present writer a second attack of measles has not been of common occurrence: indeed, during a study of several epidemics he has met with it in three different individuals only, and believes this observations to be somewhat unique. Panum (loc.cit.) seems never to have experienced it at all, and he seriously doubts its possibility. Mairelis (Virchow's Arch., Vol. cxxxvii., p. 468 et seq.), after an extensive search in the literature, has collected 106 cases, of which 103 were second attacks, and three of them doubtful third seizures - disregarding altogether many instances of recrudescence. A third attack is of great rarity. The writer has never met with one, and has been able to find mention of two only in the literature - one reported by Streng (Deut. med. Woch., 1892, p. 1084), the other by Hennig (Jahr. f. Kinderh., Vol. viii., pp. 417, 418). The account of the former is somewhat incomplete; of the latter most succinct, being that of a woman attended by Hennig himself during two attacks - one in her thirty-second year, the other in her thirty-third, the first attack being about the thirteenth year of her life. Second attacks of measles admit of a certain amount of classification: for they may be divided into such as

appear a long time after the first attack - at least six to twelve months, even from twelve to eighteen years afterwards, and into such as occur as early even as a few days after the first attack or, at most, from three to four weeks afterwards. Cases of the first kind are reported by Battersey, Roberdière, Flemming, Haartman, Håen, Brunslow, Mauthner, Trojanowsky, Baillie, Gauster, Béhier, Spiess, Rayer, Kassowitz, Webster, Stebel, Luithlen, Kierulf, Home, Lewin, Karg, Tresling, and others - in which, presuming correctness of diagnosis, there could be no doubt of the second infection; and Bierbaum relates an instance of measles three times before the thirteenth year. On the other hand, a subsequent infection in cases of the second division is less certain; they should rather be regarded as mere relapses. Löschner, Spiess, Mettenheimer, Gauster, Vézin, Wilson, Koch, Barbillier, Graves, Eiselt, Schütz, Köstlin, Chinnock, Riecke, Brückmann, Böttiger, Behr, Schultze, Abelin, Faye, Bidenkap, Nicoli, Kierulf, Rüttel, and Thaulow record cases in which, after apparently perfect recovery from measles, the disease began again, and once more ran through all its stages. According to Dübén and Molinsten, the interval can amount to only a few days. Spiess, on the other hand, reports an interval of from one to two months; so also Stiebel, Bressler and others. Lippe, who, in the course of three epidemics, has seen fifteen cases of this sort, remarks that the children concerned were newly attacked, three or four weeks after the disease was first observed, by the patient coming into contact with a child lying ill with its first attack of measles; these second attacks were, as a rule, more severe ~~than~~ the milder the course of the former had been. The same was observed by Seidl, who three times saw a violent and malignant recurrence from four to six weeks after a first mild attack, and in two of the cases death followed. If future observations should prove the free interval as in fact of nearly definite duration, it can then be assumed that a definite relation exists between the original disease and the relapse, and not the casual one of re-infection. Thus, Ruz reports cases where, in the first attack the rash did not break out, catarrhal symptoms only existed, while the eruption was perfect in the second attack which appeared two or three weeks later. Whenever, in the first attack, the rash of measles is not universal, or is merely rudimentary in development, relapses seem to be more and more frequent than when the exanthem has been intense. Furthermore, it is difficult to assign a reason for single cases of recurrent measles. According to Meissner, it depends upon a temporary suppression - a so-called metastasis - and a subsequent reappearance of the morbid process. Thus, Brückman observed a boy, who, after an ordinary attack of measles, was seized with a violent suffocative catarrh which lasted over four weeks, and only disappeared after a second attack of measles which ran a normal course. Rosenstein attributes such cases to a swollen gland remaining from the first eruption, producing a fresh outbreak somewhat later. Trojanowsky believes that subsequent attacks, occurring after the lapse of years, may often be explained by geographical differences in contagious principle etiologic of the disease. The redurient form of measles of this same author is distinguished from the above by the peculiarity of the pyrexia, which bears a close resemblance to relapsing

fever, though not wholly identical with it. It appears in the form of two - usually rather violent - paroxysms, which, as in the case of relapsing fever, rapidly supervene and tolerably quickly disappear again, having an average duration of from six to eight days. The acme of the temperature (105.5.F. or more) is attained on the second and third days of the disease, simultaneously with the highest development of the rash, which latter closely resembles that of measles, but whether identical with it or not is uncertain: the writer, from the measles-like catarrh of the conjunctivae and respiratory tract, is somewhat inclined to think that it is. Without trespassing unduly upon the domain of symptomatology, it may be further added that the distinctive features of such an attack are the violent fever, the premature eruption and its subsequent desquamation, the speedy and appreciable enlargement of the spleen, causing an extremely acute leucaemia -- both of these conditions, however, disappearing again during the remittance of the fever. If this peculiar malady (as reported **first** from Livonia, a district in which relapsing fever appears to be more or less endemic) is in reality measles, it surely - and in spite of Trojanowsky's opinion to the contrary - must be a remarkable combination of this with relapsing fever, which thus defines the time of appearance of the symptoms of measles, and may also possess the power of causing them to undergo modification. Even second attacks may be regarded as curiosities, many of them being in reality either cases of German measles mistaken for ordinary measles, or other diseases accompanied by a simulating exanthem. Finally, the finding of measles towards the end of life is exceptional: Drake encountered it at 80, and Michaelson at 83.

SEX.

Sex cannot be said to possess any special etiological influence; and no certain differences between the susceptibility of males and females can be demonstrated from statistics.

SEASON.

A certain amount of etiological significance can apparently be attached to season, the disease being more common in the winter and spring months than during the rest of the year. This may depend upon the greater degree to which children are housed at this time, and the increased exposure to infection through meeting in schools. The diminished degree of resistance which the state of the health often offers at this time may also have some influence. The statistics of Hirsch show that 3,390 of the epidemics which he records occurred in the cooler weather, and only 191 when the latter was warm. The English and Welsh returns of the Registrar-General for 1838-1840, and also for 1849-1853 show that during the months of January to March the percentage measles morbidity was 26.3 (8106 cases); from April to June, 28.9 (8907 cases); from July to September, 21.4 (6610 cases); and from October to December, 23.4 per cent. (7213 cases). The slight influence of the cold season upon the epidemicity of the disease is still further brought out by Hagenbach's statistics for Basel, where eight epidemics out of eleven occurred during the

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winter and three during the summer - he affirming (Jahr. f. Kinderh., Vol. ix., p. 46 et seq.) that 356 cases proved fatal, viz., from January to March, 92 cases (25.8%); from April to June, 183 (51.4%); from July to September, 38 (10.7%); and from October to December, 43 cases (12.1%). Or, otherwise expressed, during the six colder months, 188 cases (52.8%); but during the six warmer months, 168 cases (47.2%). The apparent favouring of the spread of the contagion during the colder months is, as already stated, probably due to the closer contact and congregation of individuals during that time; and we may therefore feel sure that the disease is, to all intents and purposes, practically independent of climatic influences. In spite of the distribution of measles over the globe and the occasional exemption of certain districts from its ravages, as well as what has just been noted regarding its independence of climate, certain kinds of weather appear to have a considerable effect upon the frequency of outbreak and the extent of its prevalence - the cold season being, par excellence, most favourable to its existence: this has been observed in all climates throughout the world. According to various writers, epidemics of measles occur in India and Brazil from February to April, i.e., in the cold season; in Persia, Egypt and Turkey measles is most prevalent in the spring and autumn; at the Cape in the autumn from April to June; in North America, Switzerland (Hoffmeister: - Zeit. f. Med., 1849, p. 471), Prague, and Roumania towards the close of the winter and during the spring. According to the official returns, in England and Wales from 1839-1841, during the months of January to March, there were 8106 fatal cases; from April to June, 8907; from July to September, 6610; and from October to December, there were 7213 deaths - these figures also comprising the years 1849 to 1853. From the official statistics of 530 epidemics in Europe and North America, the present writer clearly observes the preference of measles for the cold months of the year. Thus, in autumn there were 32; in autumn and winter 52; from winter to spring 15; in winter 62; in winter and spring 74; from winter to summer 27; in spring 77; in spring and summer 81; from spring to autumn 26; in summer 38; in summer and autumn 36; and from summer to winter 10 epidemics - that is to say, there were 339 visitations in the colder months, and 191 outbreaks in the warmer ones. Again, of 213 of the above-mentioned epidemics, the acme of prevalence was attained 48 times in the autumn, 59 times in the winter, 76 times in the spring, and only 30 times in the summer. Finally, there are many who hold that the nature of the influence of the cold weather upon measles can scarcely be explained: for the greater congregation of human beings at that season, whilst in theory feasible, is, they say, somewhat questionable as a definite reason, in that the same degree of dependence upon the season of the year has been as conspicuous in the tropics where the crowding of individuals into close rooms, and so forth, is comparatively seldom observed.

RACE.

All races of mankind are equally and universally susceptible to measles - no one race suffering more severely from it than another, the susceptibility of negroes to it in the United States of America being more apparent than real, as would appear from Drake's statement that, in 1854, whites, negroes, and Indians were indiscriminately

attacked after the disease had once spread throughout the United States, where previously only scattered cases had occurred. At times, then, when measles appears to exert its greatest virulence amongst the coloured races, this may be safely presumed to be due to the unfavourable influence of their mode of living.

SOIL.

The propagation of measles does not appear to depend upon the nature of the soil; the occasional destructiveness of the disease has never yet been satisfactorily explained upon the virgin-soil hypothesis.

IDIOSYNCRASY.

We have already seen that one attack of measles usually confers an immunity for life; and - as in the case of small-pox and scarlatina - second attacks in the same individual are extremely rare, a third attack in the same individual being more or less of a clinical curiosity. Most instances of so-called second attacks, or apparent relapse, seem to be nothing more not less than either German measles or erythema, both of which have been frequently mistaken for rubeola. Thomas (Beit. z. Kenntnis. der Masern - Arch. f. Heilk., 1867), during an observation extending over forty years, never once encountered a second attack in the same person; and this appears to have been the experience of Panum (Virchow's Arch., i., 1848), Willan (Diseases of the Skin, Lond., 1808), and others of immense experience. Most of the cases of second attack have been observed either shortly after the original seizure, or not for many years. Indeed, many good observers absolutely deny the existence of an immunity: Bohn (On Adult Measles, Deut. med. Woch., 1888, p. 332), for instance, states that it has never been, and cannot be, proved that a supposed immune person, who passes through an epidemic unscathed, has not in reality suffered from measles in childhood - the attack at the time being perhaps so slight as to escape attention and diagnosis; and that apparent immunity is in reality nothing more than a lack of opportunity for contracting the disease. Again, the susceptibility of a person to measles appears to exhibit considerable variation: for instance, it is by no means infrequent to find a nurse pass unharmed through one epidemic and contract the infection in another one. The writer has frequently observed this variation of susceptibility in the case of some of his professional brethren. Generally speaking, however, everyone may be regarded as practically susceptible to measles, those escaping possessing an uncommon amount of vital resistance in the presence of an exposure to a comparatively weak virus. Furthermore, the disease, though usually occurring in epidemics, has often been observed in sporadic form - especially in large cities; in certain instances its epidemic prevalence assumes a certain amount of regularity of return. As a rule, when once measles has entered a street or building, all (unprotected by a previous attack) suffer from it, and in nearly every instance children - the susceptibility of whom to the disease is remarkable, only 1 per cent. of these, according to Bierdert (Jahr. f. Kinderh., xxiv., p. 94), escaping it. The same has been observed in large buildings (schools and hospitals), where once the incipient case is admitted, the whole of the juvenile

population is attacked, the adults escaping owing to their having already had the malady in childhood and so acquired immunity.

GEOGRAPHICAL LOCATION.

We have already alluded to the fact that measles is to be encountered the world over, and that it is independent of climate, although its occurrence during the winter months by preference cannot be gainsaid - this being possibly of the nature of a coincidence. On the introduction of measles into a country or community previously free from it, the disease appears to assume a remarkable severity. According to Whitelegge's statistical compilation for Great Britain, the intervals between epidemics is held to be about two years; and about once in ten years an epidemic of unusual severity and great mortality has been noticed to occur - in certain instances the death-rate from the disease being double, or even treble, the mean. In view of the widespread character of the disease, it would be supererogatory to attempt to follow the many voluminous writers who have traced the occurrence of the malady - in epidemic form or otherwise - amongst the various countries of the world from the time of inception of their respective medical literature to the present day. The pandemicity of the affection is the factor which chiefly concerns our present purpose.

INTRAUTERINE INFECTION.

Although measles is most usually encountered between the ages of one and ten, the contagion has been known to be transmitted to the foetus in utero, owing to the pregnant woman at the time being a sufferer from the disease. Thus, Thomas (loc. cit., p. 49) mentions his finding of the characteristic rash of measles in six children at birth; and Jürgensen (Masern - Wien., 1895, p. 44) refers to numerous other cases of the appearance of the eruption two or three days after birth, where the mothers had contracted the disease shortly before delivery - the virus in all probability having been transmitted via the placenta. The former writer (Thomas), however, says that he has never seen measles in a mother at the fifth month of pregnancy - the foetus remaining unaffected at birth and only contracting the disease at its ninth year. Altogether, there have been about twenty cases of transmission of measles to the foetus recorded; and in the majority both mother and child appear to have become infected almost simultaneously, the disease presenting the same stage of development at birth in both - usually as regards the eruption, but also - as in the case reported by Ballantyne: - Congenital Measles, with Notes of a Case - Arch. of Ped., April, 1893) - as early as the preliminary catarrh, no eruption being present until later. Hoff's studies are apposite in this connection (Sundheds. Aarsberent, 1876); he contends that, without exception, everyone born in the year 1846 whose mother, according to her own statement and as affirmed by comparison with the church records, contracted measles during her pregnancy, was attacked by the disease, if exposed to it at the time of the epidemic in the subsequent year. It appeared to make no difference at what month of her pregnancy the mother had happened to be

when she took the measles. While ordinarily, therefore, there is not the slightest ground for believing the contagion to be carried to the foetus through the placental circulation, it is interesting to note that one child born during the epidemic broke out with the rash when only eleven days old (two days sooner than would be expected) - the rash in the mother's case being then at its height. Hoff's statement must, in view of our present knowledge pointing to the possibility of communication of the infection by the pregnant woman to the foetus, be taken with due reserve; it is possible, of course, that the child may have contracted measles immediately after birth, but it is far more likely that it was infected by the mother during the time shortly before she was delivered. Finally, Weisse reports the appearance of menstruation for the first time, in a girl of fourteen years, during the desquamative stage of measles; but, as there is no statement of the subsequent regular appearance of the same, the possibility of a simple exanthematic haemorrhage from the genitals in this case must be borne in mind.

MORBID INFLUENCES.

According to Mayr, the susceptibility to measles appears to be slightly diminished by such chronic affections as epilepsy, paralysis, chorea, and so forth. Furthermore it is said that certain acute diseases have an influence in postponing an outbreak of measles, so that the latter does not appear until convalescence from the former. In support of this we have Weisse's statement that measles appeared, in a boy of sixteen years, immediately after facial erysipelas, and only on those places where no cutaneous exfoliation had occurred; also in the case of a typhoid-fever patient, aged thirteen, in whom it immediately succeeded and ran a regular course. Acute diseases are sometimes observed to occasion modifying changes in the appearance of measles, or to give rise, as it were, to a clinical mixture of the coincident maladies. According to Panum, the development of vaccinia is at one time uninfluenced by measles; at another - according to Halen and Cramer - the same may be conspicuously protracted; and the same phenomenon in regard to variola has been observed by Fouquier. Whooping-cough is said, by Mayr, to disappear entirely when symptoms of measles appear, and only to reappear after their complete extirpation. Mumps, on the other hand, according to Liverani, attacks by preference patients with measles, and increases the intensity of the disease; and the same had been noticed by Mayr, in cases where measles attacked children immediately after cholera. That measles can appear during the course of variola, scarlatina, and varicella, and vice versa, has been proved by numerous writers, but denied by Hebra. Bierbaum encountered measles during the course of a tuberculous meningitis; Guersent, with a malignant pustule. Habisreutinger reports the disease in a boy during the fastigium of erysipelas serpens, on the right foot, and attacking first the right, and then the left, half of the body; here it appeared partly where the erysipelas had disappeared, and partly upon the unaffected placed. Barthez and Rilliet saw measles three times with erysipelas of the face, though

here the former did not affect the face. Finally, the susceptibility to measles is said to be increased by many diseases, especially by affections of the organs of respiration - an assertion which it is difficult to prove, since in every instance there is so marked a susceptibility to measles in those previously unaffected by the disease.

ANIMAL INFECTION.

It appears tolerably certain, from the experiments of Behla (Centralbl.f.Bakt., etc., xx., 16 & 17), that measles may attack some of the lower animals. He succeeded in inoculating a suckling pig from the oral and nasal secretions of a case of measles, so that there appeared in the animal, four days afterwards, the well-known catarrhal symptoms in the nose and eyes similar to those of the ordinary attack in the human being. The animal appeared to be definitely suffering, on the fifth day, with symptoms of shivering and anorexia - the temperature at this time being 103° F. On the eighth day reddish spots were observed - on the face, ears, neck, and other parts of the animal's body devoid of hair - extending, in a day or so, over the entire integument. The rash - which in no way differed from that peculiar to human measles - was followed, in due course, by desquamation. Fourteen days later, another pig, which had been allowed to associate with this one, was likewise observed to be suffering with measles, and to desquamate similarly, after an illness of four days. Again, seven days after this, a third associate pig exhibited the same phenomena. The disease was at the time regarded as swine fever, although the usual bacteriological search for the specific bacillus of that disease proved futile. Behla's experiments were repeated by Josias (La Méd. Mod., No. 20, 1898), but with negative results. Others, however, report confirmatory evidence of Behla's findings; and Chavigny (Bull. Méd., Paris, 1898, 12, p. 334) has observed the disease in an ape. For all we know to the contrary, and in view of the specific nature of morbilli not being yet established, the eruptions in question may have been other than that of measles.

NATURE OF THE POISON.

In spite of long and patient investigation by innumerable experienced observers, the exact nature of the virus of measles is still a matter of conjecture. So long ago as 1878, Braidwood exhibited, before the Pathological Society of London, what he believed to be the specific bacillus of measles. Canon and Poelicke (Berl. klin. Woch., 1892, 377), in 1892, claimed to have discovered a pathognomonic micro-organism in the blood of all the fourteen cases which they examined. The bacterium in question was observed to be very variable in size - very minute to 3.4 mm., sometimes as small as a diplococcus: or, again, in length equalling the diameter of a red blood-corpuscle. Their bacillus required for its recognition a special process of staining - the blood being carefully, thinly and evenly spread on sterile cover-glasses, fixed by an immersion of ten minutes' duration in absolute alcohol, and then stained in a solution consisting of concentrated aqueous solution of methylene-blue (40 parts), 0.25% eosin solution in 70% alcohol (20 parts), and distilled water (40 parts), and then kept at incubator-temperature for three hours.

The bacillus stains interruptedly with this mixture of reagents; and the fact that it is only to be found in preparations taken from cases of measles from the sixth day of the disease onwards upsets its one-time etiological interpretation. The discoverers succeeded in cultivating the organism on bouillon, but on no other medium; nor did it respond to Gram's method of staining. It is said to be possessed of motile properties, but incapable of spore-formation. Its presence has been demonstrated, not only in the blood, but also in the ocular and nasal secretions of measles; and it has been held by some to persist during the entire attack, as well as for a variable period after its subsidence and disappearance. On the other hand Josias (La Méd. Mod., June 2, 1892) examined the blood and secretions, according to the directions of these observers, but failed to find anything important therein.

Both v. Leyden, Fürbringer, and Lombroso (Lo Sperim., 1884, x.) claim the finding of certain peculiar cocci in the measly spots of patients, but a definite significance for these has never been established.

Doehle (Centralbl. f. Allg. Path., etc., 1892, iii., p. 150), in 1891, claimed to have discovered several protozoa in the blood of six persons suffering from measles. They were to be seen in both plasma and corpuscles (red) in preparations of fresh blood; but after the appearance of the characteristic rash they seemed to be entirely located in the latter situation; at this late stage bi-nucleated oval organisms were observed - prior to that, an opaque nucleus could be observed in the midst of a clear zone and measuring about a micro-millimetre in diameter.

Behla, whose experiments have already been described, claims to have discovered the same organism in a pig suffering from measles-like symptoms.

Czajkowski (Centralbl. f. Bakt. etc., 1895, Bd. xviii., Nos. 17, 18, p. 517) reports the finding of, in fifty cases of measles, certain organisms in the blood, nasal, and ocular secretions; and also the obtaining of cultures (in 19 out of 56 cases upon glycerine-agar, but especially upon blood-glycerine-agar) - the growth being delicate, scanty, and of a dewdrop appearance. Under the microscope the colonies were observed to be devoid of definite structure. Inoculation of the bacilli into mice proved fatal; and they are motile and unstainable by Gram's method. The specificity of Czajkowski's organism appears to be quite as questionable as the foregoing of Canon and Pielicke, and the two are probably identical: for they are both found in similar regions, are motile, and produce septicaemia in rabbits. In every case examined, Gregorieff found this bacterium, and in 10 of these 13 cases he was able to cultivate it on bouillon. Barbier and Warschovsky, as well as several others, have, however, failed to find it after patient and prolonged search.

Weber (Centralbl. f. Bakt., etc., 1897, Vol. xxi., p. 286) reports his observation of protozoa in the blood of measles cases, but has failed to prove their specificity.

Barbier (Soc. Méd. des Hôp., 1897, Feb. 20) has also observed an organism in the blood, and could also isolate a similar bacterium from the ocular secretion in nearly every instance, and from the oral and nasal in many. This

particular organism appears to be a somewhat constant finding in measles, and it is regarded by some - notably by Robet (Thèse de Paris, 1896) - as actually specific.

Dürck (Deut. Arch. f. klin. Med., 1897, Bd. lvi.) attaches considerable importance to his finding of a streptococcus in cases of measles - more especially in those suffering from pneumonia; and Hutinel (Rev. Mens. d. Mal. de l'Enf., 1897) also interprets its presence similarly from his observing the great readiness with which this form of streptococcus pneumonia spreads from measles patients to others in the same hospital ward.

Arsamakoff (Bolnitschnaja Gesta Botkina, 1898; and Centralbl. f. Bakt., etc., 1899, xxv., 831) reports his discovery of a small bacillus - in length only half the diameter of a red blood-corpuscle, and three-fourths as wide as the typhoid bacillus - in the general circulation, the pharyngeal and ocular secretions, as well as in the pneumonic areas of measles patients, - the same responding to cultivation in six instances, especially in milk where the bacilli were seen to preserve their vitality for three weeks. It was impossible, however, to effect inoculation upon the lower animals.

In 1900, Lésage (Bull. de la Soc. Méd. des Hôp. de Paris, March 15-22, 1900) described the results of his observations in 200 **specially** selected cases of measles. The nasal secretion or the blood of many of these was inoculated into several rabbits, and with positive results in nearly every instance. From the constancy of this, Lésage believes himself justified in regarding the delicate micrococcus so found as pathognomonic, and that, so far as it is possible to recognise measles in a hairy animal, his inoculations induced the disease. His micrococcus is best cultivated on gelose (agar) - the cultures resembling those of the pneumococcus, is decolorised by Gram's method, and stains but slowly. He found it absent in 25 test cases of scarlatina, but present in 6 cases complicated with measles, as well as in 2 cases of the latter complicated with diphtheria; furthermore, it was absent in 45 healthy children, and present only twice in 53 children who had previously suffered from the disease.

Finally, a bacillus resembling that of Canon and Pielicke somewhat and present during the time that the exanthem is at its maximum, has been isolated by v. Niessen who calls it the bacillus roseus. He says that it produces colonies of the colour indicated by its name on gelatine and other media.

PROPAGATION AND INFECTIVITY.

Measles is essentially both a contagious and infectious disease (with the exception of whooping-cough the most so of all the exanthemata), being transmitted from person to person. It is thus of great interest to the nosologist; and no person can be said to be exempt from an attack unless having previously suffered from it, and, even then, a second attack is possible - proving that the immunity conferred is anything but absolute. Its infectivity - using the term in its broadest interpretation - is, however, of a much more restricted kind than is observed in scarlatina and variola; for it is not transmitted so readily by fomites, or

similar agencies, to which the contagium does not usually adhere for any appreciable period so as to be carried by the same or protected person. Furthermore, being exempt from atmospheric transmission, quarantine of contacts may be expected to arrest its propagation (Richard:- Therap. Gaz., July 16, 1888). According to Bard (Rev. d'Hyg. et de Police Sanit., May 20, 1891), contagion is always direct from person to person; and the cessation of the disease in a locality leaves no trace of the contagium in its wake, so obviating any necessity for the disinfection of the patient's residence. The contagiousity of measles is obvious from the recorded epidemics, of which that described by Panum and Hoff (Sundhedskollegiets Aarsberetning, 1876), occurring at the Faroe Islands in 1875, affords an instructive illustration. From 1781 to 1846 there had been no cases of the disease observed until the latter year, when it was carried from Copenhagen to almost the entire populace (6,000 out of 7,782) by the crews of the boats in the employ of the Danish government - only those persons coming into contact with them contracting the malady, as was proved by tracing their movements and particular relationships. Panum states that in his visits to these 17 of the 20 islands, during a period of four months, he observed that the disease was introduced by a cabinet maker who had visited friends suffering from measles just before leaving Copenhagen; he contracted the disease, and communicated it to two of his friends at Thorshavn - the chief port of the Faroe Islands, from which the epidemic commenced, its propagation being invariably consequent upon individual contact, direct or indirect, and the incubatory period averaging from thirteen to fourteen days. The disease was afterwards carried to another village, Tjornvig, by ten persons - all of whom had been in contact with sufferers from measles (on the 4th of June), but only once in the society of each other; the characteristic eruption developed upon the 18th June. Prior to 1875, and since 1846, there had only been one epidemic, viz., in 1862, which was prevalent, however, in only one place and affected nearly 25 persons. In 1875 an epidemic was seen to be raging in the Shetland Islands, with which the inhabitants of the Faroe Islands did considerable fishing trade - the disease being ultimately introduced into the port of Vestmanhavin by the sick members of the crew of an English fishing smack who had been in contact with cases elsewhere, until 1123 cases of measles had occurred; and so on until it raged over the other distant islands of the Faroe group. The contagiousity of measles is likewise evidenced by the epidemic which occurred in Fiji in 1875, where the disease had never before been observed - more than one-fourth of the population dying from it in three months. Again, the value of quarantine was well demonstrated during the above-described epidemic of the Faroe Islands, as any family or villages could prevent outbreaks by remaining isolated respectively from other villages or villages - no less than 1500 persons who made the experiment entirely escaping the malady, and many of the islands as well. Similar proof as to the utility of quarantine is afforded, moreover, by the epidemic which occurred at the village of Hagelloch, on the outskirts of Tübingen, where a labourer was able,

by isolating his children from chance infection, to prevent them from contracting the disease (Pfeilsticker:- Beitr.z.Path.der Masern,1863,p.10). In the same place the extreme infectivity of the disease in children was apparent from the fact that, out of a total of 196, as many as 185 were affected. Measles is at times observed to partake of the nature of a pandemic, as from 1834 - 1836 when it raged over almost the whole of Europe; and also from 1842-1843 when the malady prevailed throughout Russia, France, Germany, Holland, and Switzerland (Hirsch:- Geogr.and Hist.Path.,Vol.i.). In addition to the classical outbreak of measles in the Faroe Islands just described, many other equally instructive instances of its virulence and infectivity are on record. In all of these, actual contact with a source of infection has been proved, except perhaps in the somewhat doubtful case reported by Tufnel (Dubl.Jour.Med.Sci., July, 1872), that of a young soldier who developed measles after forty-five days of solitary confinement and total isolation from his fellow creatures - during which period it was known to have been absolutely impossible for the contagion to have been conveyed to him.

Inoculability:- The inoculation of measles by means of the blood was first attempted by Home, of Edinburgh, at the instigation of Munro and in the year 1858. He laid for three days, upon fresh cuts in the arm of a healthy subject, linen rags soaked in the blood taken from incisions through the measles spots on the last day of their presence, with the result that mild symptoms were induced entirely different from the disease then prevalent; the rags in question were observed to lose their infectivity after ten days. Willan and Themmen (Abhandlung über die Masern, Göttingen), at Thuessink's suggestion, conducted a similar experiment, with a negative result; whilst Wachsel was successful, as were others afterwards using the tears, saliva, blood, mucus, and the debris of the cutaneous desquamation and epidermis. Albers, sceptical of Home's experiments being conducted in a hospital filled with measles patients, was able to obtain a successful inoculation; and Speranza (Jour.der Prakt.Heilk., Vol.iv., p.124), in 1822, confirmed the findings of Home (by being himself successfully inoculated), as also Bufalini (in Italy in 1854), Locatelli, Rossi, Figueri, Perceval and Horst. The experiments of Katona (Oesterr.med.Woch., 1842, No.29, pp.697, 698), in 1842, are noteworthy. In all as many as 1,122 inoculations were made, the vast majority of which induced only a mild disease, and this at a time when every case of the epidemic then raging happened to be of uncommon severity: no inoculated person died, and only 7 per cent. of the inoculations failed to take. The inoculations were made after the style of ordinary vaccination, and with a mixture of blood and the contents of the milial vesicles, or with tears only. At the point of inoculation a very evanescent red areola appeared, and the prodromal pyrexia and other symptoms appearing on the seventh day were followed by the measly eruption on the ninth - i.e., the course of the disease therefore being extremely mild; and the fever disappeared on the fourteenth day, so that the patient was quite recovered by the seventeenth. In 1848 and 1852, Mayr (loc.cit.) made similar successful experiments, whereas Wendt, Jürg, and others report

failure, so that the entire question of inoculability may be regarded as undecided, even in our day. The same author's experiments with the nasal secretion - proving that the contagion of measles can be spread by it - are of considerable practical interest. At the close of an epidemic he placed fresh nasal mucus upon the mucous lining of the nares of two children, the first symptoms of measles developing in both at the eighth and ninth day respectively, and the characteristic eruption upon the tenth after inoculation. His attempts, however, to spread the disease by means of epidermic scales from desquamating children met with signal failure; and Cullen and Girtanner state that children have even been known to eat the scales of measles without contracting the disease. ^{Hugh Thomson} (Glas. Med. Jour., Vol. xxxiii., June, 1890, p. 33 et seq.), another experimenter, was unsuccessful in his researches consisting in the inoculation of serum from blisters close to the eruption of the disease.

Contagiosity. - There seems to be every indication that measles is highly contagious even before the characteristic eruption makes its appearance upon the skin; that its contagious property can be dated from the onset of the catarrhal symptoms lasting through the eruptive stage, and ceasing before the termination of the desquamation; that a susceptible person will contract the disease the very first time he comes in contact with it; and that the duration of the febrile attack is the same in all cases. As bearing up on this are the cases reported by Panum (Virchow's Arch., Vol. i., p. 499) of a young man who, on May 26 had slept on the same bed as a sufferer from measles in the pre-eruptive stage - the eruption developing on the 9th of June; Peterson, during the epidemic at the Faroe Islands in 1875, of a teacher who conducted his class right up to the moment of the eruption, and so infected the entire school; and Kerschesteiner (Bayerisch. Arglich. Intell., 1857, No. 9, p. 103 et seq.) who, during the Munich epidemic of 1855, found in nearly every instance from ten to twelve days to intervene between the appearance of the eruption in the infecting and the infected child - the average being, according to Pfeilsticker (loc. cit., p. 39), whose work proves both instructive and interesting reading, ten days. It is perhaps during the prodromal stage that the greatest spread of the contagion takes place, as is evidenced by the slightly varying duration of the incubative stage in the cases referred to above, where contact of the infected with the infecting was ~~only~~ for a moment or a day. Reckoning, in the common cases where a family is infected, fourteen days back from the outbreak of the rash in the second child attacked, one comes remarkably often upon the first or second day of the prodromal stage, or the last day of the incubative stage in the original case. It will be apparent, from what has already been said concerning the epidemics at the Faroe Islands, that the infectivity of the eruptive stage is beyond all doubt - so certain is it, indeed, that the physicians in charge of districts there discarded the other stages entirely as to possible contagiosity. Some, authors, again, - Hoff especially, - affirm that the desquamating stage alone is infectious; whilst others - as Panum and Peterson - deny it, stating that - and with a mass of substantiative evidence - the contagion is

communicated during the prodromal stage of the disease. Owing to the diversity of opinion expressed, the contagiousness of the stage of desquamation is somewhat difficult to prove. The fact of new cases being observed - prior to the duration of the incubatory period being known - to develop about the time that the earlier ones were peeling led to the belief that measles was in reality communicated during desquamation. This one-time popular view has now entirely given way to the present, somewhat exaggerated, one that it is quite impossible for infection to take place so late in the disease: owing to lack of reliable evidence to the contrary, this is the best theory tenable, and one that inoculatory experiments and clinical observation have utterly failed to disprove. In the latter connection, indeed, supposing a patient to have been infected from the desquamation of another, how could it be ascertained for certainty that the contagium vivum was really existing at the time in the epidermic debris, and that the poison of an earlier stage were not still in the infected? If the disease be communicated at all during this stage, the writer believes that it must be very unusual - the more so as susceptible individuals seldom or never lack the opportunity for contact with the measles patients during a stage of established infectivity prior to that of desquamation.

Propagation by Non-Infected Persons. - In illustration of this factor in the dissemination of measles one may aptly quote the two cases recorded by Panum (loc. cit.): (1) Measles broke out in a house which was known to have had no intercourse with the outside world, except that a (healthy) physician had spent the night there a fortnight before, he having come from an infected district four miles away, and being compelled, moreover, to travel in an open boat in stormy weather (it was, however, alleged that some of the boat's crew who brought the physician over were at the time suffering from measles); in the same way that (2) the disease had, it is said, been introduced into uninfected houses by a midwife (just recovered from the measles at Copenhagen). Hoff, however, denies that the midwife had ever been in Copenhagen, and says that he had it on reliable authority that she suffered from the disease in Midtvaag. It appears absolutely certain, moreover, that - judging from the official reports of the Faroe Islands - in not a single instance was the contagion thus conveyed (Jahr. des Sundheds. f. Dänemark). The question was fully discussed before the Munich Medical Society by Kerschesteiner and others (Aerztl. Intellig. u. Münch. med. Woch., 1882, p. 413), who, by a large majority gave their opinion then in the negative - so that it may be taken as fairly well established that, if infection be ever carried by third parties, the same must be of exceeding great rarity. One may still further emphasise the fact by the observation that the children of physicians suffer from measles no more often than those of other individuals.

Conveyance by Fomites. - It appears to be beyond dispute that measles may be conveyed by means of fomites, but this is just as rare a happening as propagation by uninfected persons. Amongst the recorded instances the following merit citation: Case 1. - A student visiting Jena fought a duel, and was forthwith punished by solitary confinement in the college "carcer". On the second

day of his isolation, he received a letter from a measles patient - with the result that he came to suffer from that disease nine days afterwards. Case 2.- A tailor of Dresden was engaged upon a boy's suit of clothes in the same room as his children were suffering from measles; and on the completion of his work, carried the garments to the boy's house to be tried on - with the result that the child showed signs of measles a few days afterwards: the fact, however, of measles being epidemic at the time considerably detracts from the etiological significance of this experience (Förster:-Jahr.f.Kinderh., N.S., Vol. x., 1876, p. 118). Case 3.- Thuessink vouches for the fact that he knew of a case where the infection was conveyed by a letter. Case 4.- He likewise affirms that he has known the disease to arise from the receipt of an engraving by post from an infected house. In disproof of the propagation of measles by articles of common use the following case has been urged: At the time of an epidemic on the island of Samsøe (see report by N. Flindt), in a certain school the children in the upper standard were not taken ill until over a month later than those of the lower class, and this in spite of the fact that the former sat in the same room as the latter amongst whom the disease raged, and who attended school in the morning, the older scholars in the afternoons only; the disease, moreover, passed over these until it happened to be introduced by a member who contracted it at his own residence.

Tenacity of the Poison.- How long the contagion in clothes and other objects remains active is not known: its tenacity, however, should it really exist, must be but small and of short duration. Indeed, some assert that, no poison being left in the sick-room after the patient's recovery, anyone may inhabit it with impunity as is borne out by experience. This experience, however, in no way disproves the presence of the poison: for the members of a family referred to in such cases have most likely already suffered from the disease, and thereby become immune. Evidence is, so far, obviously too scanty and difficult to obtain to allow of an emphatic conclusion either way with regard to the hypothesis in question.

Propagation by Air.- The enunciation of the well-known air-borne theory of measles seems to have been due to the every-day experience of the practical impossibility of protecting the uninfected juvenile members of a family, or even those of other families in the same block of buildings, by the isolation of the child afflicted with the disease: the possibility of the infection of the former during the catarrhal stage of the latter appears to have been entirely overlooked. For want of evidence to disprove this theory - especially in cases where contact of the infecting with the infected has not taken place, the latter perhaps merely entering the sick-room of the former - one is forced sometimes to place a certain amount of reliance upon it: how often it occurs is a question difficult of solution. The probability of the contagion of measles being incapable of being carried to any great distance through the air has been demonstrated by Effersøe

(Sundheds.Aarsb., 1883), who relates the case of (1) a boy who for several hours occupied a room next to one in which a measles patient at the height of the eruption was conveyed, and who, in spite of the door between the two apartments being open all the time, did not contract the disease until infected elsewhere many weeks afterwards; and (2) of two families - three children of one of them suffering from measles - who shared a flat of two rooms, the apartments, being separated only by a thin partition of lath and plaster, allowing of the free passage of air from one room to the other, and the disease failing to be conveyed thereby: the infection was afterwards observed to reach them by another channel, and all were stricken down by the disease.

Mode of Infection.- In most cases contagion is due to association with those infected, and there is no gainsaying the fact that a slight exposure is usually sufficient to superinduce the disease: sometimes a prolonged one is needed, but here both the susceptibility of the infected and the total amount of contagion should be remembered. Thus, under circumstances where rooms are badly ventilated or crowded with patients, the poison must obviously be present in greater amount than under opposite circumstances, and a slight contact may accordingly be presumed to communicate it to one susceptible to its influence: the prompt response to adjustment of the ventilating apparatus in such cases proves the reasonableness of this assertion. The opportunity for infection occurs, next perhaps to the association of families, most frequently in the schools, to which the poison is conveyed by children in the catarrhal stage of the disease and conveyed to any child there susceptible to its influence, and so from the schools into the entire home circle. Of this common observation two instances may here be cited: (1) Flindt (Sundheds.Aarsb., 1879) reports that the island of Samsøe had been quite free from measles from 1864 to 1878, when an epidemic was started by the advent of an infected child to the island in question and to be generalised by the children there. (2) Fürbringer (Eulenburg's Real-Encykl., Ed. 2, Art. "Masern") recounts how, during the Jena epidemic of 1879-80, the schools of two neighbouring hamlets remained free from measles for two months until, a case occurring in each of them, spread the disease throughout the respective villages - the curious feature being that, during the period of exemption, doctors and relatives of patients in the homes of the villagers, as well as the children, mingled with one another as freely as ever.

EPIDEMIOLOGICAL CHARACTERISTICS.

Duration of Epidemics.- From what has already been said it is evident that an epidemic will prevail as long as there are any persons remaining in a district susceptible to the poison; and also that, naturally, the larger the district the longer the duration of the disease therein. It must likewise be remembered that considerable variation is at times observed in the degree of virulence of the contagion, according to which the disease spreads with a corresponding rapidity or the reverse, accounting for the sudden outbreak of an epidemic in very large communities where the disease is, of

course, practically endemic and susceptible persons numerous: the same explanation applies, perhaps, with an equal appositeness, as a rule, to villages in other places where there is but little or no change in the population.

Sporadic Outbreaks. - The occurrence of measles in the sporadic form seems to be common enough in large cities where the disease, as has been noted above, is to a greater or less extent endemic. Here, too, it exhibits at times a tendency to light up into an epidemic. So also, the disease is frequently observed to become epidemic in small districts - remote from main-roads and large communities - at intervals (sometimes of many years) varying with their isolation, during which not a single case of the disease may have been reported. Furthermore, single epidemics are there comparatively more considerable in small places than in larger ones where, to a certain extent, several epidemics must be divided amongst those of the population who are predisposed to it. The larger a place becomes in the course of time, and the more considerable the commerce with it and in it, the more frequently epidemics of measles appear, and the more numerous become the sporadic cases - so that eventually in very large places the disease is always present. This fact can be explained by the great contagiousness of the disease, and also by the universal susceptibility of individuals not as yet attacked. The number of these increases after a time by births to such an extent that it evidently often requires merely the introduction of the contagion by a single person to infect quite rapidly the larger number of those belonging to the new generation - after which, from lack of material susceptible to the infection, the epidemic fades out, to appear again after years under similar conditions. In large places with much commerce, the number of those susceptible can never be very considerable, since it is continually diminished by the constant introduction of the contagion from all directions, and by the more or less sporadic prevalence of the disease produced in this way.

Epidemic Periodicity. - The supposed regularity of epidemic prevalence of measles in certain localities and large cities - sometimes said to be every two years - has never yet been demonstrated, - the intervals between each recorded observations exhibiting the widest variation. Thus, in the city of Tübingen, from 1874 to 1893, there were six epidemics which respectively lasted 138, 144, 201, 184, 131, and 63 weeks; and, in the village of Lustnau, there were four epidemics from 1876 to 1893, and the figures were in weeks 208, 175, 138, and 211. Furthermore, it may be specially noted here that, in addition to what has already been said, measles has been reported as occurring with an approach to periodicity amongst largish communities, so that in many of them the outbreak of such epidemics was able to be foretold with more or less certainty. The intervals were observed to vary from two to four years; and it was alleged that, in general, the shorter the intervals between the milder would be the ensuing epidemic, and vice versa. It was likewise noted that a mild epidemic was, as a rule, soon

followed, and also out of its regular turn, by a more severe one compensating for the omissions of the former. Indeed, reports are extant from various places in regard to the succession of these epidemics during long periods; and from these it appears that in certain years the disease is universally prevalent - so that epidemics of measles will be found prevailing simulataneously in different cities; while, however, on the other hand, exceptions and irregularities are frequent. Sometimes the epidemics are not coincident in neighbouring localities connected by constant intercourse - a proof that in this question local conditions play an important part, and are frequently of determining influence. Thus, it appears that no universally appreciable law with regard to the periodicity of epidemics of measles can be established; and the most that can be asserted is that, with the increase of intercourse and the growth of large cities, they have become in these especially by degrees more frequent. The following examples of epidemics, taken from various authors whose names appear in the bibliography and are here also parenthetically expressed, may be cited by way of illustration: (1) The population of Meerane was, in 1837, 4,634; in 1843 - 5,550; in 1850 - 7,337; in 1856 - 9,530; in 1861 - 12,747; in 1867 - 16,511. Epidemics occurred in 1837, 1850, 1853, 1857, 1861, 1865, 1867, 1869 - becoming thereby correspondingly more frequent with the increase of the population (Geissler). (2) In Dresden there were epidemics in 1835, 1838, 1840, 1844, 1846, 1848, 1852, (1853), 1856, (1858), 1860, 1864 (1865), and 1867 (Fürster). (3) In Danzig there were outbreaks during the years 1863-1869, 1863-1864, 1865, and 1868 (Lievin). (4) In Königsberg there were visitations of measles in 1857, 1860-1861, 1862-1863, and 1868 (Schiefferdecker). (5) The population of Halle was, in 1782, = 24,149; in 1852 = 36,07; in 1871 - 52,400. Epidemics there occurred in 1784-85; 1790; 1795; 1801; 1804; 1806; 1808; 1810; 1812; 1815; 1818-19; 1823; 1828; 1831; 1833; 1836; 1838-39; 1841-42; 1843; 1845; 1848; 1850; 1852-53; 1855; 1857; 1860; 1861; 1864; 1867; 1869; and 1871-72 (Bärensprung and Weineck). (6) In Zurich epidemics were observed in 1827; 1833; 1837; 1843; and 1849 (Meyer and Hoffmeister). (7) In Erlangen - in 1819-20; 1825; 1831-32; 1839; 1847; 1852-53; and 1856 (Küttlinger). (8) In Stuttgart - in 1849-50; 1852-53; 1855-56; 1858; 1861; 1864-65 (Köstlin). (9) In Würzburg - in 184; 1849; 1854 (1855); 1860; 1863; 1866; 1868; 1871 (Voit). (10) In Frankfurt-on-the-Main - in 1842; 1846-47; 1850; 1854-55; 1858; 1860-61; 1863-64; 1866-67 (Kellner and Spiess). (11) In Munich - in 1859-60; 1861-2; 1864; and 1866. (Ranke). (12) In Vienna - in 1842; 1845-4; 1848; 1850-51; 1853; 1855; 1857; 1859; 1862; 1864; 1867; and 1869 (Mayr and Fleischmann). (13) In Prague - 1843-44; 1847-48; 1850 (1851), 1853; 1855-56; 1857-58; and 1859-61: also a large number of sporadic cases (Löschner). (14) In Berlin - in 1843-44; 1844-4; 1848; 1851; 1853-55; 1857; 1859-60 (Romberg and Engel); 1862-63; 1864-65; 1866-67 (Passow); 1876; 1879-90; and 1893 (Formey). (15) In Geneva - in 1832; 1838; 1842; 1846-47 (Rilliet). (16) Haggellock - 14 years' interval. (17) Faroe Islands - 65 years' interval. (18) Cape of Good Hope - interval of 30 years. (19) Iceland - in 1644; 1894; and 1846. (20) In Madeira - first epidemic in 1808.

P A T H O L O G Y.

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Though there are no pathological characteristics observed in cases of measles, there are certain changes sometimes present that are well worthy of narration.

SKIN.

The eruption characteristic of this disease is first observed about the hair follicles and their apertures. The latter become raised above the surrounding skin so as to form minute papules; at these points vesicles sometimes appear, which result from the closure of the apertures of the sweat glands: sometimes the papules may be found close together. With these changes occurs a marked superficial congestion of the neighbouring integument, so defined at its margin as to be distinguishable from chicken-pox - this being due, according to Mayr (Art. "Measles" in Hebra's Diseases of the Skin, New Syd. Soc., 1866, Vol. i., p. 177), to the cutaneous furrows limiting the capillary suffusion; the large size of some of the macules is due to the coalescence of smaller ones. Simon (Die Hautkrank. durch anatom. Unters. erläutert, Berlin, 1851, p. 122) and Unna (Die Histopathol. der Hautkr., p. 625) both give detailed accounts - the best perhaps extant - of the histological changes induced leading to the formation of the ordinary flat or slightly papular measles' spot. The symptoms of the disease, when carefully considered, point to a specific paralysis of the blood-vessels of the skin, following close upon the primary active hyperaemia which develops in the neighbourhood of the infectious organism after it lodges in the capillaries of the skin. This specific condition of the vessels, according to Unna, explains the cyanotic appearance, the papular form, and the urticaria-like oedema of the centre of the eruptive spots, also the frequent escape of haemoglobin. It is not to be wondered at, therefore, that on cutting across a measles-spot, either on the living or the dead subject, one fails to detect any evidences of hyperaemia or to discover any dilated blood-vessels: other signs of the oedematous stage, however, are present. The rapidly forming spastic oedema always collects at the points of least resistance, which, in the early years of childhood when the disease usually occurs, are represented by the adipose tissue, the sweat glands, and the sheaths of the larger blood-vessels supplying the muscles of the skin and the hair follicles. Accordingly, in specimens hardened in alcohol, one finds the ducts of the sweat glands highly oedematous, looking like great gaps in the tissue, partly filled with distended areolar tissue and thin-walled connective-tissue cysts, while the corresponding sweat glands, compressed by the oedema, lobate themselves in an angle at the end of the ducts. Individual sweat glands, hair follicles, and muscle fibres all seem to be floating free in the broad cleft-like lymph spaces. In addition to this, the middle

and deeper layers of the skin contain spaces and channels - round, oval, or irregularly shaped - which can only be regarded as in part distended lymphatics, in part as enormously dilated lymph spaces. In a few places - more especially in the neighbourhood of the hair follicles - the dilated lymph channels can be traced upwards to the papillae of the corium. These signs of an intense oedema of both skin and subcutaneous tissue are equalled in importance by the almost complete absence of a cellular exudate. The emigration of white blood-corpuses does not exceed that to be observed in any simple passive hyperaemia: it is, indeed, rather less than is usual in such cases - for which reason only a few leucocytes are noticeable in the epidermis. The rete mu cosa does not appear thickened; the oedema does not extend to the lymph channels of this layer; and no signs of mitosis are to be found at the height of the inflammatory process - this is rather an accompaniment of desquamation. Some slight anomalies of cornification are present, however; the stratum granulosum is missing in places, while the basal lamellae of the stratum corneum are thickened. At the time of desquamation the super-basal corneous lamellae become separated from the basal, and, together with the middle and outer lamellae, fall off in the shape of measles scales: this loss of epithelium is replaced by mitotic cellular proliferation. Still greater changes occur, however, in cases where the eruption takes place in the form of small nodules, consisting of well-developed inflammatory lesions of the blood-vessels, and marked degenerative changes in the epithelium: so that the theory of the earlier days - unsubstantiated by microscopical examination and based upon macroscopical evidence only, holding that that the eruption consisted of an inflammation of the follicles of the skin with a slight degree of exudation - must be regarded as no longer tenable. Unna (*Univ. Med. Jahr.*, Oct., 1895) furthermore claims, in the case of a patient recovering from measles, to have noticed a marked resemblance to the pox of variola: no alteration of the epidermis was to be found, and he supposed the eruption in question to have originated from the irritation occasioned by the presence of bacilli in the vascular loops of the papillary layer of the derma. In addition to this, he has observed a peculiar non-haemorrhagic thrombosis of the superficial cutaneous capillaries, from the same cause as the aforementioned; and also, at autopsies on subjects in which gangrene has occurred, the constant presence of bacteria. Catrin (*Arch. de Méd. Exp.*, 1891, No. 2) states that he has encountered a marked diapedesis of the papillary leucocytes; and also a colloid degeneration of the deeper layers of the epidermis, appearing first of all in the perineuclear zone. Unna points to the direct action of the poison of the disease upon the epidermis as the cause of this colloid change and epithelial necrosis. Neumann (*Med. Jahr.*, 1887, p. 159) holds that the chief changes in measles consist of an infiltration of round cells about the sweat glands, hair follicles, and blood-vessels.

MUCOUS MEMBRANES.

The mucous membranes - usually of the conjunctivae, nose, pharynx, larynx, and bronchial tubes - in measles are the first structures to show anatomical alteration, the latter being that of an ordinary catarrhal inflammation - the secretions resulting from which are at first transparent, later opaque, but alkaline throughout (Mayr, loc. cit.). What first attracts attention is the light-bluish colour or "skimmed-milk" appearance induced by the dilatation of the capillaries: followed, in the course of from twenty-four to forty-eight hours, by the dark-red papules - these bearing a close resemblance to those subsequently developed on the skin, with the exception that on the mucous membranes they are less sharply defined from the gradual thickening or blending of the congested vessels with the neighbouring capillaries. According to Slawyk (Deut. med. Woch., April 28, 1898), the whitish dots or vesicule-like elevations are induced by the thickening, and sometimes sunsequent fatty degeneration, of the epithelial cells: careful investigation has failed, however, to reveal the presence of any special bacteria in the parts so affected. At times, moreover, the intensity of the inflammatory process may - commencing with the lymphatic follicles - induce greater tissue destruction, so that ulcers of considerable depth are formed. Corresponding in the main to these are the anatomical changes to be found in the mucous lining of the intestines (involving Peyer's patches and the solitary glands), the mouth, larynx, and trachea (Gerhardt: -Lehrb. der Kinderkr., Tubingen, 1871, p. 94); whilst Steiner, Thomas and Bohn (Masern, Wien, 1895, p. 80) claim for the dark reddish spots on the intestinal mucosa a marked resemblance to the cutaneous eruption. Jürgensen (loc. cit.) directs attention to similar findings in the mucous membrane of the genito-urinary tract. An eruption on the stomach, duodenum, and jejunum - very like that on the skin - was also observed by many of the earlier writers - notably by Heyfelder. Worthington says that perforation may result from the occurrence of a destructive ulceration of the lymphatic follicles and Peyer's patches; and Henoch, Chomel, and Fuchs dwell upon the above-mentioned eruption upon the genital mucous membrane.

LYMPHATIC GLANDS.

These structures are usually less inflamed than in either scarlatina or rubella; and, as a rule, their affection is subject to considerable variation. When productive of extensive necrosis of tissue - for example, in the glands of the nose and pharynx - the adjacent lymphatic glands are found to undergo simultaneous enlargement and infiltration - this, in the case of scrofulous subjects, often resulting in suppuration and destruction of the glandular structures involved. Loomis, Pizzini, and Kalbe report the finding of tubercle bacilli (the last-mentioned in 8 per cent. of cases) in seemingly healthy glands of the trachea and bronchi; and these observers believe that such bacilli lie dormant until the occurrence of some such acute affection as that under consideration, when the latent tuberculosis is stimulated into activity.

LUNGS.

The changes observed in the case of the lungs appear to differ in no essential particulars from those occurring in the course of other affections. Many of the cases die from bronchopneumonia, which affection seems to differ from that seen in other diseases in its occasional greater tendency to suppuration; the outcome of the **malady** is sometimes, too, a form of caseous pneumonia. Cornil and Babes (Quoted by Williams:—Trans. Med.—Chir. Soc., Vol. lxx., p. 77) insist upon the occurrence of a peripneumonia or form of pulmonary inflammation peculiar to measles, and due to the direct action of the specific poison; it is said to occur early in the so-called suffocative cases of the disease, and is regarded as the sole cause of death in its subjects. It appears to begin as an interstitial pneumonia, at first involving the lymphatic tissue, involves the structures **between** the alveoli and lobules, and ends in an alveolar exudation of fibrinous material. In four cases Stiebel (Arch. Ped., Feb., 1900) observed blotchy redness of the pleurae; and, **during** the convalescence of one of his juvenile patients (aged five years), Roger saw a purulent pleurisy develop.

SPLEEN.

In common with other febrile affections, the spleen is markedly enlarged in measles.

LIVER.

The local action of the poison of measles sometimes results in disease of this organ: it usually takes the form of a focal necrosis. Freeman (Med. Rec., 1898, Vol. liv) observed this in about a third of all his fatal cases of measles; and he reports that, as the larger areas of necrosis are clearly distinguishable by the naked eye, there is a possibility of the disease being mistaken for tuberculosis; but, microscopically, fragmentation of the nuclei is observed, and there is a resistance of the cytoplasm to stains.

BLOOD.

The condition of the blood undergoes no alteration in cases of measles that are free from complications, although it may be of a bluish or brownish-red colour in severe attacks. In very exceptional instances only, it is deficient in coagulability, and **in** some others either of a tarry thick consistence, or thin and of a cherry tint. In the eighteen cases of measles specially investigated by Widowitz (Jahr. f. Kinderh., Bd. 28, S. 25), the haemoglobin gradually diminished as the fever subsided; which same is a remarkable finding, as it is nearly always found to be increased during convalescence until quite equal in amount to that found during the fastigium of the disease. Franz (Wien. med. Woch., 1899, No. 47) — who used Gowers' haemoglobinometer in his investigations — contends, from numerous observations, that the haemoglobin is nearly always diminished, and that it is sometimes actually increased, also that the cells show no decrease — **rather** an increase — when counted during the eruptive period of the disease; and, furthermore, that any alteration in the erythrocytes (as regards form, the formation of rouleaux, etc.) cannot be determined; in only one case (during the height of the regeneration of the leucocytes) were two normoblasts found in

a single preparation; and he holds also that no marked quantitative change in the blood-plaques or in fibrin-formation occurs, and that in measles a relative, and to a certain degree an absolute, increase of the large mononuclear cells and transitional forms takes place, which same can always be appreciated when proper procedure is adopted. It is usually at the beginning of the disease (and also on days when the mononuclear elements are present in greatest abundance) that the polynuclear neutrophils most often are to be found in normal numbers; but the lymphocytes show a slight decrease from the normal percentage - not only relatively, but absolutely. This, however, does not occur equally in all cases, gradual variations being noticeable, according to the time of observation. Great variation at the time of regeneration of the blood is to be observed in the form of the single lymphocytes, and many, moreover, which are essentially transitional stages between it and the mononuclear giant-cells. The eosinophile cells seem, however, to bear no constant relationship to the other percentages during an attack of measles; but, in some cases at the acme of the disease, there are present in diminished numbers, and during the regenerative process of the blood they seem to be actually increased in number, but in some cases only. In the course of a general review of our present knowledge of the condition of the blood in measles, Ewing (Clinical pathology of the Blood, 1901) remarks that (1) the red cells have been found in the great majority of cases to suffer little or no change, but a loss of haemoglobin is usually demonstrable after defervescence. (2) In the case of adults, uncomplicated measles never causes leucocytosis, but is characterized rather by hypoleucocytosis, reaching in certain cases 2,700 cells - from 4,000 to 6,000 cells being (according to Pee, Pick, Rieder, Rille, and Felsenthal) commonly seen. (3) Normal or slightly reduced numbers of white cells are found at the onset of the disease. At the height of the exanthem they are (according to Pee and Turk) at their lowest figure, and return to the normal within a few days or a week after defervescence. When the bronchitis is severe, there may be a moderate leucocytosis, Hayem finding 10,000 to 14,000 cells in such cases occurring in children. Rieder observed slight leucocytosis in a case complicated by catarrhal pneumonia, and Cabot observed 9,000 cells in two cases - one haemorrhagic. In three cases occurring in malarious subjects, no leucocytosis was found; the malarial parasites appeared again with the chills during convalescence. (4) The proportions of the various leucocytes show no distinctly abnormal variation. Turk found a rather high percentage of polynuclear cells during the fever, with diminution of small lymphocytes. Pee, Klein, and Turk noted an excess of large mononuclear cells. The eosins are usually in low normal proportions during the early febrile period, but tend to diminish as the eruption declines. Yet Turk found nearly 5 per cent. during the second week of the disease. (5) Bacteriological examination of the blood was negative in ten cases examined by Barbier. Wieber claims to have found in the blood of

measles a protozoon which he has also seen in small-pox. (6) Regarding diagnostic procedure, typical cases of measles and scarlatina can, therefore, be sometimes distinguished from each other in their early stages by examination of the blood. Yet, as Turk says, the blood in measles strongly resembles that of a mild scarlet fever, as both show a nearly normal number of leucocytes and normal proportions of eosins. Yet equally severe constitutional disturbance should give on the second or third day leucocytosis of scarlatinal - normal or diminished leucocytosis ~~diff~~ from measles. "In the incubation period of measles", says Coombe (Arch. de Méd. des Enfants, 1903), "there is a hyperleucocytosis without other symptoms. This is a constant sign of the incubation period. During the last two days of the period of invasion or exanthem, and throughout the entire period of the exanthem, there is a hypoleucocytosis". He adds that a change in the number of the polymorphonuclear neutrophiles gives rise to these alterations, which latter, Platenga (Arch. de Méd. des Enfants, 1903) adds, are to be seen in cases of rubella. From such observations as the foregoing it may be concluded that the most characteristic changes in the blood in measles are the almost constant relative and absolute increase of the large mononuclear cells and transitional forms at the height of the disease and during convalescence, while during this period the polynuclear neutrophiles and lymphocytes are diminished in number. The chapter on Bacteriology contains other points of interest concerning the clinical pathology of the blood in measles.

URINE.

In almost every case of measles Ehrlich's diazo-reaction is present, and is first noticed, according to Franz (Wien. med. Woch., 1889, No. 46), on the third day of the disease. In milder cases it may be ~~either~~ absent altogether, tardily developed and with difficulty, or be extremely evanescent. ~~Its~~ significance, however, is slight, although it may be at times worth a trial for the confirmation of a doubtful diagnosis.

NERVOUS SYSTEM.

The tissue changes induced by measles in the nervous system are at first mainly vascular, and result also from the direct toxic action of the circulating poison, and after the manner of what occurs in cases of such acute infections as diphtheria. It may here be added that, as the pathology of the various complications met with in cases of measles - which at the best cannot be said to have any absolutely characteristic anatomical lesions - differ in no essential respect from that found when not associated with this disease, certain points of interest and importance will be fully considered in the next chapters.

S Y M P T O M S .

CLASSIFICATION OF PHENOMENA.

Whilst it is obviously advisable that the symptoms of measles be described under groups, dominating periods, or stages, it must not be forgotten that they represent only the course of an average case based upon the congeries of experience of a large number of cases, embracing the maximum and minimum of duration and intensity of infection. In this way one is able to obtain a standard from which the course of a given case may be estimated or anticipated from all standpoints. Deviations from this, however, are quite common, and that, too, without real abnormality in the course of the attack - the so-called normal being only the average: this point cannot be too strongly insisted upon. Thus qualified, the phenomena of the disease may be arranged into certain stages as follows:

I. STAGE OF INCUBATION.

The stage of incubation (Stadium Incubationis) of measles of regular or normal course (*Rubeola Vulgaris* or *Morbilli Regularis*) may be taken to represent the time which elapses between the implantation of the infection and the development of the disease. It may be as well, however, to premise these remarks by stating (1) that it lasts from seven to fourteen days, and in the inoculated cases from seven to ten days; (2) that, though conforming to certain rules of average and type, measles no more follows fixed lines of development than any other form of infection. The greatest divergence of opinion seems to exist amongst recognized authorities as to the length of the incubatory period, due to differences in conditions under which test cases are studied. The stage of incubation - according to Panum (*loc. cit.*) - lasts ten days; and this is also the view of Abelin, who observed that when a case of measles was brought into the hospital, the disease broke out amongst the other children in nine days. Some estimate the duration of incubation thus: in families, where a child has introduced the disease, they noted the number of days from that of the illness or eruption of the first child to that of the same in the others. It is evident that this manner of reckoning does not afford any trustworthy estimation of the duration of the stage in question, since the beginning of the illness and the eruption are not always equally widely separated as to time, and the infection of the subsequent cases can clearly have ensued at very varying periods, namely: (1) before the illness of the first child from the same or another source, and particularly from the contagion in the clothes of the first child; (2) during the course of the disease of the first child, from the infectious material produced by it, and this either at any time of the prodromal or of the eruptive stage; (3) after the disease of the first child (or at least at a time when the child no longer diffused any infectious material), from contagion which

it had produced during its illness, and which was communicated to the second child by means of inanimate objects or otherwise at second hand. Since, however, it may be taken for granted, from the great contagiousness of measles even during the prodromal stage and from the great susceptibility to the disease in those never attacked, that the infection will occur as soon as possible, we may expect in such instances as the above to meet with no very varying numbers, and in the majority of cases to observe nearly the normal duration of the stage of incubation. Pfeilsticker, proceeding upon the assumption that the infection of those subsequently attacked took place on the first day of the prodromal stage, found the interval ~~existing~~ between the infection and the appearance of the eruption was from thirteen to fifteen days; Girard (with the exception of three cases where it lasted sixteen days) one of thirteen to fourteen days. In the six cases of Harnier, where the infection could only have occurred during the prodromal stage, the intervals between the eruptions were from eleven to thirteen days. In a carefully controlled case described by Rilliet, the interval between the first sign in two children was twelve, that between the eruptions ten days, and the rash of the second child appeared fifteen days after the commencement of the prodromal stage in the first. Spiess, on the other hand, observed only the time of the outbreak of the two exanthems, and found the interval to be, in 147 cases, 117 times between ten and fourteen days, 8 times in nine days, and 22 times between fifteen and eighteen days. Salzmann found - reckoning in the same way - in 25 cases from a single source, 3 times in 9, 8 times in 10, 13 times in 11, and once in 12 days. According to Kerschensteiner, the exanthem of the second series in 37 families appeared 34 times between the tenth and twelfth days after the outbreak of the first eruption, and once each on the eighth, fourteenth, and fifteenth days. The obvious conclusion from observations such as these is that the average duration of measles is ten days; and an interval between the maxima of the exanthems of the infecting and affected children, which far exceeds the standard, may be explained by at first slight and subsequently increasing susceptibility of the second child - so that it becomes infected by the contagion which still adheres to objects: it might, however, also be explained by an unusually long duration of the incubation. On the other hand, against this last is the fact that such a one was never yet confirmed by reliable observations - a further reason for labouring for the greatest possible augmentation of their number; it must also be remembered that some of the figures quoted hitherto have been derived from measles in adults, not in children. It is obviously somewhat difficult to account for certain unusual observations; but the most feasible theory regarding the same is that the contagion adhered to objects which did not at once come into contact with the person subsequently affected. Thus Roux describes a measles epidemic, which broke out amongst the healthy occupants of a vessel seventeen days after leaving port; Tuffnell, the isolated affection of a soldier who

for forty-five days had been in prison: in both cases the diagnosis seems certain. Possibly existing chronic diseases sometimes influence the duration of the incubatory period: thus, according to Mayr (loc. cit.), rickets. Emmert reports a case where a boy of ten, just recovered from acute rheumatism, had a severe attack of measles after an incubation of seventeen days. It is, furthermore, important to recognize a distinction between the constitutional and local symptoms in dealing with the early manifestations of measles; and judging from the diversity of opinion expressed thereon, this is not always easy. Thus (1) Bonn (Gerhardt's Handb., Vol. ii., pp. 297, 298) contends that the constitutional disturbances are rarely altogether absent from the incubation period of measles, whereas in the other acute exanthemata this is almost always a latent stage. An infected individual usually feels generally indisposed for days before the actual outbreak of the disease, though seldom ill enough to stay in bed. Children look pale, lose interest, are listless and sleepy, often complain of headache or pain in the stomach, feel nauseated, and have a poor appetite, at times they are feverish; but catarrhal symptoms do not regularly belong to this period. This much is clear - deducting all the time in which any indisposition is manifested, an average of only a few days remains for the absolutely latent germinating period of measles. (2) Thomas (Ziemssen's Handbuch, p. 76), on the other hand, remarks that in the period of incubation the infection normally remains completely latent, and that this period is distinguished, therefore, by an absence of fever as well as of local symptoms. These opinions, paradoxical as it may at first sight seem, are both correct and incorrect, taking pyrexia as a certain indication of constitutional disturbances caused by infectious processes. After careful study of temperature charts, and taking an all-round view of the question, the writer scarcely believes himself justified in speaking of "signs of an infectious disease" - no matter what its order may be - in the absence of all local symptoms and of fever: hence the necessity for frequency in the estimation of the temperature of the patient. Embden (E ine Masernepidem. in Heidelberg im Jahre 1888, 1889) confirms the latter suggestion by his chart showing one of the children under observation to have had no rise of temperature before the appearance of the eruption (nor were any local symptoms appreciable); in another case, moreover, the latter broke out only twenty-four hours after the initial pyrexia. Analyzing the cases just mentioned, the probability of a greatly prolonged period of incubation, during which the infection remains latent, becomes apparent. It is difficult, moreover, to fall in with Bonn's conclusions, owing to the obvious doubt as to whether temporary disturbances manifested before the regular development of the disease are necessarily the direct result of the action of the measles poison (Thomas: - Arch. der Heilk., 1867, pp. 390, 391; Henoch: - Vorlesung. über Kinderkr.): the presence of the latter in all probability may make the patient's system more sensitive to other influences. It is likewise a matter of regret that reliable analyses of temperature to

determine these points have never been published. Thomas, indeed, states that he has seen temporary pyrexia (to 102.2.F.) accompanied by slight constitutional disturbances and trifling catarrhs of the upper respiratory passages, during the time when the individuals in question were under the influence of the measles infection, the same being followed by several days of normal temperature and of improvement in local conditions before the ordinary symptoms of measles began to develop in their respective sequence. The temperature, he continues, was frequently slightly over normal during the period following infection, although no other signs of bodily derangement were present. The common finding of an unusually early appearance of the catarrhal symptoms is to be explained on similar grounds to that of the early pyrexia. Holt (Diseases of Infancy and Childhood, 1899, p. 911) found the period of incubation to be most often eleven days, and to generally range from eleven to fourteen days - this being, however, subject to great variation, as is evidenced by the following figures taken from his well-known publication:- The incubation was less than 9 days in 3 cases; from 9 to 10 days in 22 cases; from 11 to 14 days in 95 cases; from 15 to 17 days in 19 cases; and in 5 cases from 18 to 22 days. According to Haig Brown's studies of the disease (60 cases) at Charter House School (*British Med. Jour.*, April 16, 1887, p. 826), the incubatory period of measles was fourteen days. Other writers, however, record an incubation of this disease as brief in duration as five days. Graham (Art. "Measles", *System of Dermatology*, etc., Morrow, 1894, Vol. iii.) has observed that in second attacks of measles the stage of incubation may be as long as from eighteen to twenty-one days, but much shorter if the infection be conveyed by inoculation - e.g., from eight to ten days. During the latter part of this stage some slight symptoms (e.g., cough, lassitude, anorexia, and general indisposition) may be complained of by the patient. Indeed, Gregory holds that in some cases "the entire incubation stage is marked by languor, lassitude, and a sense of malaise and occasionally a characteristic symptom such as cough".

II. STAGE OF INVASION.

The stage of invasion (Prodromal Period or Stadium Prodromorum) is ushered in by symptoms appertaining to the character of an ordinary coryza, accompanied by a watery discharge from the nose, sneezing, lachrymation, and smarting of the eyes, as well as **photophobia**, and irritation of the pharyngeal and laryngeal mucosa - giving rise, in the course of about twenty-four hours, to coughing and hoarseness of voice. With the above occurs a rise of temperature - usually from 2 to 3 degrees on the first day - which may be preceded by chills or, again, - though rarely, - rigors alternating with some feeling of heat. According to Krabler (*Griefswalder med. Beitr.*, 1861, 117), chills are but seldom present, as they were present only five times amongst a very large number of cases observed. In children there is usually stupor and apathy of expression, and especially irritability and fretfulness: these may, and often do, alternate or

vary during the different hours of the day and night. An unpleasant taste in the mouth is always complained of; and the tongue (which is never so much involved as in cases of scarlet fever) shows its papillae swollen and projecting - a thin white fur perhaps covering the dorsum thereof; thirst is apt to be distressing; dryness of the mouth and throat contribute to the general discomforts of the illness; and there is also marked anorexia with sometimes obstinate constipation.

The temperature of the **prodromal** stage cannot be regarded as characteristic, owing to its vagaries - so that from it no special hint as to the character of the disease can be derived. Both it and the other symptoms being of gradual development, the transition between the incubation and the prodromal stages is more or less indefinite; and a typical and distinctive temperature curve cannot in this disease be established. A good deal, however, regarding the pyrexia of measles has been written, amongst which the studies of Wunderlich (Arch. der Heilk., 1863, §. 332) are particularly noteworthy, though his conclusions - at times, indeed, decidedly contradictory - cannot always be accepted without reserve. Thus, he contends that the fever which in measles precedes the eruption, and accompanies it up to its complete development, is quite strictly typical in character. Since measles, however, is a disease the course of which is particularly subject to irregularities, certain epidemics being distinguished by their eccentric type of infection, one must, of course, be prepared to meet with many deviations from the ordinary temperature curve. Measles, furthermore, is in the main a disease of childhood, when the temperature is more easily disturbed by accidental influences than at any other time of life. It is only natural, therefore, that cases should frequently display more or less well-marked deviations from the type of temperature recorded as characterizing the uncomplicated action of the measles contagium on previously healthy, **susceptible**, and not too irritable or sensitive individuals. What usually happens in ordinary cases of measles is that - according to Thomas (Arch. der Heilk., 1867) - with the onset of the prodromal stage the temperature rises rapidly, and, as a rule, uninterruptedly, to a considerable height - certainly high enough to constitute true fever (102. to 104. F.): it seldom remains below 102. F. The febrile symptoms usually abate very appreciably on the following morning (i.e., on the second day of the prodromal stage) - the temperature frequently even falling to normal; exceptionally it continues high for another twelve or twenty-four hours before the remission takes place. This initial fever, lasting on an average one day, is succeeded in most cases by two days of very light fever. On the first of these two days - that is, on the second day of the illness - the fever is particularly apt to remain low; whereas on the following day, the third, this applies at the most only to the morning hours - a further more or less well-marked rise of temperature seldom failing to occur in the evening. Although this description applies to

the characteristics of the fever in the majority of instances, it should be remembered that another and pronounced type of pyrexia is sometimes encountered. This is characterized by the same rapid initial rise, but not by the well-marked remission - the peculiar fluctuations of temperature, corresponding to night and day and observed in health, are not effaced by the continued tendency of the fever to rise. In some cases, furthermore, the fever of this stage merges without notable remission into that of the eruptive stage.

During the second day of this stage the symptoms increase in severity, and the expression of the face becomes markedly altered, either pale or puffy or slightly livid and dusky; and at the same time the nose discharges an acrid secretion on the upper lip and immediate neighbourhood, from which partial or complete congestive occlusion may result. The catarrh by spreading up the Eustachian tubes may occasion an annoying crackling or, it may be, an actual deafness. The conjunctival lining of the eyelids becomes congested likewise, red, injected or oedematous, and numerous dilated capillaries are to be observed running across the sclerotic in all meridians; with this there will be photophobia, smarting, and considerable orbital suffusion. Such symptoms, however, do not prevail in all cases: at times the discomforts may be so slight as to escape attention altogether, and the disease only be recognized on the appearance of the characteristic exanthem.

Sometimes the symptoms subside with the dawn of the third day; the appetite returns, and the patient seems well nigh recovered. Such respite, unfortunately, is nearly always of very short duration, with the result that towards the evening there is a sharp rise of temperature and a return of the symptoms with even greater intensity. So far the illness may have been mistaken for a common "cold", and that, too, in spite of the presence of a certain amount of croupy or coarse and dry cough - accompanying or following which are wheezy chest sounds, sibilant râles, slight dyspnoea, and a sense of constriction about the thorax.

The parotid and submaxillary and thyroid glands are usually found to be somewhat tender, as well as more or less enlarged; and children are sometimes found to be delirious towards or during the night. Convulsions are, however, rarely met with, except in markedly neurotic individuals. Epistaxis, though somewhat common, is seldom severe. Affection of the throat is usually evidenced by a certain amount of tonsillitis, causing pain in swallowing; whilst, in addition to this, laryngitis and laryngismus - the latter especially in children of tender years - may be present to an alarming degree.

The Enanthem or Mucous-Membrane Eruption. - On and from the second and third days of the prodromal stage onwards, there will be found on the buccal mucous membrane an eruption which has been subjected to a most accurate and detailed description by Flindt (Reports of the Danish Board of Health, Translated and cited by von Jürgensen), in 1880, to the following effect: On the first day of the fever there will be observed a slight and

diffused erythema of the throat. On the second day of the fever, - a fairly dark redness without marked oedema of the posterior pharyngo-palatine arch and tonsils, which on the anterior palatine arch and velum palati is somewhat less deep in colour, and of irregularly diffused or mottled appearance. On the evening of the second day of the fever the mucous surfaces of the tonsils and the posterior palatine arch have undergone little or no change, appearing as a uniformly red erythema with slight oedema. On the anterior surface of the soft palate and the posterior part of the hard palate, as well as occasionally on the remaining mucous surfaces, a distinct exanthem appears. The lesions are round or irregular in shape, of a bright-red colour, having an ill-defined margin, with little or no elevation at this time above the surrounding surface. In places there is a tendency for the lesions to cluster in groups and to become blended. They acquire a peculiar appearance, on account of numerous small and white glistening points - simulating minute vesicles - which occupy the middle of the small red macules. These manifestations in the macules are irregularly grouped. One can see and feel the minute vesicles elevated above the surrounding areas. The palpebral conjunctiva is hyperaemic in its entire extent. Besides the reticular and macular reddening of the conjunctiva, which is due to the dilatation of the conjunctival vessels, there are also small, glistening, miliary elevations similar to the elevations in the palate. On the third day of the fever the mucous surfaces of the buccal cavity, which up to this time have been only slightly hyperaemic, are now found to be invaded by the lesions previously described. These latter are strongly marked over the entire anterior surface of the velum palati, the glosso-palatine arch, and usually also over the contiguous two-thirds of the hard palate. The hard spots are sometimes very numerous, at other times isolated, and, again, by blending they form irregular figures of a stronger red than previously seen. Here and there a faint appearance of the perviously described vesicle-like formations is seen projecting above the surrounding surface. On the other hand, they may be also found on the apparently normal mucous membrane. Similarly grouped spots with whitish vesicles now also appear on the inner surface of the cheeks, especially on the part opposite the juxtaposition of the upper and lower molars. As a rule, the gums and inner surface of the lips retain their normal colour, or at the most are only slightly hyperaemic. It is, indeed, seldom that the eruption appears on these parts. The tonsils and both pharyngo-palatine arches still remain red. The palpebral conjunctiva retains its deep red colour, but no spots are visible excepting the minute vesicles previously described. At this time the eruption breaks forth on the skin. On the evening of the third day there is little or no change to be seen. On the fourth day of the fever the spots stand out prominently on the palate and inner surface of the cheeks, while in many places there is a tendency to merge by enlargement of the individual lesions; and on the surfaces last invaded they are more copious than ever. The conjunctival exanthem is now disappearing. On the

evening of this day no change is to be observed. On the fifth day of the fever the exanthem in the buccal cavity is more marked than before. Frequently at this time there appear faint reddish spots on the mucous membrane of the lips, even extending to the exposed cutaneous margin. On the gums they are seldom present, and never distinct. The hyperaemia of the posterior fauces remains unchanged. The skin exanthem begins to fade, and the temperature falls. On the sixth day of the fever the exanthem on the mucous surfaces is no longer visible, except a slight diffused redness of the palate and the inner surface of the cheeks. The fever ends. This characteristic exanthem is seldom absent: its presence, in at least 90 per cent. of all cases (Slawynk:- Deut. med. Woch., April 28, 1898) may be safely anticipated; but it should also be borne in mind that it may disappear from haemorrhagic effusion into the individual spots and immediate neighbourhood of each. As the blood becomes absorbed, light-coloured spots marking the points of haemorrhage may remain for a period of variable duration.

Koplik's Spots.- The characteristic appearances (and their diagnostic value) produced by the spots (now generally known as Koplik's spots), observed with such constancy upon the buccal mucous membrane, have been specially described by Koplik (Arch. of Ped., Dec., 1898, liii., 505-507) in a lengthy dissertation, in the course of which he states that scant attention is given to the most important elements of the eruption as it appears on the mucous membrane on the inside of the cheeks, as well as that of the lips. A thorough understanding of the eruption of the buccal mucous membrane will aid in separating an invading measles from a mass of eruptions resembling measles which appear on the skin in infancy and childhood. Looking into the mouth during the stage of invasion, one observes a redness of the fauces; perhaps, not in all cases a few spots on the soft palate. On the buccal mucous membrane and inside of the lips a distinct eruption, consisting of small irregular spots of a bright-red colour, is invariably observed. In the centre of each spot there is noted, in strong daylight, a minute bluish-white speck. These red spots, with accompanying specks of bluish-white colour, are, according to Koplik, absolutely pathognomonic of beginning measles, and when seen can be relied upon as introductory to an outbreak of the eruption. Koplik states that, prior to the publication of his observations, no one had called attention to the pathognomonic nature of these small bluish-white specks and their background of red, irregularly-shaped spots. They cannot be mistaken for sprue, because they are not so large nor as white as sprue spots. These specks of bluish-white surrounded by a red area are seen on the buccal mucous membrane and on the inside of the lips, not on the hard or soft palate. Sometimes only a few red spots, with this central bluish point may exist - six or more; and in marked cases they may cover the whole inside of the buccal mucous membrane. If these bluish-white specks on a red spotted background are at the height of their development, they never become opaque, as sprue, and in this respect are diagnostic; nor do they ever coalesce to become plaque-like in form - they retain their punctate character.

The eruption just described is of the greatest value at the very outset of the disease - the invasion. As the skin eruption begins to appear and spreads, the eruption on the mucous membrane becomes diffuse, and the characters of a discrete eruption disappear and lose themselves in an intense general redness. When the skin eruption is at the efflorescence, the eruption on the buccal mucous membrane has lost its characters of a discrete spotting, and has become a diffuse red background with innumerable bluish-white specks scattered on its surface. Long before the disappearance of the cutaneous eruption, the mucous membrane retrogrades to the normal appearance.

Much has been written by others as to the exact significance of these alleged pathognomonic spots of measles. Thus, Libman (Med. Rec., June 11, 1898) attaches great diagnostic importance to Koplik's enanthem, as he found them present in every case - fifty in all - which he investigated; and he states that the more abundant the exanthem the fewer in number will be the spots; he also adds that he has never seen anything exactly resembling them in other diseases, although the eruption of purpura and of secondary syphilis might be at first sight somewhat difficult to distinguish. Knöspel (Prag. med. Woch., Oct. 13, 1898) directs attention to the fact that an enanthem of the buccal mucous membrane had been described by pediatricists long before the time of Koplik (Flint, for instance), but allows that since Koplik has shown a new feature (their early appearance before the outbreak of the cutaneous eruption), the credit of their diagnostic interpretation is very properly his, and from his observation of them in 41 cases believes their significance established beyond the shadow of a reasonable doubt. Finkelstein (Berl. klin. Woch., 1898, p. 605), having seen the spots in 5 cases in which they were specially looked for, admits their value in arriving at an early diagnosis, more especially from influenza. Ślawyk (Deut. med. Woch., 1898, No. 27), finding them present in no less than 45 out of 52 cases examined, states that there are usually six to twenty on a side (in exceptional instances on one side only), sometimes, indeed, hundreds, and that they are usually in greater number near the lower molars; furthermore, that under the microscope he found them to consist of buccal epithelium in a state of fatty degeneration. Havas (Wien. med. Presse, 1899, No. 24) found Koplik's spots present in 15 out of 16 cases studied, and in size frequently larger than described by Koplik, often equal to that of a lentil. When examining close to the gums, he was able to discern the presence of a bluish-white deposit upon them. He insists that their pathognomonic interpretation cannot be denied. Manasse (Münch. med. Woch., June 5, 1900), maintains that too much reliance cannot be placed upon their supposed pathognomonic value, as he has seen measles without Koplik's spots, and the latter without being followed by that affection. Hirsch (Phila. Med. Jour., 1900, vi., 343) believes the sign to be of special value in diagnosing measles in the negro, in whom it is obviously impossible to always make out the rash. He was able to detect Koplik's spots in all the 50 cases which he examined for their presence. Cotter (Arch. of Ped., 1900, xvii.) gives a

somewhat qualified opinion as to the value of Koplik's spots, and from a study of no less than 187 specially selected cases at the New York Foundling Hospital. Firstly, with regard to the regularity of their appearance, he found that in 8 patients they did not appear at all; in 10 their presence was doubtful; but in 169 they were easily appreciable. Secondly, with regard to the priority of the appearance of the spots, he reports it was synchronous in 78 cases; in 80 cases the spots preceded the eruption (from one to five days before); while in 2 cases the rash came out before the spots; and in no single case was the sign the sole evidence of the disease. Ross (Columbus Med. Jour., 1900, xxiv.) asserts that the trustworthiness of the sign is almost absolute: it was present in all of the 15 cases studied. Sobel (New York Med. Jour., 1898, lxviii., 556), on the other hand, places no reliance upon the spots, as he has never seen them in a single instance. Lorand (Jahr. f. Kinderh., 1901, iii., p. 658), moreover, states that (1) in 175 cases of measles he failed to discern the spots in 11; of the 92 cases studied in the prodromal stage 3 had no spots; (2) in 348 other cases they were absent in 19, and that in all these negative instances better illumination than was at his disposal might have revealed them.

It would appear that so far back as the year 1806, Willan (Diseases of the Skin, Lond., 1808) drew attention to spots, resembling those described by Koplik and Flindt, about the buccal cavity on the fourth day of the fever: these, from the palate and uvula and tonsils merged, on the fifth day, forming a bright-red surface extending backwards to the fauces. Heim (Jour. der Prakt. Heilk., C.W. Hufeland und K. Hunley, Herausgeber, 1812, St. iv., S. 86), in 1812, was able to distinguish between the enanthem (buccal spots) and the exanthem (cutaneous eruption) of measles, stating that usually there appeared in the mouth on the second day of the fever small bright-red spots, which he regarded as of the nature of those which appeared later on the skin. In 1854, Forbes (Dunghlison's Cyclopaedia of Practical Med., 1854, Vol. iv., p. 53), describing the eruption of measles, stated that the eruption spreads over the face, and that spots may also be observed on the palate and fauces. Trousseau (Clinical Lectures, p. 171), in 1864, described the early appearance of the buccal spots and their relation to the subsequent cutaneous eruption, and in no uncertain terms: for he says that "before there is an exanthem on the skin you see the disease inscribed on the pharynx, tonsils, and the veil of the palate". Rehn (Quoted in Niemeyer's Practice of Med., 1876, Vol. ii., p. 528), in 1876, drew attention to an eruption of pale-red and somewhat undefined spots on the mucous membrane of the cheeks, gums, lips, and fauces. Since the above, particular attention has been drawn to the prodromal exanthem of measles by others - notably by Mayr (1852), Krabler (1861), Barthez and Rilliet (1854), and Monti (1873); and by all, it will be observed, prior to the publication of the investigations of Flindt and Koplik.

Bolognini's Sign.- Another peculiar phenomenon of the prodromal stage of measles, and one which Bolognini (Jahr. über die Leistungen und Fortschritte in der Gesamt. Med., 1898) considers as pathognomonic of the disease, consists of a fine crepitation or friction, as if two bottles were rubbed together when the pulps of the fingers are applied with gentle pressure to the relaxed abdomen. To obtain the sign, therefore, the patient is placed upon his back with the legs flexed and the abdominal muscles relaxed; the pulps of the three middle fingers of both hands are applied to the abdomen, and gentle pressure, gradually increased, is made with a kneading movement, when a slight rubbing sensation will be conveyed to the fingers, which same disappears as the pressure is increased. Koppen (ibid.) found the sign in 50 per cent. of all cases examined; and Bolognini himself failed to elicit it only twice in 200 cases. He, moreover, states that it disappears with the outbreak of the cutaneous eruption, and that it is due entirely to vascular disturbances of the peritoneum analogous to the enanthem observed on the mucous surfaces. In spite of all this, however, it is now realized that little reliance can be placed upon it, owing to its presence in other diseases.

Miscellaneous Eruptions.- Although rare, certain accidental eruptions may be observed in pre-eruptive stage of measles, just as in the majority of the acute exanthemata. Richards (Accidental Rashes Occurring in the Course of the Exanthemata, Quart. Medical Jour., 1898, Vol. v., p. 31) has drawn special attention to this point. "In the pre-eruptive stage of measles", he says, "there may be a scarlatiniform rash, usually more transient and more diffuse than the eruption of scarlatina. This rash is responsible for some of the cases in which measles is diagnosed as scarlet fever. Another pre-eruptive accidental rash is a somewhat faint general erythema, not unlike the true measles eruption in its general appearance, but almost confined to the trunk and limbs, and more diffuse and less distinctly papular. It is difficult to account for the occurrence of these eruptions, but many hold that they represent an attempt on the part of the regular eruption to antedate itself. The earliest signs of the eruption", Thomas says, "at first in a thoroughly undeveloped condition, appear not infrequently upon the first day of the febrile period, more often on the second or third". Amongst 1917 cases of measles, Roger (Les Maladies Infectieuses, Paris, 1902, p. 874) observed pre-eruptive rashes five times, two or three days before the time of expected onset of the regular exanthem, in the case of three adults, a fourteen-months infant, and a child of three years; the rashes were decidedly morbilliform in appearance. Comby (Trait. des Mal. d'Enfance, Paris, 1897) reports two cases of the eruptions in question. One of them was a child of four and a half years who developed the regular eruption two days after her admission to hospital with a morbilliform rash; and the other was a girl of the same age who had a scarlatiniform erythema four days before the characteristic eruption of measles appeared. Gerhardt

described the occurrence of a prodromal exanthem a day prior to the development of the measles eruption, the same being located in the femoral triangle.

The duration of the prodromal stage of measles is usually four days (from three to five days); but it has sometimes been observed to be much shorter, because the first slight affection of the nasal mucous membrane often appears some days before any other symptom, and may then entirely escape attention. In this case it is only when the more severe catarrhal symptoms attended with fever set in that the presence of the disease is detected. On the other hand, in the case of persons previously in ill-health, and particularly in those who are rachitic or tuberculous or scrofulous, this stage may be prolonged to a remarkable extent, so as even to last ten days (Trousseau:- loc.cit.) In the 270 cases, mostly children, studied by Holt (loc.cit.), the duration of the prodromal stage was one day or less in 35 cases, two days in 47, three days in 64, four days in the same number, five days in 29, six days in 20, seven days in 6, eight days in 2, nine days in 2, and ten days in 1 case. In the case of adults there appears to be less variation in this stage. Roger (Rev.de Méd., April, 1900, p.290), for instance, found it to be shorter than in children over two years, and longer than in infants.

III. STAGE OF ERUPTION.

The eruptive stage (Stadium Exanthematicum, Stadium Floritionis, or Period of Efflorescence) usually commences on the fourth, rarely the fifth, day of the fever when the remittance and intermittence of the prodromal pyrexia cease to be replaced by the continuous elevation of temperature characteristic of the febrile affection.

The maximum temperature will be observed to have been reached in this stage, as a rule, some thirty-six hours after its commencement; and this in nearly every instance corresponds with the maximum of the exanthem, or at least with the first stage of it: it is quite exceptional to find the acme of the pyrexia attained near the beginning of the eruptive stage. The acme of temperature is usually observed to last from one and a half to two and a half days, corresponding conversely with the duration of the prodromal stage, so that the maximal temperature occurs with considerable regularity at the end of the fifth or sixth day of the illness. The period of the maximum of the exanthem, and with it of the maximal temperature is more constant than the duration of either the prodromal or the eruptive stages - each of which compensates for the other. The time which elapses from the moment of infection to the maximum of the eruption (about fifteen days) appears to be still more uniform, so that this interval - or rather the shorter one - has been applied by certain writers only to the beginning of the interruption for the estimation of the duration of the incubation. The temperature at this time very rarely rises above 105.F., though a temperature of 110.F. has been reported by Hunter (Brit.Med. Jour., April 30, 1898) in a child of sixteen months, and who recovered in spite of the intensity of the pyrexia.

The eruption shows itself in milder cases on the morning (in more severe cases only in the evening) of the

fourth day of the fever. The evening preceding the fourth day, however, if the skin be carefully examined, a faint mottling or roughening may be detected over the points about to be occupied by the spots. To find the eruption appearing on the third or the fifth day is quite exceptional. It may be expected to appear first upon the upper part of the forehead, on the temples, behind the ears, and on the sides of the neck - in that order: though occasionally all simultaneously. It soon spreads to the orbit, mouth and chin, in the form of punctate spots not unlike those occasioned by flea-bites (according to Hebra), and of the precise colour which is obtained by adding a little yellow or brown to a red pigment, that is to say, a medium-red. The appearance of the eruption invariably gives rise to a marked intensification of the symptoms: the catarrh increases, the cough becomes vastly more distressing, respiratory sounds may be shrill and harsh, and swallowing is apt to be more painful. The patient will complain of a sensation as if his eyes were filled with sand; and photophobia may be so acute as to occasion much persuasion to allow inspection of his face, which he keeps buried in the bedclothes and as much as possible in the dark. The fever is now observed to be gradually increasing in intensity with slight morning remissions, gaining a half to one degree each evening. A certain amount of epistaxis may be observed at this period, and it is seldom in excess of a mere oozing. The initial constipation may now give way to a very severe catarrhal diarrhoea; and if this be left untreated, especially in debilitated persons, dangerous complications may appear. The minute and scattered spots upon the face do not remain long in that condition: for, as early as the second day, the whole face, neck, upper pectoral region, and back may be covered with them. Their appearance may be either singly, or in groups forming, according to Willan (*loc. cit.*), crescents or irregular and broken circles. Before this, however, that is, during the first day of their presence, they may show a great resemblance to the rash of urticaria and be elevated above the surface of the surrounding skin, their redness momentarily fading on pressure. In the ripe condition the spots vary in size from one millimetre to one centimetre ($1/24$ to $\frac{3}{8}$ inch) in diameter, ranging from two to three millimetres ($1/12$ to $\frac{1}{8}$ inch). The eruption consists of circumscribed and slightly raised spots, often presenting a slight central elevation. In colour they may even assume a dark red, later a purplish, tint, or finally a distinct violaceous hue termed by the laity "black measles". The skin between the spots remains intact, although the face when viewed from a distance seems to have a puffy and oedematous appearance. It should be noted, moreover, that the lesions are not always rounded, but may be almost of any shape compatible with their size - e.g., attenuated, notched, crescentic, and so forth. In every case, at first at least, the sharp definition of the spots against the surrounding skin is very characteristic, the elevation of the lesions being easily determined, even by sight (especially at the acme), and remains until the desquamation is

complete. The central elevation, which especially demarcates the spots, is not, however, always present: generally speaking, the heavier the rash the more papular its character - this papulation being attributed by Unna (loc.cit.) to a condition of passive oedema induced by a previous spastic contraction of the muscular coats of the blood-vessels from the action of the **special poison thereon**. The fact of the development of the eruption in independent spots deserves special notice as strongly indicative of their presence in the circumscribed form being due to a circulating contagium vivum acting only where it lodges: for, were it simply in solution in the blood and always so, the lesions would necessarily be of uniform distribution; as suggestive of this the fact of Eberth's bacilli having been isolated from the typhoid ~~spots~~ *spæclae* may be cited here.

Varieties of Measles according to Eruption.

Several varieties of measles based upon the characters of the eruption are recognized by Mayr (Vide Art. on "Measles" in Hebra's Diseases of the Skin, 1866), namely: (1) The term morbilli laeves is applied to the usual form of the eruption, consisting of red spots with a small central elevation. (2) In morbilli papulosi we have to deal with an eruption in which the central elevation of each spot is nodular, the spots themselves being of a deep-red colour. It is said that in certain epidemics this form of measles takes the place of the ordinary form; furthermore, it is apt to be mistaken for the exanthem of variola. (3) In morbilli vesiculosi vel miliares there is an eruption of spots covered with minute vesicles, resembling goose-flesh, or of the so-called prickly heat: indeed, the presence of the miliary vesicles has been attributed to perspiration. The writer, however, does not subscribe to this theory, as in such affection as scarlatina we have the same kind of vesicles, and sweating is not a prominent feature of that disease. (4) Morbilli confluentes vel conferti is a variety of measles in which the spots run together and become confluent; the term, however, was in use for the designation of scarlatina even before the time of Sydenham. The resemblance to that disease is sometimes striking, and the mortality is apt to be high. (5) Morbilli haemorrhagici is that variety in which there is an eruption characterized by haemorrhagic effusion into and around the individual spots. It is as well, however, to pay more attention to the general course of the disease than to the varieties of the eruption, which being due to trophic cutaneous disorder, allow, according to Fürbringer (Art. "Measles" in Eulenberg's Real-Encyklop., u.s.w., Vienna, 1887, 2nd Ed., Vol. xii., p. 55), of no special prognostic interpretation. This is particularly true as regards the haemorrhagic variety, for, as Veit (Virchow's Arch., Vol. xiv., p. 86) remarks, several forms of haemorrhagic effusion into the rete Malpighii and corium are not infrequently encounteredered in cases of haemorrhagic measles. There are the isolated, sharply circumscribed, blackish tinged, small and round

petechiae; but more frequently large ecchymoses preserving the size and shape of the former spots of rash. Sometimes, again, the effusion takes the form of long and irregular streaks (vibices), sometimes that of large plaques (purpura haemorrhagica). Any of these different forms may be seen alone, or two or more may occur in the same individual. Only a few parts of the body may be involved, or the haemorrhages may be distributed over more or less of its entire surface. The colour of the affected areas, when fully developed, varies from purple to black, subsequently passing through the changes characteristic of the absorption of extravasated blood. They may last for a few days or several weeks. At times the ecchymoses may be accompanied by epistaxes, and without bleedings from other parts. The early appearance of the haemorrhages, usually within the first few days, is an especially important indication of their dependence on the measles eruption, and also calls for a strict differentiation from a petechial process which may develop some weeks later after the rash has entirely disappeared. Veit still further emphasises the fact of the abatement of the fever pursuant to the appearance of the petechiae, as well as the general improvement in the patient's condition when this occurs. And, accepting his views, the general conclusion is that there is an uncertainty as to there being both a benign and a malignant form of haemorrhagic measles. The fading of the rash first takes place on the parts where it first appeared, and vice versa; and, in spite of its sometimes brightening and becoming more distinct after fading (due probably to a rise of temperature), it seldom or never undergoes a recrudescence.

Local and Constitutional Disturbances.— During the development of the eruption, the catarrhal symptoms increase in character, the nasal discharge becomes sero-purulent, the cough loosens, moist râles are audible, and the sputum is frequently copious as well as mummular or sero-purulent; the patient suffers from more or less prostration, the pulse is quickened, and the breathing may become hampered. It is at this time especially that a careful watch should be kept for bronchitis and pneumonia, which are responsible for a very high mortality at this stage of the disease. The abdominal symptoms - usually those of severe diarrhoea of a catarrhal or choleraic character - are almost always prominent, and may be accompanied by great tenderness on pressure, this being sometimes of a mild peritonitic character. With this, headache is usually distressing, but vomiting is a rare accompaniment of the attack. The urine is seldom markedly altered. Brown contends that it may become albuminous when the eruption develops rapidly, and that this albuminuria generally occurs on the third day of the disease. Becquerel, on the other hand, states that he has never found any signs of albuminuria, even in cases in which the kidneys were known to be congested. There seems, however, no reason why a slight amount of temporary albuminuria should not occur at the acme of the fever, in consequence of the excessive increase of temperature, more rarely of a slight desquamative

nephritis - in favour of which is the fact that now and then a profuse exfoliation of the epithelium of the urinary apparatus is observed. In spite, however, of Abeille having twice reported albuminuria in the course of measles lasting for seven and eighteen days respectively, an essential participation of the kidneys, as in scarlatina, does not occur in rubeola. The usual urinary changes common to all acute fevers (increased urates, scantiness of secretion, and darkening) always, of course, occur; in addition to which the diazo-reaction may be obtained, acetonuria and peptonuria detected, and a certain amount of vesical irritability be experienced.

IV. STAGE OF DESQUAMATION.

The commencement of the stage of desquamation (Stadium Desquamatonis or Period of Convalescence) marks the decline of the disease, so that when the disease runs its ordinary course febrile symptoms are altogether wanting. As early as the second day of the affection the constitutional and other symptoms begin to subside, and sometimes even before that. The lesions upon the mucous membranes have by now usually disappeared, or at least give rise to no special symptoms. The redness of the various mucous membranes fading away may, in the mouth chiefly, leave some evidence of desquamation. The cuticle of the skin now becomes detached in the form of branny scales, which make their appearance first on the exposed regions of the body - i.e., on the face, neck, and upper part of the chest in the order named. On the face, however, the degree of exfoliation of the epidermis is only moderate, and is most noticeable about the temples, sides of the nose and chin. But it sometimes happens that a considerable desquamation takes place over the entire body. As a rule, the profusity of the exanthem and of desquamation coincide, though the latter may be rendered almost imperceptible by frequent cleansing of the body and baths. On the other hand, again, with an equally severe eruption there may be no desquamation; or with a mild exanthem, on the contrary, some exfoliation may take place. The almost invariable branny nature of the scales is due to the exfoliation taking place only on the site of the spots - large scales occurring only with confluent exanthems; but even then, never to the same extent as in scarlatina. And never in measles does the skin peel off in large lamellae from the fingers, palms, toes, and soles of the feet. Desquamation may occur very early a few days after the acme of the eruption, while the redness of the spots still exists: at another time it only appears after their complete fading. The exfoliative process lasts, as a rule, several days; but rarely protracts itself into the second week, or disappears as early as in one or two days. In both appearance and duration, therefore, a considerable uncertainty exists. After the total disappearance of the eruption a certain amount of pigmentation may remain for a week or two on the sites previously involved. These stains are of a faint reddish-brown colour, and correspond with the size and shape of the original spots; they are of the utmost diagnostic importance, and also indicate that the patient is still capable of infecting others. A certain amount of prostration is still experienced; and the patient being very

sensitive to cold and draughts; should be kept indoors for a week or more - say, from twenty-one to twenty-eight days from the commencement of the febrile attack.

ANOMALOUS FORMS.

There are certain atypical, irregular, or anomalous forms of measles (*Rubeola Anomala*) in which the disease fails to follow the normal course above described, there being a large number of variations either in certain particulars or in the course of the disease as a whole. For instance, even in healthy persons the period of incubation may be prolonged two or three weeks without there being any apparent cause to which the occurrence may be assigned; and the same thing happens still more frequently when the individual is already the subject of disease - particularly in the case of children affected with some disease of the nervous system, or with some nutritional anomaly. Again, in persons suffering with any of these complaints the prodromal stage may be prolonged so as to last a week or even ten days - the period of latency being in this case of normal duration; and in exceptional instances either of the other stages may be protracted in a similar way. Edgar (*Canada Med. Rec.*, Dec., 1892) states that in an epidemic of 423 cases he found only 123 which adhered to the regular type. So it happens that the modifications of measles require to be described in detail; and the following plan of narration will be found as convenient as any:

(A) MILD FORMS.

(*Rubeola Benigna.*)

MEASLES WITHOUT CATARRHAL SYMPTOMS (MORBILLI SINE CATARRHO).

A form of measles has been described in which the catarrhal symptoms are slight or entirely absent (Harris: - *Lancet*, Feb. 21, 1891); and as there is usually less fever or other concomitants of the prodromal stage, this variety of attack is sometimes termed MORBILLI SINE FEBRE or MORBILLI APYRETICA. Such cases, nevertheless, though at first sight unimportant, are not so - as they are, in spite of their mildness and imperfect development, genuine cases of measles in other respects of the ordinary type.

MEASLES WITHOUT ERUPTION (MORBILLI SINE ERUPTIONE, MORBILLI SINE EXANTHEMATE, or MORBILLI SINE MORBILLIS).

Just as in the case of variola and scarlatina, measles is sometimes encountered bereft of its characteristic eruption. Such cases, necessarily rare, are described by numerous writers - particularly by the older ones, who devote considerable space to describing what many nowadays are inclined to regard as a very doubtful or abstract quantity. The writer candidly admits that, in the course of a somewhat extensive experience of the disease, he has never seen a well-marked instance of this variety; but as it is often referred to in the literature, a detailed description of the clinical anomaly in question is certainly demanded at this juncture. Thomas holds that the affection is often diagnosed than is justifiable, but adds that "this form of the disease may be diagnosticated in persons previously unattacked, if in a single case, during an epidemic of measles, the

characteristic mucous membrane symptoms together with fever appear and become exactly as much developed as in measles with an exanthem, so that we have ground for assuming that this symptom alone is lacking from a normal course". In order to accurately recognize the presence of measles without eruption, Bohn (Gerhardt's Handbuch, p.307) states that the enanthem should be carefully sought for and examined; and also that if this fragment of the eruption at least is always to be found, the case in question cannot, of course, be diagnosed as morbilli sine morbillis. What usually is considered as appertaining to this variety is when, even in primary attacks, a case is encountered where the disease runs its ordinary course, in respect to catarrhal symptoms and fever, up to the time when the eruption should appear and then comes to an end without showing either an eruption or the fever characteristic of the eruptive period. Such a case would therefore be distinguished by the presence of the first half of the regular measles pyrexia from others which present an irregular course of temperature. According to Embden (Quoted by Williams:-- Art. "Measles" in the Twentieth Century Practice of Med., 1898, Vol. xiv., p.133), no less than 20 out of 461 cases of measles (4.3 per cent.) studied by him in Heidelberg failed to display any eruption; most of them were mild, and severe manifestations were extremely rare. The lack here, as when elsewhere reported, of individual descriptions demands that such instances should be accepted with considerable reserve. So far back as the time of Webster (1773 and 1783) and of Rush (1789), cases of the disease were reported devoid of eruption anywhere, unless perhaps a trifling rash about the neck and thorax. The Parisian epidemic of 1850 is said to have included cases similarly characterized. The cases of measles without eruption reported by Rilliet (loc.cit., p.249) happened to be very severe, and occurred in a child of twenty-one months of age infected from two others in whom the disease had run a normal course. The fever and concomitant catarrh were observed to be of the ordinary kind; but, instead of the expected eruption developing, a double lobar pneumonia appeared on the fourth day and spread very rapidly, the child dying on the eighth day of the disease. Desquamation has even been stated to occur in non-eruptive cases, as witness the affirmation by Seitz (Med. Corresp. Bayer. Aerzte, 1844, No.12, p.181) that a few times he saw cases presenting all the characteristic symptoms of measles, except that no eruption was visible on the skin but were followed, nevertheless, by (partial) desquamation. In such an instance, however, where the skin affection was sufficiently severe to cause desquamation, the eruption had probably been overlooked during examination of the patient.

IRREGULARITY IN ORIGIN AND SPREAD OF THE EXANTHEM.

As already stated, it is the usual thing to find the eruption of measles spreading successively over the face, chest, neck, abdomen, arms, legs, etc., but nonetheless a departure from this normal and diagnostic progression is sometimes observed. Instead of breaking out

upon the face, the rash may first be seen upon some distant part of the body. Thus, if the patient has been lying for some time on one side, it may commence upon that arm; if ointments or plasters or lotions have been applied to the chest, it may present itself first in that region; if any part of a limb is compressed by tight bandages or articles of clothing, the rash may make its appearance at that spot. Again, in cases in which the eruption appears upon different parts of the body in regular order, it perhaps is very imperfectly developed. Thus, its presence may be confined to the face and trunk, no trace of it being seen on the limbs - this being, moreover, observed chiefly in cases of spinal disease in which the rash is often altogether - or at any rate very nearly - absent on the paralyzed lower extremities. In some cases of measles also, independently of the presence of any other disease, the exanthem is almost limited to the face and neck, the spots being so sparingly distributed over other parts of the body that they can be easily counted; and this is observed chiefly when an epidemic is either beginning or just about to subside. Formerly much weight was attached to the import of irregularity in location and order of the eruption in measles. Thus, according to Hensch (Vorles. über Kinderk., 3rd Ed., p. 671), when the rash, instead of spreading from the face downwards towards the feet first breaks out upon the chest or back and then develops irregularity in all directions, from this point the course of the disease is very apt to be unfavourably influenced by complications or by previously existing general bodily weakness; but this sign, however, does not exist in all cases. It is now generally believed that, no matter where the cutaneous lesion appears, or how spread, the course of the disease is quite uninfluenced thereby. Trivial causes may determine this, and any local irritation, such as tight bands, may occasion the first appearance of the spots on the part in question.

VARIETY IN THE DURATION OF THE EXANTHEM.

The eruption - especially when the catarrhal symptoms are of extraordinary severity - not infrequently remains visible for a week or ten days; but in such cases, however, it usually undergoes certain changes in colour - the original yellowish or brownish-red colour passing into a bluish or dark-brown tint, which same no longer fades on pressure. These spots of pigment are not infrequently observed in patients suffering from some other eruption, such as eczema, lichen, scabies, or pityriasis; but if the skin were previously healthy, these spots must be regarded as being due to the presence of some severe internal disease.

RECESSION OF THE ERUPTION.

It occasionally happens that one comes across a case of what is termed the RETROGRESSIVE FORM OF MEASLES i.e., a variety of the disease in which the rash prematurely disappears or suddenly fades, either when it should be spreading further or when at its height; this, according to the lay mind, drives the poison from the skin to the internal organs, as it were, by a metastasis to the internal parts. This theory, however, cannot be

substantiated by facts: for internal affection is always present before the retrogression of an eruption even, showing that this is the cause and not the effect of the disappearance of the rash. The cause of the phenomenon lies probably in either (1) the fact that when the general circulation is seriously interfered with - usually in consequence of the extension of the catarrhal inflammation to the small bronchi and the secondary involvement of the lungs - the blood supply is diminished; the latter becomes paler all over, the spots of rash which were previously outlines grow less distinct but still visible, and both the eruption and the skin in general take on a somewhat bluish tinge; or (2) that the contagium of an acute infectious disease circulating in the blood of the tissues may be stored up in one or other of these according to its individual proclivities, when sooner or later it is excreted or rendered inert as a result of the activity of the cells with which it comes into direct contact; in measles the effects of the poison are seen in the skin and mucous membranes, in which tissues it is also probably destroyed - the infectious stream being conveyed in both directions: first, as a rule, to the mucous membranes, and then to the skin; the inflammation of the former, however, is not usually in the least decreased by the outbreak of the exanthem; and it is still further conceivable that under certain circumstances a larger proportion than usual of the poison may be diverted to the mucous membranes, causing an excessive inflammation of this tissue, while the skin is left comparatively uninfected. The important point to be noted in this connection is not so much the so-called retrogression of the eruption, but rather how much it spreads at the time severe respiratory symptoms have begun to manifest themselves, the latter sometimes appearing very early in the course of the disease. The question, however, must remain somewhat open, and only the future can decide it: for it is evident that the circulatory disturbances in the skin dependent on the bronchitis can curtail the action of the measles poison on the skin only, as manifested by the less severe reaction of the latter than normally occurs. It is not a question, therefore, of the poison already present in the skin being driven out of it, but of the exclusion from this tissue of part of the quantity which ordinarily is carried in it. The disappearance of an eruption rapidly is not by Thomas considered indicative of the occurrence of some complication. "I have never had", he says, "an opportunity to convince myself of the connection of a speedy fading of the spots with the sudden occurrence of a complication. A simple rapidly progressing paleness of these can certainly not be considered anomalous".

RELAPSING MEASLES.

In rare instances, and after the eruption has disappeared, a second attack or relapse is said to sometimes occur: this is most usually the case at the end of the second week, and is accompanied, moreover, by elevation of the temperature and a return of the catarrhal symptoms. The literature contains several instances

of this, as the writings of Feltz (Gaz. Hebdom. de Méd., 1896, Nos. 84, 87), Fischer (Corresp. Bl. f. Schw. Aerzte, Sept. 15, 1898), Lemoine (Bull. Méd., Jan. 1 & 8, 1896), Roger (loc. cit., p. 294), Sévestre (Bull. Méd., Jan. 1 & 8, 1896), Lippe (Quoted by Thomas: -loc. cit.), Löschner (Jahr. f. Kinderh., 1868), and Spiess (Frankf. Jahr. über die Verwalt. des Med. Wes., Kranken., 1867, xi., p. 40) testify. Trojanowsky (Dorpat med. Zeit., 1873, iii) describes another form of relapsing or recurrent measles in which the primary exanthem is slight, and accompanied by high fever lasting from six to eight days, followed by an interval of normal temperature lasting about eight days. This, however, may have been nothing more than relapsing fever accompanying measles - a common finding in countries where the former is endemic. And many of the so-called relapses of measles are doubtless systematic disturbances induced by complications or attacks of rubella only, rather than re-intoxications of the system by the *contagium vivum*.

VARIETY IN THE APPEARANCE OF THE EXANTHEM.

Morbilli Laeves. - This is the form usually described as typical, and it is the only one observed in connection with the vast majority of epidemics.

Morbilli Papulosi. - This form of measles in certain epidemics replaces the usual variety; and in it there appear dark-red or reddish-brown points or papules, the size of a millet seed, containing pigment, and seated at the mouths of the hair follicles. In such cases the rash is at first apt to be mistaken for variola, than which, however, it is much *dar ker*.

Morbilli Vesiculosi vel Miliaries. - Here the mouths of the hair sacs, from being filled with fluid exudation become raised, and form delicate and transparent miliary vesicles, giving to the skin a peculiar appearance resembling that seen in miliaria; and it is probably moreover, that in these cases the peculiarity of the eruption is in part produced by the same cause to which is attributed the formation of the vesicle of miliaria - being due either to profuse sweating or pyaemic infection.

Morbilli Conferti vel Confluentes. - In this variety of eruption the spots, as expressed by their name, are either crowded together or confluent, the result of the formation of papules in such large numbers that the intervals between them are reduced to nothing, or exist only at the time of outbreak of the eruption. As a matter of fact, moreover, there subsequently appear continuous red patches of considerable extent, but strictly circumscribed, and with deeply indented margins - the same being observed chiefly on the face, back, and limbs. Even in these cases, however, the real nature of the disease can always be determined: for at some point or other some spots can be found at which the eruption is of the ordinary kind and consisting of distinct maculae: even in the youngest infants, the rash never covers the entire skin uninterruptedly. To this form of measles is to be ascribed the "exanthema hydridum" of Schonlein, named by him "rubeola", in which

a scarlatinous rash is associated with the concomitant symptoms of measles.

Morbilli Haemorrhagici.- This variety of the disease has already been fully described on a preceding page.

MIXED EXANTHEMS.

Before leaving the subject, it should be noted that there are certain minor varieties consisting in the combination of other acute or chronic skin affections with the rash of measles. Susceptibility to the contagion of measles is by no means restricted or negatived by the existence of some chronic skin disease: for children suffering from such are observed to contract measles with as great facility as without it. In these cases the pre-existing skin affection disappears for a time, but only whilst the rash of measles is out, and desquamation is usually very abundant; but this does not, however, prevent the return of the chronic skin affection which, on the other hand, is apt to prove even more serious and infractable than hitherto. Scarlatina and variola have both been reported as existing with measles, but obviously here the diagnosis of the latter will be somewhat difficult and uncertain. Bullae and wheals are common enough with measles in addition to the rash thereof, which latter is sometimes accompanied by erythema. This is, however, of a very evanescent nature - due probably to the patient being kept too warm; and can be easily determined from (1) its irregular mode of development and of involution, (2) from its arising at any stage of the disease, (3) its being unattended by febrile disturbance, and (4) by its not spreading completely over the entire skin. It is, still further, more apt than not to appear in patches on the chest and abdomen, as well as on the limbs; and after one or two days it disappears without having perceptibly modified the pre-existing exanthem or leaving effects behind. The rubeola Schonleinii - the hybrid scarlatiniform exanthem referred to above - is in all probability an eruption of this kind, appearing during the eruptive stage of measles - the more so as it is never epidemic, being invariably encountered in the sporadic form.

(B) SEVERE AND MALIGNANT FORMS.

(Rubeola Maligna.)

That certain forms of measles may take on a malignant tendency is the experience of almost everyone. Edgar (loc.cit.), in his report of 423 cases of the disease, states that 103 were of the malignant kind, 7 of them dying from complications. These cases are usually found amongst the debilitated living under adverse conditions, and exposed to vicissitudes of season and weather. Thus a malignant form of the disease is common amongst soldiers and others living in tents: hence the designation of "camp measles" which this variety receives.

The variety already described, in which the eruption spreads over the entire skin simultaneously, though regarded by some as of a malignant type, is not so, as it does not appreciably influence the death-rate and is common enough in children.

Retrogressive Measles.- This variety has been alluded to already; apart from the recession of the eruption, it is apt to be of some severity - not of necessity through the disappearance of the exanthem.

Typhoid or Ataxic Measles.- This variety occurs in certain epidemics, especially in the case of persons existing under bad hygienic conditions, and particularly amongst troops on the march or suffering the hardships of a siege. Amongst these the symptoms partake of an exceedingly alarming character - being accompanied by hyperpyrexia, a quickened pulse, accelerated respiration, dryness of the tongue and lips, diarrhoea, anuria, convulsions or delirium, prostration, and followed by death in the comatose condition about the third or fourth day of the eruption. On the other hand, however, the symptoms may subside, and recovery be uninterrupted.

Suffocative Measles.- The word suffocative is used to indicate the class of cases in which the brunt of the attack falls upon the respiratory organs, producing thereby a severe hacking cough (even in the prodromal stage) or cyanosis; mucous râles are in evidence from the first and daily intensify - so that (especially in children) the affection is apt to merge into one of capillary bronchitis with, in them, death from heart failure, and in adults from syncope. As might be expected from what has already been noted, in this - as in other visceral affections - the eruption assumes the retrogressive form.

Haemorrhagic Measles.- Haemorrhagic or "black measles" (*Morbilli Haemorrhagici*), concerning which a good deal has already been said, exists in two forms: in one, the mild form, the haemorrhage seems to have little or no influence upon the disease; in the other, the contrary obtains and the patient **exceptionally** only is known to recover. These varieties merit separate description:

(1) Mild Haemorrhagic Measles.- According to Holt (loc. cit., p. 915), who reports it in 5 per cent. of all his cases, and Edgar (loc. cit.), who encountered it in 47 per cent. of his observations, this variety of measles is a common one: but more so in some epidemics than in others. The disease is of very sudden onset, the appearance of the cutaneous discoloration being the first special phenomenon to attract attention. The rash now assumes a purplish tint which does not disappear on pressure, and the pigmentation is either confined to the spots or appears in the form of numerous dots or petechiae - in size from a pin head to a lentil - in the sound skin between the maculae. The extravasations may be confined to either the lower limbs or the trunk - the arms, neck, and head remaining free; but more often the whole body assumes a bleeding tendency, as also the mucous surfaces, causing epistaxis and haemorrhage from the gums and rectum and genito-urinary tract. In spite of this, however, recovery usually occurs (the lesions gradually resolving), but convalescence may be protracted; or, again, the disease may merge into the malignant type of the disease.

(2) Malignant Haemorrhagic Measles.- This variety seems to have been common enough two centuries ago, but is seldom encountered nowadays, owing, it is believed, to general improvement in social and hygienic conditions. Even now, however, in those specially predisposed to it

by the haemorrhagic diathesis, it may be observed, and its possibility in such must therefore not be overlooked. It usually makes its appearance during the prodromal stage in the form of a severe nose-bleed, which with other haemorrhagic symptoms (of which there may every grade of severity) become worse as the eruption appears; which latter, again, is apt to assume the retrogressive form on the second or sometimes on the first day, leaving in its place a variety of cutaneous maculations of any hue from purple to black. With this there is great prostration, as well as muscular weakness, as well as abolition of the control of the sphincters perhaps, with haemorrhages from the gums and bowels and genito-urinary tract. The usual symptoms of profuse bleeding are manifested by the altered condition of the pulse and respiration; and the patient usually dies in a state of collapse within forty-eight hours from the onset of these phenomena.

Severity of Type and How Occasioned.

Certain writers seem to attach great importance to errors in diet and treatment as etiologic of a severe attack of measles - basing their opinion upon observation of the greater severity of type of the disease in former times, but losing sight, nevertheless, of many of the epidemics in question having been really those of scarlet fever, unrecognized as such perhaps through faulty diagnostic procedure: others, again, were undoubtedly those of rubeola. And from the careless way we know the disease to have been treated two centuries or more ago, the etiological interpretation of the factors mentioned, as regards malignity of type, must be apparent. A well-known instance of this appears in the records (Sigaud, p. 111) of the epidemic of measles which occurred (1) amongst the natives on the banks of the Amagon, in 1749, where the number of deaths amounted to 30,000, whole tribes being annihilated; (2) in Astoria, in 1829, where about one-half of the natives succumbed to the disease (Moses); (3) amongst the Indians of the Hudson Bay Territory, in 1846 (Smellie); (4) amongst the Hottentots at the Cape, in 1852 (Scherzer); (5) amongst the natives of Tasmania in 1854 and 1861 (Hall); and (6) in Maritius and the Fiji Islands in 1874 (Lancet, June, 1875, p. 865). Regarding the last two epidemics, it appears that the great mortality was in great measure due to the fact that the sick were exposed to the most unfavourable conditions. Unprotected from exposure, unattended and untreated, chiefly in consequence of their own unhappy prejudice, every complication of the disease must have been invited and rendered intense. In accordance with this view, it was found that those classes of the native population over whom adequate supervision could be exercised suffered only slightly. The same facts were reported by Smellie in the malignant epidemic of 1846 among the natives of the Hudson Bay Territory: of all those who were received into Fort York, and who there receives medical treatment, not one died. Much the same is apparent from the report by Squire (Med. Times & Gaz., Mar., 1877, p. 323) of the destructive epidemic of measles in the Fiji Islands, which was known to have been introduced from Sydney by the suite of King Kakoban, and which

carried off 20,000 of the natives, or one-fourth to one-fifth of the entire population of the Fiji Group. Squire, treating of this famous epidemic, remarks that the favourable progress of the early native cases negatives the idea of any special proclivity. Cruikshank, who treated 143 of the native police, reported only nine deaths, most of them resulting from evasion of needful precautions. Later in the epidemic, when it was observed to possess a virulence equal to that of plague, the natives, terror-stricken, abandoned their sick; and only one death occurred amongst a number of cases treated in separate rooms with satisfactory attention. The natives chose swampy sites for their dwellings; and whether they kept closely shut up in huts without ventilation or rushed into the streams and remained in the water during the height of the illness, the consequences were equally fatal. Squire further adds that the excessive mortality resulted from terror at the mysterious seizure, and from the lack of the commonest hygienic ideas during illness; that thousands were carried off from defective care and nourishment, as well as by dysentery and congestion of the lungs; and that no special susceptibility of race or peculiarity of constitution can be regarded as sufficiently explanatory of the frightful mortality. Further proofs of the disastrous influence of unfavourable hygienic conditions upon the type of measles are to be found amongst civilized peoples. Thus, during the epidemic which prevailed in 1866 amongst the Confederate troops at the time of the American Civil War, there were 1900 deaths out of 38,000 cases of measles. In the course of the official report of this epidemic (Medical History of the Rebellion, Phila., 1865, p. 127) it is stated that the disease resembled ordinary measles in adults, except when aggravated by the effects of crowd, poisoning, or other depressing influences; and also that in two large hospitals the mortality amounted to 20 per cent of the inmates. Another instructive example is afforded by the epidemic which prevailed during the siege of Paris in January, 1871: out of 215 of the Garde Mobile who contracted measles, 86 (40 per cent.) died. The mortality reached very nearly the same figure among the French troops who returned to Paris after the Italian War - 40 out of 125 cases dying in one hospital (where the sanitary conditions were of the worst possible kind), and with severe intestinal symptoms (Laveran: - Gaz. Hebd. de Méd., 1861, No. 2). Again, with reference to the virulent epidemic of measles amongst the troops of the National Army of Paraguay, it seems that the disease carried off, at the beginning of the Brazilio-Paraguayan War, nearly one-fifth of the National Army in three months - not from the severity of the disease, but from want of shelter and proper food (Masterman).

C O M P L I C A T I O N S A N D S E Q U E L A E .

GENERAL CONSIDERATIONS.

Measles is said to be complicated when any of the symptoms observed during its regular course become so severe as to constitute an independent affection. They must necessarily greatly modify the development of the disease, or delay or retard its progress. Complications are commonly observed in all epidemics: Haig Brown (loc. cit.) in 60 cases of measles had complications and sequels in 48. The more important complications retard the patient's recovery from the disease, and may give rise to grave conditions continuing for an indefinite period, and then constituting sequelae. There are three main factors which can be regarded as general causes of complications - viz., individual peculiarity, the surroundings of the patient, and epidemic peculiarity. Regarding the first-mentioned, - an individual, the susceptibility of whose system is of a suitable kind for the germination and development of the measles contagion, is particularly liable to complications - especially inflammatory lesions of the larynx, trachea, and lungs. The same morbid tendency is observed in the case of persons of a tuberculous or scrofulous diathesis. Under the heading of surroundings it may be noted that defective sanitation, careless or unskilful nursing, and the like may be the cause of various complications, which same do not make their appearance in those placed under more favourable conditions. Lastly, it is matter of common observation that certain epidemics exhibit a great tendency to produce complications; but the greatest variety exists in this important particular.

SKIN.

Erythema has been seen already to occur during the prodromal pyrexia; but it may also be observed at the acme of the exanthem, especially if the patient be kept too warm and the eruption is severe. Meyer-Hoffmeister observed a scarlatiniform erythema during convalescence; and Hauner frequently saw one resembling an acute lichen. The erythema may be either more or less intense and diffused over the whole body, or limited to a single region. For example, Gerhardt reports having seen it located to the region of Scarpa's triangle. It is of short duration, and fades with the appearance of the general exanthem.

In the case of children especially, and as a result of the copious perspiration, miliary vesicles are sometimes observed. They are usually to be found in greatest abundance about the neck, axilla, scapular region, and inner surfaces of the thighs - especially when these parts are covered with a profuse rash. Apart from the intense itching which they at times occasion and occasional pustulation, the general course of the disease is quite unaffected by them.

Eczema is an occasional complication, and in persons specially predisposed to it considerable trouble may eventually be experienced over its cure.

During the desquamative stage, or shortly thereafter, psoriasis may be observed - perhaps excited by the measles in a predisposed patient.

Impetigo, furunculosis, and phlegmonous abscesses may be induced by the access of micro-organisms to the subcutaneous tissues through disrupted points in the cuticle: they are, however, of somewhat rare occurrence, and seldom occasion the suppurative processes observed in the case of small-pox.

The development of bullae, in the form of an eruption on the skin and on the mucous membrane of a part, has been reported by Löschner (loc. cit.), Du Castel (Rev. Gén. de Clin. et de Thérap., Paris, 1897, xi., p. 609), Baginsky (Arch. f. Kinderh., 1900, Bd. 28, H. i., ii.), and others. Steiner (Jahr. f. Kinderh., N. S., Vol. vii., p. 346) uses the term "morbilli bullosi sive pemphigoidei" to designate the disease presenting this condition - the inaptness of which and its origination from other infectious processes have been pointed out by Henoch (Zur. Path. der Masern, Berl. klin. Woch., 1882, p. 193). Steiner reports four instances from amongst 6,000 cases of measles, and Henoch only one in the course of a lifetime. Steiner's four cases are of considerable clinical interest: they all occurred in the same family, the bullae varied in size from a pea to a pigeon's egg, they were stretched tight by their contents, which at first consisted of a clear or slightly turbid fluid of alkaline reaction, increasing in turbidity later on. The skin of the affected parts seemed little altered, sometimes showing a red border around the base of the bullae; crusts formed after the bullae burst, but there was no cicatrization. The lesion attacked any part of the body, sometimes one sometimes another, without reference to the presence of the measles eruption; of the mucous membranes, those of the mouth and nose and inner surfaces of the labia majora were affected. The bullae appeared in successive crops independent of the measles eruption, sometimes developing before the latter, sometimes at the same time or following it, but always persisting at the time of desquamation. The bullous process was accompanied by fever independent of that due to the measles infection. In Henoch's case, however, the bullae were of much larger size, so that a single one covered each cheek, and they were so plentifully distributed over the body that the epidermis was lifted up as if it were the seat of extensive burns. Henoch therefore regards the condition as due to a complication of measles with acute pemphigus, which is to be ranked amongst the infectious diseases. The literature contains a few other examples, amongst which is one reported by Romberg (Die Masernepidemie in Tübingen im Sommer, 1838), in which the skin under the bullae became gangrenous. This case possesses a special interest in that the patient recovered - an unusual happening, for the reason that pneumonia almost invariably carries off the patient.

Various parts of the body may be attacked by gangrene as a result of measles; and it generally arises when the fever has subsided. Even should it be associated with some complaint arising during the febrile stage of

the disease, it does not in any way modify the exanthem, and is therefore a sequel; the only form of gangrene which is, properly speaking, a complication of measles is that which affects the lungs.

Other eruptions are occasionally observed - especially herpes facialis in the eruptive stage; at which period also one occasionally comes across other cutaneous lesions - e.g., pemphigus, abscesses, and Zoster femoralis (Thomas: - loc.cit.).

Disseminated tuberculosis of the skin, according to Du Castel (loc.cit.), more commonly follows measles than is generally supposed; and in addition to his findings we have the sequel reported by Adamson (Brit. Jour. of Dermatol., 1889, p.20), Haushalter (Annal. de Derm. et de Syph., 1898, T. ix., No. 5, p.455), and others - the inoculation of guinea-pigs with portions of the lesions by these observers giving rise to tuberculosis in these animals. The malady has a tendency to be widespread, attacking the face and upper extremities, as well as the trunk and legs (but to a minor degree) - appearing in the form of small and deep-red nodules, which later present larger patches the size of a shilling-piece. These are due to the coalescence of the original nodules, which latter, early in appearance, are observed to assume a more or less chronic tendency, and after absorption leave the characteristic cicatrix of lupus.

Urticaria, together with herpes and the other dermatoses already noted, is a common result of the early irritation of the nerve centres in measles by peripheral stimulus from the digestive tract. Claus (Jahr. f. Kinderh., June 5, 1894) reports two cases of the malady appearing during the incubation period of the disease.

MUCOUS MEMBRANES.

The various alterations arising in these structures as a result of measles have already been considered elsewhere.

EYES.

It is a well-known fact that the eyes are frequently affected in measles: indeed, conjunctivitis appears to be a regular feature of the disease, and when severe may lead to various serious structural alterations. It is of the utmost importance therefore that these parts receive painstaking attention during the entire course of measles. Eversbuch enumerates the various complications that may arise, and to the following effect: (1) Blepharospasm, in consequence of a highly developed photophobia: this may give rise to subsequent myopia. (2) Inflammation of the lachrymal gland, with its usual symptoms. (3) Hyperaemia of the conjunctiva and catarrhal conjunctivitis: this lesion is characteristic of the measles infection, but not infrequently persists after the latter has subsided and takes on a severe form. (4) Necrosis of the cornea and central purulent infiltration: these lesions are ascribed to poor circulation and bacterial embolism, or to the implantation of bacteria from without on the cornea, which in its reduced state of nutrition offers a favourable site for their growth. (5) Marginal ulcers of the cornea, which are apt to be very stubborn to treatment. (6) Weakness of accommodation, paralysis or spasm of the ocular muscles. (7) Affections of the optic nerve, taking the form of

amblyopia or amaurosis - atrophy of the nerve developing at a later stage.

EARS.

The inflammation of the nose and pharynx, so constant in measles, may extend along the Eustachian tube, and so reach the middle ear - carrying along with it the pyogenic bacteria streptococcus pyogenes, and the staphylococcus albus and aureus. Should the patient remain in the recumbent position, the free escape of accumulated secretion becomes retarded, leading to the development of a highly virulent and infective pus; and this condition of otitis is perhaps, next to the laryngeal and pulmonary lesions, the most serious of all the complications of the disease. As a rule, the following are the most common aural complications of measles:

(1) Acute catarrh of the middle ear: this is the form most commonly observed - it being seen in a large percentage of cases in some epidemics, sometimes developing early in the disease, but usually not until the stage of desquamation. (2) Severe purulent otitis media: this is not at all a rare complication. (3) Necrosis of the Labyrinth from invasion of cocci, resulting in a serious loss of function: it is, according to Burkner (Behand. der bei Infectionskr. Vorkomm. Ohr affectionen, p. 581), far more common than is generally supposed. The occurrence of aural complications may entirely escape notice until actual suppuration has taken place. On the other hand, however, the patient may complain of intense agonizing pain in the ear, accompanying which is great restlessness, grinding of the teeth, and sudden cries in children, with, in the case of adults, delirium. As a rule, the aural mischief is noticed about the end of the second week of measles, although, as Tobeitz (Quoted by Willaims: - loc. cit.) insists, it may be recognised post-mortem as early as the first day of the cutaneous eruption, and is usually well marked by the fourth day of the fever. Auroscopy usually reveals in these cases signs of myringitis - the tympanic membrane being lustreless, with a yellowish point at its lower segment indicative of subjacent pus. Should bulging result, the drum not infrequently ruptures - an occurrence in these cases to be hoped for, as allowing of the evacuation of the pus and preventing the extension of the septic process inwards. At the necropsies of 16 cases of otitis media, Bezold (Munch. med. Woch., 1896, Nos. 10, 11) found the tympanic cavity to be filled with muco-pus - in a few extending to either the mastoid antrum or the mastoid cells, in one case with necrosis of the Eustachian tube, and in all with intense congestion of the aural mucous membrane and haemorrhages here and there. The involvement of the Eustachian tube (and its early closure) is a serious matter, being productive of mortality from retention of sepsis or extension to the antrum or mastoid cells, with cerebral extension resulting in meningitis, cerebral abscess, and pyaemia - the same being in the case of children facilitated by patency of the petro-mastoid suture allowing of free access of pus to the cranium from the middle ear. Downie (Brit. Med. Jour., 1894, Vol. ii., p. 1163) states that in 501 cases of

tympanic disease measles was responsible for 131, or 26.1 per cent. The occurrence of cerebral extension is manifested in these cases by the patient lapsing into a comatose condition from which he may not rally, a happening to be carefully guarded against, but unfortunately not always possible, as the otitis of measles is singularly lacking in the pathognomonic signs of aural disease. The fact that permanent deafness or, short of that, impairment of hearing may result has been noted above, and it is an established phenomenon. Addison (Deaf-Mutism: A Clinical and Pathological Study, Glasg., 1896) states that of 1410 deaf-mutes in Great Britain 138, or some 9.8 per cent., were traceable to measles; in American institutions, of 1673 cases 53, or 3.1 per cent., and on the European Continent 84, or 4.2 per cent., have arisen from the same exanthematous affection.

NOSE.

Catarrhal inflammation of the nasal mucous membrane is a common enough complication in measles, but it need occasion no alarm, as it is of a trivial nature usually. In the case of infants, however, this part of the respiratory tract may become occluded, and so give rise to the pernicious habit of mouth-breathing with a resulting nutritional defect.

Epistaxis, or nose-bleed, appears to be fairly common during the time that the exanthem is prominent - especially perhaps just when it is appearing - and being usually slight and relieving headache, is really rather salutary than otherwise. Should, however, the epistaxis be part and parcel of the haemorrhagic diathesis, the matter becomes much more serious, and has even been known to terminate fatally.

Specific micro-organisms of a pyogenic nature may, of course, gain access to the nares as in the case of other parts of the abraded mucous membranes: this is uncommon; and a marked distinction from similar processes in scarlet fever lies in the infrequency with which the pharyngeal lesion in the case of measles spreads into the nose.

PHARYNX.

To some degree or other, the pharyngeal mucous membrane is invariably involved in measles, and the eruption which occurs thereon has received much discussion at the hands of various writers. It may be specially noted here, however, that the inflammation nearly always remains superficial and simple, although other complications have been observed - the most important of all being diphtheritic inflammation. This but seldom extends to the larynx - one instance being reported by Embden (loc. cit., p. 20) amongst 10 cases of pharyngeal diphtheria noticed amongst 461 cases of measles. It is only in severe epidemics that complications of this kind are observed at all.

LARYNX.

Laryngitis, in the case of children especially, is met with as a common and dangerous complication of measles, and in one or other of three forms: (1) Spasmodic laryngitis, or "false croup", is the most common of the laryngeal complications of infants - the peculiarity being the minor degree of inflammation in association with a disproportionately great muscular

resemble a bark, and have with it a whistling inspiratory sound. The spasm occasioned by attempts at swallowing are frequently alarming, but only for a time, as with the ripening of the exanthem the condition quickly subsides. (2) Acute phlegmonous laryngitis is a variety of laryngeal lesion in which the inflammatory process is much more severe, and the patient is unable to phonate beyond a whisper. From even this he refrains, owing to the great pain attending the procedure. Palpation is likewise painful, and the expectoration is usually blood-stained; but the cough is either entirely absent, or much less troublesome than in the former variety. Laryngeal ulceration and gangrene not infrequently follow, resulting in necrosis and destruction of the vocal cords, and, in rare cases only, fatal oedema of the glottis. (3) Membranous laryngitis, or croup, occurs as a complication chiefly in children - mostly under three years of age - living under conditions of overcrowding and sanitary defects. It is characterized by the formation of a grayish-white false membrane on the laryngeal lining (due, it is supposed, to infection by pyogenic micro-organisms, more especially the streptococcus), which may extend upwards to the fauces or downwards into the trachea. This complication makes its appearance any time from the fourth day up to the end of the second week of the eruption; and it is attended by a peculiar shrill cough, voice-whisper, paroxysmal dyspnoea, which may or may not destroy the patient by asphyxia. Granlou (La Revue de l'Hospice des Enfants Assistés, Paris, 1892, iv.), at the Parisian institution parenthetically named, found amongst 1633 cases of measles the condition in 235, with a mortality of 218; amongst the 1398 cases which escaped membranous laryngitis, the deaths amounted to only 388.

Diphtheria. This affection in its relation to membranous laryngitis is still at times a matter of dispute: the latter is due, as already noted, to pyogenic cocci, the former to Klebs-Loeffler's bacillus. Adriance (Arch. of Ped., Feb., 1900) states that 36 out of 96 cases of measles in the Nursery and Child's Hospital of New York suffered from this complication, with a mortality of 4. Instances are described by Speiss, Abelin, and others, from which one may take it that the course of the disease is that of simple primary diphtheria. It may, when starting in the tonsils, remain thereabouts, or spread from thence to the larynx and trachea, and even into the bronchi; or it may begin at the larynx and extend upwards and downwards, or affect this alone, and so on. According to Rothe, it can, if of moderate extent, lead to slower or less speedy recovery, while it usually proves fatal if the air-passages are early implicated. Diphtheria usually appears at the acme of the measles eruption, or soon thereafter; and in mild cases it apparently exerts no influence upon the character of the rash. In severe cases, however, while the air-passages are greatly affected and the appearance of the diphtheria is temporarily coincident with that of the exanthem, the latter becomes changed as in the case of broncho-pneumonia, which then, moreover, generally sets in as a further complication. The normal

course of the pyrexia of measles being affected by every severe complication, it is no matter of surprise that with the onset of diphtheria the temperature shows marked and protracted elevation. The condition can be recognised by the actual symptoms - e.g., macroscopic phenomena, cough, hoarseness, and the consequences of the narrowing of the lumen of the larynx or other adjacent parts. In New York City, from the fact of diphtheria being endemic, it is the invariable rule, especially in large institutions, to consider every persistent case of laryngeal stenosis as diphtheritic - with the result that it is the established custom in these institutions to give immunizing doses of antitoxin (200 to 500 units) to infants and young children in the prodromal stage of measles; and the great lowering of the death-rate thereby seems to have amply justified the procedure in question. Before leaving the subject, however, it may be noted that diphtheria affects other parts in measles besides the throat and larynx. Thus, Mason records diphtheria of the eyelids; Hauner, the same affection in the conjunctiva; Schreiber, of the prepuce and female genitals; and Ravn and Aerstrup, secondary diphtheria of the nose, oesophagus and eyelids, with parenchymatous nephritis as an outcome thereof.

LUNGS.

Bronchitis in moderate degree seems to be a symptom of measles; but not seldom it becomes so severe that it deserves consideration more than the parent disease does, and is then to be regarded as a dangerous complication. Still oftener it is a sequel, and continues after other symptoms have disappeared, being the cause of the persistence of the fever for a considerable time. In infants it may prove fatal, principally by producing collapse of the lungs. There are two forms of the disease - viz., phlegmonous and capillary bronchitis. (1) Phlegmonous bronchitis is a variety which attacks by preference young strumous persons, and consists in a subacute inflammation of the trachea and larger bronchial tubes, which may continue long after the measles has been recovered from and not infrequently culminates in tuberculosis. (2) Capillary bronchitis constitutes a much more common and serious complication of measles, and occurs by preference during the eruptive stage of the disease. It is recognised by a continuance of the pyrexia after the fading of the rash, or by headache, vomiting, chills, elevation of the temperature, severe cough, frequent and impeded respiration, followed in due course by dyspnoea and prostration. The physical signs are those common to the condition arising under any circumstances.

Bronchopneumonia constitutes by far the most frequent and fatal of all the complications of measles. Houl (Wien. klin. Rund., 1897, Vol. xi., p. 833) reports its occurrence in one-fifth of all his cases; and Holt (loc. cit.), during two epidemics in the Nursery and Child's Hospital of New York, embracing 300 cases, in 40 per cent., of which 70 per cent. died. Bartels saw it in 68 out of 573 cases of measles, or 11.9 per cent., and Embden in 27 out of 461 cases, of 5.9 per cent. Numerous other observers report somewhat similar findings. It

seems to be particularly common in foundling institutions and asylums; and bacteriological investigation has demonstrated its origin in the micrococcus pneumoniae of Fraenkel and the pneumococcus of Friedlander. With the appearance of broncho-pneumonia the eruption of measles disappears, in addition to which chills, rigors, pyrexia and weakness and irregularity of the pulse are observed. The respirations become short and frequent, the cough hacking or spasmodic and uncontrollable, attending which will be the usual signs of the adynamic state and developing pneumonia. It is especially important that an incipient pneumonia be recognised. Amongst the signs which may be regarded as suggestive are the following: (1) Apathy, with mental dulness and prostration, and toxæmia. (2) Pyrexia, increased beyond the normal morbillous curve. (3) Disturbed pulse-respiration rate - the normal being 1 to 4, or 20 to 80, with a temperature of 99. F. The ratio in a developing pneumonia may be, for instance, 1 to 3, with a temperature of 104. F., the respirations rising to 40 and the pulse to only 120. (4) Râles, fine and localized, in addition to the coarse ones of general bronchitis. (5) Diminished respiratory murmur over the affected portion of the lung. (6) Broncho-vesicular respiration. (7) Dulness on percussion. After the development of the complication, the symptoms and physical signs in no way depart from the classic. It may be noted, however, that in young children its commencement is acute, with rapid pulmonary congestion, terminating fatally within two or three days, and that in older children or adults the pneumonic affection usually pursues a more subacute course, is more frequently of the lobar variety, and sometimes leads to the so-called caseous pneumonia or pulmonary phthisis.

ALIMENTARY TRACT.

The mucous membrane of the alimentary tract is frequently the seat of important complications, of which simple ulcerative and aphthous stomatitis and glossitis are rare, but gingivitis more common (Dustvel, Weil, Thore, Hartmann and Pank). Mertens reports in infants the occurrence, upon the lips and gums and tongue, of a thrush-like pseudo-membranous affection, occasioning so great a rigidity of the tongue as to interfere with suckling. Increased salivation, on the authority of Brichsen, is occasionally encountered during the prodromal stage, as well as in the eruptive. Weil reports stomatitis and, with Heyfelder, the occurrence of parotitis. Before the appearance of the eruption, severe parenchymatous tonsillitis, giving rise to intense dysphagia, may be observed. Severe gastric affections are rare; but intestinal catarrh, of varying severity, is very frequent. Indeed, it is extremely difficult to know exactly when a mild diarrhoea ceases to be merely that and becomes a complication: for it is probable that in measles the intestinal mucous membrane participates normally in the general congestion of the skin and superficial mucous membranes. Thus, diarrhoea begins very frequently in the prodromal stage, or on the first day of the eruption, not so often during the same, and least

frequently during the stage of retrogression, though these last cases are apt to be most severe. The diarrhoea begins with or without previous indigestion, is painless or at times associated with colic, and passes rapidly and harmlessly away; or, especially after laxatives have been used for preceding constipation, it may last with great violence for even a week or more. In the case of young children - in whom, moreover, these intestinal complications are most frequent - death may ensue even in mild epidemics; and this occurs especially under the influence of hot weather, with gradual disappearance of bile from the stools and the appearance of even true choleraic symptoms. Or, again, if the large intestine be especially attacked, a dysenteric or mucous character manifests itself in the stools, accompanied by much tenesmus. Occasionally, however, one reads of severe epidemics in which, even in winter, and also in adults, a fatal result appears to have been due to intestinal complications, or where - short of fatality - the same seriously threatened the life of the patient. As a rule, the intestinal affection, since it seldom depends upon marked anatomic lesions, heals soon after the fading of the exanthem, upon the duration and course of which - as upon similar conditions of the fever - it exerts no influence except when it appears unusually early and produces by its great intensity a cholera-like collapse. The unfavourable influence exerted by the diarrhoea of measles appears to depend especially upon the fact that it lowers the vital resistance of the patient, and so renders him less potent to resist the onset of further complications. Besides epistaxis, haemorrhages also occur in the prodromal stage; and later from the rectum, and even from the kidneys and genitals. According to Roger (*Presse Méd.*, 1897, ii., pp. 189, 192), secondary infection may occur from the intestinal tract, leading to phlegmonous hepatitis, perihepatitis, and pleurisy

NERVOUS SYSTEM.

Nervous affections are unusual in measles. The frequency of the same depends more on individual peculiarity than on the severity of the attack; and in spite of the nerve centres being irritated in nearly every case of the disease, serious affections are of comparatively rare occurrence. Cioffi (*Rif. Med.*, 1900, 51-53) holds - and his theory has met with considerable acceptance - that the morbillous toxin exercises a marked influence upon the vagus nerve: when severe, at first irritating, then paralyzing it. Others, again, contend that the frequency of the various catarrhal conditions - especially of otitis media - is due to irritation of the meningeal branches of the vagus, which at first gives rise to catarrhal symptoms, and which, in turn, predisposes to simple and tubercular phlogistic affections.

Chorea would seem to be the least common of all the sequels of measles; and even when observed, its etiological association with the latter affection appears to admit of considerable doubt. Stephen Mackenzie (*Brit. Med. Jour.*, Feb. 26, 1887, p. 425) has collected 439 cases of

chorea, in which he asserts that measles was a precursor in 116 (or 26 per cent.), and that in 32 (or 7 per cent.) rubeola was the sole antecedent of the attack.

A rare complication of measles is disseminated myelitis. It most usually occurs with the development of the exanthem, after which it runs an ordinary course. In the cases studied by Williams (Trans. Med.-Chir. Soc., Vol. lxxviii., p. 57) and Barlow (Ibid., Vol. lxx., p. 77), vascular disturbances of the spinal cord were discovered at the necropsy.

False disseminated sclerosis seems somewhat more common as a complication of measles than the foregoing, and is most apt to be observed in the hyperpyretic cases. The symptoms appear at times to point to an acute ascending paralysis similar to that observed in other acute febrile disorders; and in these it is of rapid onset, and the patient may die in a state of coma. Should, however, he rally from the latter, he is apt to remain either aphasic, paralytic, paretic, or ataxic; but from these recovery is rather more common than is usually supposed. Again, the maladies mentioned may give way to a condition differing only from true disseminated sclerosis in that the symptoms are retrogressive rather than progressive, and with a marked tendency to recovery. Williams (loc. cit.) mentions paralysis of the soft palate, pharynx, and tongue and cervical muscles, which in four cases appeared at the commencement of the morbillous attack, and in four others not until after the lapse of a month - recovery in all taking place in from three to twenty days. Similar recovery was reported by Barthez and Senné (Tr. aité Clinique et Pratique des Mal. des Enfants, Paris, 1891, T. iii., p. 38), in cases in whom the paralytic symptoms appeared early in the disease, in others as sequels three weeks after the commencement of convalescence - dysphagia and dysphonia in many remaining permanently.

Hemiplegia. - Recovery from this affection is the rule, common as it seems to be. Lop (Centralbl. f. klin. Med., 1893, No. 50) considers that paralysis with or after measles may be classified in two divisions: (1) the cerebral, and (2) the spinal. Hemiplegia is, however, much less common with measles than with scarlatina. Thus, Osler (The Cerebral Palsies of Children, Lond., 1889) out of 120 cases of hemiplegia states that 4 followed measles and 7 scarlatina; and Gowers (Manual of Diseases of the Nervous System, Lond., 1888, Vol. ii., p. 423), 7 after each of these diseases. The malady is still further most likely to be observed as a sequel than as a complication: thus, of the 9 cases mentioned by Williams, it appeared during the height of measles in 4 cases, and in 4 during convalescence - the onset in one not being specified. It appears to be more common in females than in males, from the first day to the third week; and general or local convulsions often precede it.

Mental Disorder. - Insanity, of an apathetic kind, is in rare cases seen to follow an attack of measles, and it may become chronic in those predisposed by insanity, imbecility, epilepsy, convulsions, and so forth.

Beach (Brit. Med. Jour., 1895, Vol. ii., p. 707), reporting upon 2,000 cases of idiocy, states that 37 (1.85 per cent.) followed one or other of the acute exanthemata, of which measles was responsible for 11 - i.e., over 30 per cent. Bond (Maryland Med. Jour., Jan. 20, 1898) describes the occurrence of acute mania on the eighth day of measles; and Finkelstein (Vrach., No. 20, 1898) saw two cases of the same disease. Mugnier mentions a peculiar form of mental aberration immediately after the appearance of the exanthem; Christian, transitory mania with paralysis; Weber, delusions of persecution in the delirium of the collapse; and Neureutter, severe mental symptoms of a varying nature. Nearly all of these cases, however, were observed in persons of neurotic temperament.

Muscular atrophy is occasionally observed to follow paralysis. Coote (Quoted by Williams: -loc. cit.) describes it so and as leading to club-foot. Ormerod (Brain, Lond., 1885, p. 335) reports three cases of the sequel in one family, a father and two children.

Tetany. - Measles has been known to be followed by a condition of painful tonic and symmetrical spasms of the muscles of the upper and lower extremities, in the case of infants or very young children - especially in those who have previously suffered from convulsions.

Meningitis. - Cases of inflammation of the meninges of the brain have been reported by numerous observers - e.g., Speiss, Meyer-Hoffmeister, Constant, Thore, Krug, Voit, Kellner, Löschner, Bufalani, King, Mettenheimer, and Harvey (Jour. Amer. Med. Assoc., 1897, Vol. xxix., pp. 1149-1151). Starck, Frank, and Rilliet have seen measles to be followed by spinal meningitis; and Mittenheimer has drawn attention to the occurrence of tetanic and cataleptic rigidity of the limbs after the same affection.

Miscellaneous Nervous Affections. - Amongst the other diseases of the nervous system for which measles has been held responsible are: (1) Acute hydrocephalus (Kronenberg, Weil, Heyfelder, Hayden, Pheilsticker, Schallermüller); (2) Chronic hydrocephalus, aggravated by the measles attack and consequently fatal (Heinecke); (3) Universal paralysis after gangrene (Bourdillat); (4) paralytic contractures (Hennig); (5) spasm of the glottis (Zavizianos); (6) tonic spasms in the flexors of the extremities, with rolling spasms of the head, two days after the exanthem, and accompanied by its disappearance (Pinkham); (7) convulsions and eclampsia, usually with the like effect upon the exanthem at different periods of the same (Posner, Adel de Roseville, Carro, Kaufmann, Weil, Bartscher, Brachel, Fichtbauer, Bartels, Bierbaum, Trousseau, Edwards, Liverani, Brown, Jütting, Espinouse); (8) facial neuralgia with convulsions (Rilliet); (9) intercostal neuralgia (Imbert-Gourbeyere); (10) neuralgic arthralgia of the leg, with immobility of the knee as an abnormal prodrome (Köstlin); (11) and strabismus immediately after the eruptive period has passed (Bierbaum).

HEAR T.

It is but seldom that disease of this organ is observed in connection with measles, in spite of the weakening of the cardiac muscle which the febrile state occasions - from which latter, indeed, a death now and then is perhaps recorded. Sturges (Trans. Med.-Chir. Soc., Vol. lxxiv., 1891, p. 229), Lee (Ibid.), Stephen Mackenzie (loc. cit., p. 429), and others insist that the few cases on record in no way prove that measles in itself can produce heart disease. Autenrieth holds that pericarditis is not so rare as is generally supposed, though usually associated with inflammation of the lungs and pleura. Several interesting cases have been described by Berndt, Mettenheimer, Siegel, Braun, Espinouse, Majer, and Heyfelder (Quoted by Thomas:-loc. cit.). Williams describes the finding of fatty degeneration at the autopsy of a case in which the first sound had been toneless, or accompanied by a systolic murmur. Several cases of endocarditis appear in the literature reported by Martineau, West, and Köbler. Hutchinson had 4 cases of embases with mitral murmurs; and Cheadle found 2 in the archives of the Great Ormond Street Hospital. An attack of measles in one of Comby's patients - a girl of nine years - culminated in mitral insufficiency. Nevertheless, it is generally believed that this complication is somewhat rare in its occurrence, notwithstanding the contrary opinion of Sansom.

KIDNEYS.

In view of the fact of measles being a febrile affection, the occasional observation of albuminuria in that disease need excite no alarm: its infrequency and of renal complications in general will always stand as a sharp contrast to scarler fever. Baginsky, however, affirms that, if carefully looked for, such phenomena will be in future much more often encountered than hitherto. The presence of peptonuria has been reported by Loeb (Quoted by Williams:-loc. cit.) in 9 out of 12 cases examined during the height of measles, or at the commencement of desquamation. Zichy-Woinarski (Australas. Med. Gaz., Oct. 15, 1893) mentions uraemia as a sequel of measles; and ascites and anasarca have been reported in cases even where no lesion of the kidneys could be detected. Nephritis is well known to be a rare complication of measles. Reimer's statement (Jahr. f. Kinderh., Vol. x., p. 3), that he found it in 5 out of 51 autopsies on children who had died during an attack of measles, refers to a very exceptional finding, as it is probable that the lesions in question were the result of chronic tuberculosis from which the subjects thereof were during like well known to have suffered. Still, there are several cases of undoubted nephritis after measles to be found in the literature - there recorded by Thomas, Geissler, Rösser, Frank, Rilliet, West, Kjellberg, Lehman, Bouchut, Malmsten, Speiss, Hauner, Steiner, Neuretter, and Zehenda: whilst Müller, Demme, Browning, and Zichy-Woinarski describe fatal cases with uraemic phenomena.

TUBERCULOSIS.

Apart from the like affection of the lungs, tuberculous affection of the lymphatic glands has been known to follow measles; and it sometimes appears at the acme of the eruption in miliary form - the tubercles special ly

appearing in the lungs and cerebral meninges. The disease at times immediately follows the exanthem, and runs a fatal course in a few days or weeks - appearing under the form of an intense bronchitis and with cerebral symptoms after the stule of acute hydrocephalus, but with hyperpyrexia and frequent pulse: the very sensitive skin in such cases is very often the seat of erythema. The development of tuberculosis after measles occurs either (1) by the draining of the inflamed portions of the bronchial mucous membrane - the lymph stream flowing through the corresponding lymph nodes, increasing in volume as in the case of ordinary inflammatory processes, setting free some of the tubercle bacilli resident in the nodes, and so carrying them into the circulation; or (2) the tubercle bacilli may enter from without and implant themselves on the inflamed parts of the bronchial mucous membrane. Tuberculosis after measles does not, however, at once necessarily prove fatal, as temporary improvements are frequently observed. It is likewise noteworthy that many measles epidemics produce a high death-rate amongst tuberculous children; and that many who in after-life succumb to pulmonary phthisis are known to have had this respiratory lesion started from a broncho-pneumonia of measles - a condition with remarkable frequency leading to the tuberculous dyscrasia.

PURPURA.

In common with other exanthematous affections, measles may be complicated at a late stage by the occurrence of haemorrhages into the skin, and from the mucous membranes and intestines and kidneys. Masarei (Quoted by Thomas:-loc.cit.) had 8 fatal cases in which the convalescence was characterized by the occurrence of fever, dropsy without albuminuria, and purpura; and some days after the subsidence of the measles exanthem, Gley (Quoted by Thomas:-loc.cit.) reports the finding of scurvy of the mouth and intense purpura haemorrhagica. Should purpura supervene on measles, it may do so without modifying the eruption thereof; but, as a rule, on the development of the haemorrhagic form of the disease the contrary obtains.

OTHER CONSTITUTIONAL AFFECTIONS.

The following are some of the other constitutional diseases that have been known to follow measles: (1) Intermittent fever (Meyer-Hoffmeister); (2) acute rheumatism (Salzmann); (3) haemorrhagic diathesis (Trousseau); (4) morbus maculosus Werlhofii (Masarei, Mettenheimer); and (5) scurvy. The last-mentioned is somewhat of a rare occurrence after measles; and it has been seen in the buccal cavity without giving rise to gangrene, and either with or without further symptoms of the above-mentioned haemorrhagic diathesis.

PHLEBITIS.

It is only very exceptionally that inflammation of the veins has been observed after measles. A fatal case, however, was seen at the Brighton Children's Hospital by Mackay (Brit. Med. Jour., Dec. 19, 1896, p. 1772).

GANGRENE.

With the exception of gangrene of the skin in connection with variola, the like condition is not very often seen as a complication of measles, though it would seem to occur more often in conjunction than any other

The accident is apt to occur in cases in which there is a strumous or rachitic dyscrasia. Steiner and Neureutter observed gangrene of the lungs with measles in two instances: both of these cases ended fatally. The condition usually begins in the form of an ulcer, the base of which from the first shows a certain amount of discoloration, whether proceeding from a catarrhal and apparently simple affection or from an originally dangerous one such as gangrenous bullae. It occurs especially in the buccal cavity, as well as on the genitals of boys and girls - noma. In the former case the ulcers originate from the gums, the lips, the mucous membrane of the cheeks, the cavity of a tooth, etc., and sometimes go on uninterruptedly in their course while they destroy a very considerable portion of the skin of the face and of the base of the tongue, even of the muscular structures of the latter as far as its tip; or they may cause, short of that, a partial separation of the attachments of the tongue and consequent difficulty in swallowing (Bartels), or even partial exfoliation of the nasal bones (Huxham) and of the jaws (Huxham, Bartels, Saddler, Bresseler), or at least loss of the teeth. This noma arises for the most part only after the fading of the rash, and does not therefore influence its course; it, however, generally occasions more or less violent fever with its consequences loss of appetite, diarrhoea, and respiratory disturbances. Where the course is relatively mild, the patients can recover with patients can recover with disfiguring loss of tissue. Thus, Bentley has described a case where so great a stenosis of the mouth followed that only one finger could be introduced, and then only with difficulty. Noma of the genitals appears to be more common in girls than in boys, in whom it may begin at the prepuce and progress as far as the navel (Bartels). Gangrene of the vulva is developed in the same way as that of the buccal cavity, and can destroy the labia, the vaginal orifice, the mons veneris, and even the perineum as far as the anus: the secondary results are much the same as the above. The condition may also occur after measles upon ulcerating or exzematous portions of the skin, especially on the nasal alae and the external ear (Causit, Mayr, Triboulet). Faye has recorded a case in which gangrene spread from the finger upon the forearm; Mayr mentions gangrene of the forearm in caries of the radius; Battersey, a similar instance, and also a case of gangrene of the lower lips; Faye, another in which some pustules which had arisen during the eruption producing gangrene and destruction of an extensive character of tissue upon the loins; Thomas (of Paris) describes the case of a child of two years on whose nates extensive gangrene was developed. Carroll mentions a severe epidemic of measles at Sydney in which there occurred several cases of great malignancy, where on the face and thorax only a few dark blotches appeared, while upon the extremities single vesicles were formed, which rapidly increased to a large size, burst, and became gangrenous: the affection extended with such rapidity that sometimes within twenty-four hours the whole epidermis would be lost. Masarei observed upon

the soles of the feet and palms of the hands, during the desquamation, large bullae which burst, leaving, leaving obstinate and painful ulcers. In very exceptional instances gangrene of the lungs has been reported, but only as a sequel of broncho-pneumonia. The cause of noma is but imperfectly understood. It has been attributed to the use of mercury, diseases of the nerves, embolism, and some destructive bacterium. Although the nature of the last-mentioned is unknown, it is probably the real excitant of the accident. Walsh (Philadelphia) has submitted 8 cases of noma to careful bacteriological investigation, all of them having occurred within two and a half years. In every case the diphtheria bacillus was indentified by culture, inoculation, and tinctorial tests. Though some of the cases were sequels of diphtheria, four of them followed measles and began with ulcerative stomatitis. Our author affirms that "since noma is a species of moist gangrene, requiring probably from analogy two different micro-organisms, one a saphrophyte to produce putrefaction, another a parasite to produce ~~primary necrosis~~, it is possible that in these cases where diphtheria bacilli are found they may be the primary causative agents. When other pathogenic micro-organisms capable of producing necroses are found, it is possible that they may be the primary excitants". The mortality of the disease is very large, as noma appears on the averga to destroy the lives of 70 per cent. of the patients.

PREGNANCY.

Owing to the occurrence of the disease in childhood, measles is seldom seen to occur in pregnant women. As might be expected, the accident nearly always gives rise to abortion - a fatal case of which has been reported by Rösch.

SALUTARY INFLUENCE UPON CHRONIC AFFECTIONS.

Thomas (loc.cit.) has described several cases in which a chronic disease may disappear on an attack of such disease as that under consideration, due probably to the general shaking-up of the system by the invasion thereof. Behrend also saw an eczema of three years' duration cured by an attack of measles, the patient being a woman of forty years of age. The same kind of desideratum has been observed in connection with old-standing affections of the skin by Rilliet, Taupin, Guersent, and Rayer; and measles has been said by Barthez and Rilliet to have a curative effect upon chronic incontinence of urine, chorea, and epilepsy. Weisse reports the case of a girl who had convulsions cured by an attack of measles, and Guersent affirms the same for epileptiform attacks in one of his patients. Schmidt tells of a girl, aged six years, who had been brought almost to the point of death by daily convulsive seizures, and who had only measles to thank for her complete and permanent recovery therefrom. A curative effect of measles upon an apparently insane woman in an asylum is vouched for by Feith and Schroeder van der Kolk; Hildebrand has seen obstinate articular disease cured in this way; and Schmidt writes to the same effect regarding a case of contracture of the legs of six months' duration. Of course, similar almost magical recoveries are witnessed in connection with other diseases - e.g., variola.

COINCIDENCE WITH OTHER AFFECTIONS.

Measles may complicate or be complicated by any other acute or chronic disease. The influence which other diseases sometimes have upon its course has been referred to in discussing the variations in the symptoms. On the other hand, measles occurring in the course of such diseases as pneumonia, bronchitis, or tuberculosis aggravates greatly the severity of the previous affection. When coexisting with other infections, measles may exert various influences upon the primary disturbances. When the latter belong to the common complications of measles, they are usually made worse by the onset of the disease. For instance, should the malady appear in the course of, or during the convalescence from a pneumonia, this becomes worse or reappears, and in all cases recovery is delayed; so, too, a bronchitis is likely to become aggravated to a capillary form and bronchopneumonia. Phthisis is speedily made worse, and destroys the patient sooner than otherwise. Walz lost by suffocation a girl of five years suffering from aneurism of the aorta. Children with chronic diarrhoea are usually made worse by the contraction of measles; and, in general, a previous gastro-intestinal catarrh predisposes remarkably to the diarrhoea of measles - more especially in the case of teething children (Walz). Children suffering from measles are very apt to be attacked by cholera, and usually in a marked degree (Polak, Mayr, Weisse). The predisposition to diphtheritic and gangrenous affections exerted by measles has been already referred to. Should measles, on the other hand, appear during a disease to which it does not usually give rise, it may favourably influence the course of the latter. Thus, it has been observed, when attacking a patient with psoriasis or eczema or other disease of the skin, to cause it to disappear for a time and return, as a rule, after the disappearance of the exanthem. Behrend, however, has described the case of a woman of forty years, whose eczema of the scalp of three years' duration disappeared permanently after measles. Barthez and Rilliet mention that chorea, epilepsy, and incontinence of urine of several months' duration were cured by measles, and also that an anasarca after scarlatina disappeared coincidentally with the eruption of measles. Weisse reports that measles, in the case of a girl suffering from convulsions, lead to a permanent cure of that disease; Mettenheimer, that a boy suffering from nervous winking of both eyes was relieved of this affection during the morbillous attack, though after several weeks it gradually returned; and in another instance the cure of a nervous cough of three months' standing. Guersent has reported, with the beginning of the prodromal stage of measles, permanent relief from epileptiform attacks, which had appeared in consequence of a fit of anger, and of which the patient had several daily for many years. Schmidt describes the case of a girl of six years, who had for ~~twelve~~ months suffered from frequent convulsive attacks which had so reduced her strength that death was expected, but who recovered entirely through an attack of measles; he also saw a boy of five years, with a contracture of the lower limbs lasting for six months, in whom this disappeared, as if by magic, on contracting measles. Feith and

Schröder van Kolk report the case of a woman who for five years had been in a lunatic asylum with violent mania, which did not return after her recovery from measles, so that the patient came to be discharged as cured. Mombert and Michele describe the passing of worms in consequence of measles as a frequent phenomena. Hildebrand observed an obstinate disease of the joints, which resisted treatment for three years, heal up entirely after measles, and of its own accord, in a very short time; so also the dispersal of glandular tumours in the same way. Mettenheimer reports a caries of the tibia, which had undergone a remarkable improvement immediately after measles; and Röser, a caries of the hand of a year's duration, in the case of a boy of three, heal quickly after measles. Levy states that an old gonorrhoea of the penis disappeared with the outbreak of the exanthem of measles, which was immediately followed by chicken-pox; after the expiration of this, the gonorrhoea at once returned; in another case after measles it did not return. Pank has seen an obstinate ophthalmia disappear for a short time under the influence of measles. Measles and scarlatina have been reported as occurring together by Johnston (Brit. Med. Jour., Dec. 31, 1898, p. 1928- and others. The concurrence of the two diseases will, of course, greatly aggravate the prognosis: Hase, for instance, lost eight of such patients. Chicken-pox during the course of measles has been noted by Joshua (Lancet, July 13, 1889), but does not appear to have unfavourably influenced the prognosis. The concurrence of measles and whooping-cough has been frequently observed: Bernad (Ann. Gyn. & Ped., July, 1894) saw it twenty-one times in 166 cases. The two affections seem to mutually exert a predisposition. There are some, however, who regard the paroxysmal cough, so frequently seen during measles, as being due to the pressure of enlarged mediastinal glands; and from the resemblance of the symptoms Mussy contends that the essential cause of pertussis can be attributed to a specific tracheo-bronchial glandular hyperplasia. Subcutaneous emphysema - in the absence of known injury or severe cough - has been reported by Pallese (Deut. med. Woch., 1898, Vol. xxiv., p. 255) as a complication of measles, as well as by Kelly (Therap. Gaz., Jan., 1891) and Felsenthal (Arch. f. Kinderh., Bd. 14, H. i., ii., 1891). It has been already mentioned that pulmonary phthisis is a very frequent sequel of the morbillous attack.

D I A G N O S I S.

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Owing to the widespread nature of the affection and its serious complications, the diagnosis of measles becomes a matter of no inconsiderable importance. The recognition of sporadic cases, especially in epidemics characterized by irregular forms of the disease, may be far from easy; but, as a rule, proper observance of the various symptoms already detailed will suffice for the diagnosis of the malady in nearly every instance. Owing to the early infectivity of the disease, it is urgently essential that a diagnosis of the disease should be made not later than the prodromal stage. Practically all other simulating affections can be eliminated by the observance of a feverish period of four days associated with catarrhal symptoms in the eyes, nose, and upper air-passages; a few papules on the hard palate, followed within twenty-four hours by a papular efflorescence on the face, will in addition usually discriminate measles. Nevertheless, it should not be forgotten that the diagnosis of all the exanthemata should never be made from the appearance of the rash alone, and, indeed, not on any one or two symptoms: for there is a great variation in the development of every feature of these diseases as regards incubation, prodromes, and general symptoms. And in doubtful cases a conclusion can only be arrived at by carefully weighing the symptoms as a whole, and noticing accurately how the supposed exanthem differs from the usual type, remembering also that the more fully the eruption is developed the less likely are the other criteria to fail in a real exanthematous disease.

Diagnostic Value of Munier's Sign.- According to Munier (Gaz. Hebdomadaire de Médecine et de Chirurgie, N.S., T.iii., No. 89, 1057, 1898), there exists during the incubation stage of measles a phenomenon consisting of a marked lowering of the body-weight, independent of any kind of morbid trouble whatever; and this loss - or pre-measles fall - of weight is all the more important and suggestive as it contrasts in the child with the ascending curve of physiological growth. It has been observed to commence about the fourth or fifth day after infection (that is to say, five or six days before the appearance of the first catarrhal or febrile symptoms, eight or ten days before the exanthem), lasts several days, even to the beginning of the stage of invasion, in intensity varies, and is independent of the age of the patient as well as of the severity of the subsequent symptoms. Munier states that the loss of weight varies from one and a half to ten ounces in a child of from one to four years of age, but that it has been observed to be as great as twenty-two ounces, usually never less than a quarter of a pound.

Diagnostic Value of Koplik's Spots.- The value of the muco-membranous eruption, commonly known as Koplik's spots or sign, has already been mentioned above; but it may here also be specially noted that cases of measles nearly always show these buccal spots, usually

early enough to be of corroborative diagnostic value - i. e., in about 91 per cent. of all cases. A typical muco-membranous eruption of this kind is seen in no other disease than measles. The presence of buccal spots without other morbillous symptoms cannot be considered a guarantee of immunity to the infection of measles. The average time of appearance of buccal spots before the exanthem is from one to three days, though a few cases have been reported as ~~late~~ as the fifth day. The observance of these spots should lead to an early recognition of the disease, but unfortunately the diagnosis is even then not early enough to antedate infection in this very infectious disease; it does not suffice to prevent the spread of measles in the schools, hospital wards, and asylums. Buccal spots are of service in differentiating measles from (1) scarlet fever, in which the buccal mucous membrane is of normal colour; (2) simple aphthae, which does not show such bright-red spots and the bluish-white specks characteristic of measles; (3) German measles, a pronounced case of which is often extremely difficult to diagnose from true measles: the buccal spots here serve a useful purpose, in that they are present in about 90 per cent. of the cases of measles, whereas in German measles the mucous membrane usually pale and pink as in health, and never presents a muco-membranous eruption; (4) antitoxin rashes, erythema multiforme, common cold, influenza, and so forth. In short, the presence of Koplik's spots vastly aids the diagnosis of measles in a large proportion of the cases; and the general opinion seems to be that, while their absence does not exclude measles, their presence is pathognomonic of that affection. It was Northrup (Art. "Measles" in Nothnagel's Ency. of Practical Med.) who first drew attention to their presence in 91 per cent. of cases of measles, usually three days before the development of the exanthem, and only in that disease. Sevestre dwells upon the importance of the appearance of the soft palate - an erythema three days before the morbillous cutaneous rash. "The redness", he says, "is not uniform, but presents itself in the form of small, rounded or irregular spots, which are sometimes disseminated in small number and at other times almost confluent."

The following are the diseases which are most apt to resemble measles:

RUBELLA (Rotheln or German Measles).

German measles is the disease which most resembles ordinary measles; but it is useful to bear in mind that a measles-like affection with a morbillous rash epidemic amongst children who have **already** had measles is most likely to be rubella. One is particularly apt to confound measles and rubella when the former affection presents in a very mild form or when rubella appears, as it sometimes does, with severe manifestations. A very important point is the history of the previous occurrence in the patient of either of these two affections: for it is a very rare thing for measles to attack anyone twice, and still rarer for rubella to manifest itself thus.

Another distinctive feature is the fact that the incubatory period of rubella lasts for from five to twenty-one days. Griffiths holds that one may consider as a feature of great diagnostic importance the variable duration of this stage as compared with the ten or eleven days' incubation of ordinary measles. The prodromal stage of rubella may be absent altogether, or at the most be very brief, rarely lasting more than twenty-four hours. There may be present slight conjunctival redness, sneezing, and sore-throat. In measles, however, there is a distinct pre-eruptive stage characterized by considerable fever and marked catarrhal symptoms affecting the eyes, nose, larynx, and bronchial tubes. The catarrhal symptoms are more pronounced in mild attacks of measles than in severe attacks of rubella. In measles angina may be absent, whereas there is usually a certain amount of sore-throat in rubella. In the latter affection the soft palate usually presents pinkish pin-head-sized elevations, and the buccal mucous membrane sometimes exhibits reddish spots. There are, however, never seen in rubella the bluish-red spots surmounted by whitish dots described by Koplik as characteristic of measles. The temperature in rubella usually ranges from 99. to 101. F., rarely exceeding this. In measles fever is a prominent symptom, commonly registering 103. F. or more. It is usually more protracted in measles than in rubella. The exanthem in rubella spreads more rapidly, fades on one part when spreading to another, and is of brief duration - one to three days. It consists of discrete, pale, rose-red, slightly elevated, pin-head to pea-sized macules. In measles the eruption spreads more slowly, reaches a maximum intensity simultaneously all over the body, and lasts for four or five days or longer, being followed by a staining of the skin. The colour is deep red, at times being bluish. The macules are larger than in rubella, irregularly grouped, often disposed in crescents, and presenting an appearance that is somewhat blotchy. In both diseases glandular enlargements occur, but are more prominent in rubella, there being frequently present intumescence and tenderness of the postauricular and postcervical glands. Measles is not infrequently complicated by pneumonia, an occurrence that is exceedingly rare in German measles. Children with rubella are often so little affected as to resent very much being put to bed. Measles is accompanied by an amount of prostration and weakness that makes it difficult to cause them to leave the recumbent position. In general, the above distinctions will suffice for the recognition of the disease. But we sometimes come across attacks of measles, however, that present anomalous features. The fever may be extremely slight, the eruption may be poorly developed, or the catarrhal symptoms may be almost in abeyance. On the other hand, severe cases of rubella are occasionally encountered: conjunctival redness, coryza, and cough may be developed to an unusual degree, and the fever may be high. In other cases the eruption may be deep-red, the macules may be arranged in crescentic groups, the rash persisting for five or six days. The recognition of Koplik's spots is here of great importance, as well as the history of the case and the general course of the illness.

SCARLET FEVER.

It general, it may be said that before the exanthem has appeared it is impossible to make a positive diagnosis of scarlet fever, since at this time there are no characteristic symptoms, such as occur in measles. During an epidemic, if a child is seen who has been vomiting and has a high temperature and catarrh of the pharynx, it may be strongly conjectured that the patient is suffering from scarlatina, but the medical attendant will be wise not to commit himself positively to such an opinion. As a rule, since the period of invasion is so short, he will not see the case until the eruption has appeared. Usually when the rash has become fully developed the diagnosis offers little difficulty. The height of the fever, the evident illness of the patient, the character of the eruption and the positions which it first occupies upon the body, the angina, the enlargement of the glands at the angles of the jaws, and the presence in the urine of a trace of albumin will declare the nature of the disease. In the malignant cases where death occurs before the eruption comes out, the diagnosis can only be made by considering the height of the fever, the nervous phenomena, and the fact of the existence of an epidemic or history of exposure, with the possibility of excluding other causes for the same train of symptoms. The chief difficulties in diagnosis will often arise in connection with those cases which present irregularities in their course. In all such cases a point of the very highest diagnostic importance will be to establish the probability of infection. In those rare cases which run their course without fever, one will have the greatest difficulty in arriving at a diagnosis of scarlatina: for a rise of temperature is so essentially connected with our ideas of that affection that its absence will always throw doubt upon the diagnosis thereof. If, in addition to the characteristic rash, there were sore-throat and albumin in the urine, the presumption would be in favour of scarlatina. This would be much strengthened should lamellar desquamation or nephritis develop at the usual time; and, should an ordinary case of scarlet fever occur after exposure to infection from the anomalous cause, the supposition would be especially confirmed. For the reason that scarlatina may occur without any characteristic eruption, it seems to the writer that during an epidemic all cases of angina should be regarded with suspicion, especially when albumin is present in the urine, and if possible treated as though they were cases of scarlet fever. This will doubtless be a difficult and often a thankless task; but in the present state of our knowledge a due regard for the public safety dictates such a course - more especially as the anginas which occur during an epidemic of scarlatina are infectious, whether they may be scarlatinal or not. It is especially in cases where the eruption of scarlet fever remains discrete that the disease may be confounded with measles. In measles the incubation period is much longer than in scarlet fever: the invasion period of measles occupies four days with well-marked catarrhal symptoms, but lacks

the sore-throat, the high fever, the vomiting, and the nervous phenomena of scarlet fever, while albumin is absent from the urine. The eruption of measles is maculopapular and of a dusky hue than the rash of scarlatina; the borders of the lesions of measles are crenated, and they are often collected into crescentic groups, while the whole face is affected by the eruption, the region of the mouth's circumference being avoided not, as is the case in scarletina; the rash of measles stays out on the body in full bloom a shorter time than the eruption of scarlet fever. The desquamation of measles occurs as furfuraceous scales, while in scarlatina large lamellae are usually thrown off. Finally, there is an entire difference in the complications of the two diseases, and Koplik's spots are absent in scarlatina.

INFLUENZA.

Particularly in cases in which there are pyrexia and prostration, the symptoms of influenza commonly known as "cold" may lead to the disease being taken for measles. The most important differential sign, however, is that of photophobia in the prodromal stage of measles: so that, were a child previously unaffected by measles observed to be suddenly seized with a "cold" accompanied by the dread of light, the diagnosis of measles might safely be made, even in the presence of an epidemic. Furthermore, the development of the exanthem on the first or second day, as well as of the enanthem, in addition to the other classic symptoms would confirm the suspicion.

SMALL-POX.

It sometimes happens that when the eruption of variola first appears it is mistaken for measles. The catarrhal symptoms, which are so prominent in measles and so rarely absent, constitute at this stage one of the most striking points of difference between these diseases. Equally important also is the degree of fever. While the temperature in the initial stage of variola suddenly rises to 104. to 106. F., in measles it is rarely higher than 102. to 104. F. In variola it falls soon after the eruption appears, while in measles it continues the same or may rise still higher. The eruption of measles frequently makes its appearance quite as early on the back as on the face, and the lesions are equally as numerous on both of these localities; while in variola the eruption begins on the face and extends gradually downwards. If the eruption be carefully examined, it will be found to consist of innumerable maculae, and that the maculae of measles are larger than the papules of variola; that the macules are set in groups or clusters, while the papules, even in the confluent cases, are at first remarkably discrete; that the macules disappear or grow pale under pressure, while the colour in the papules is more persistent; that the macules are soft and velvety to the touch, while the papules are hard and shot-like. The latter condition of the eruption in variola has always been regarded as a symptom of considerable diagnostic value, - and justly so, too, - yet the eruption of measles often assumes a distinctly papular character on some

parts of the face, and especially on the wrists; therefore care should be taken to examine the back of the patient before making a diagnosis. But it must be admitted that the eruption of these diseases is occasionally, for a very brief time, so similar in appearance as to defy the skill of excellent diagnosticians. In such cases it is advisable to defer the diagnosis for twenty-four hours, by which time the individuality of the eruption in either case will certainly be revealed.

TYPHUS FEVER.

In dealing with the question of the differential diagnosis between measles and typhus fever, it should be remembered that measles is essentially a disease of children, while typhus affects adults. The high temperature and pulse and early acute catarrhal symptoms, affecting the eyes as well as the respiratory tract, point towards measles. The bronchial or catarrhal symptoms accompanying typhus are not so acute or as early. The eruption of measles, although it may in a way be confounded with the early eruption of typhus, is particularly prominent on the face, where the eruption of typhus is absent. If measles occurs in an adult, the mental dulness and subsequent delirium, which are marked in typhus, are wanting. Special care should be taken to ascertain if there have been other cases of measles in the family or vicinity. It is well to remember that the eruption of two distinct diseases may be present at the same time. In one of the cases recorded in the literature, the typical eruption of this fever was present on the abdomen. At this stage the temperature suddenly became higher, and pronounced coryza and other catarrhal symptoms appeared. In two or three days the characteristic eruption of measles appeared on the face and chest. An investigation disclosed the fact that the patient, a young man, had attended his sister's children who were suffering from measles, shortly before he was admitted to hospital. In all cases it is important to bear in mind the fact that typhus has no mucco-membranous enanthem of the kind described by Koplik.

SYPHILIS.

It sometimes happens that the macular eruption of syphilis is mistaken for measles, especially when the patient is an adult and the febrile symptoms are not marked, or, on the other hand, when a high temperature accompanies the syphilitic roseola. In general, however, fever, catarrh, and severe constitutional symptoms are absent in syphilis; the latter affection is found in adults bearing a history usually of infection, whereas measles is a disease of childhood; and the chancre of syphilis is an early symptom of the disease.

MORBILLIFORM ERYTHEMATA.

In the case of children suffering from various digestive disturbances, roseola, erythema, nettle-rash, and prickly heat may be observed and mistaken for measles - the more so if the patient be at the times suffering from a common "cold" and an epidemic is about. But in these affections, as a rule, catarrhal symptoms and constitutional disturbances are absent, and the temperature remains normal or undergoes merely a temporary elevation. The

eruption seen in these diseases never appear in the characteristic order of measles. For instance, erythema appears usually on the backs of the hands, forearms, and feet; whilst simple roseola is apt either to be limited to the face or extends to the neck and chest, rarely over the whole body: it is likewise of a most evanescent character. The cutaneous lesions of erythema are usually larger, sometimes forming more or less extensive plaques, while roseola simulates more closely the deep and bluish tint of scarlatina. The rashes due to excessive perspiration and the irritation produced by flannel or other rough clothing are easily distinguished by the absence of coryza and systemic disturbances. Epidemic morbilliform eruptions commonly encountered in the tropics and elsewhere - dengue and Malta fever, for instance - are sufficiently characterized by their well-known symptoms. Roseolous eruptions produced by decaying straw are described by Salisbury as resembling measles very closely: in general, however, they should occasion no confusion in view of a definite appreciable etiology.

DRUG ERUPTIONS.

There are various eruptions, not symptoms of the infectious fevers, which may resemble that of measles. Prominent amongst these are some of the medicamentous rashes - notably those produced by antipyrine, copaiba, quine, chloral, etc. As a rule, the fever and the catarrhal symptoms are absent, but sometimes - especially in the copaiba and antipyrine eruptions - both may be present, and the similarity to measles may be striking. The history of the case is always a point of great diagnostic importance. The eruption produced by the administration of quinine is apt also to be particularly confusing, as it is often given during the prodromal stage of measles. No less than 38 of the 60 quinine rashes were of the erythematous variety. Most of these were of the scarlatinous type, but measles was simulated by some. Even a fraction of a grain may - especially in the case of women who frequently present the idiosyncrasy - cause a morbillous exanthem. The eruption may be either local or generally distributed, or it may develop first on the face, and then wander down over the trunk and extremities. It may assume the form of bright or dull red macules or papules, very like the spots of measles: moreover, desquamation is not infrequently observed as in measles, but there is less itching than in the latter affection. There are no catarrhal symptoms, but there may be more or less headache, nausea, vomiting, prostration, and pyrexia at the outset. If in doubt as to the nature of the eruption, the discontinuance of the suspected drug will lead to its speedy subsidence. A peculiar form of morbilliform erythema is the most common eruption arising from the administration of antipyrine: 41 of the 52 cases analyzed by Spitz were of this type. Ernst (Centralbl. f. klin. Med., 1884, No. 33) appears to have been the first to point out the close resemblance between the eruption of antipyrine and that of common measles, and reported five cases of the anomaly. It is important to note that the rash seldom

appears on the face - it being usually found on the trunk and extremities only. Croker states that he has seen oro-nasal catarrh accompanying the condition; and the diagnostic difficulty may be still further increased by the appearance of the eruption after some such catarrh as that of influenza in which it is frequently used as a sort of specific. But there is no photophobia, and also no hoarseness, cough, or koplik's spots. The pyrexial registration will be merely trivial and non-characteristic, and the regular progressing character of the measles eruption will fail to be observed. The rash will, furthermore, be level with the skin and very irregularly distributed thereon. Finally, the addition of perchloride of iron to the urine points to the kind of drug being ingested. Chloral eruptions seem to be much less common than the foregoing. The rash in question consists of a diffuse erythema which first appears upon the face, to be distributed over the neck, chest, and extremities - more especially over the joints of the knee, wrist, elbow, and ankle - with the additional peculiarity that it usually manifests itself as a diffuse redness; whilst on other parts of the body it is made up of dusky-red spots of various sizes and irregular outline, giving to the skin a mottled appearance. Gee (Quoted by Croker:- Diseases of the Skin, 1903) has reported two cases in which there appeared a dusky-red and papular rash, surrounded by some diffuse redness of the face and neck, and - especially about the joints - patchy or mottled-red spots; but the absence of catarrh and constitutional symptoms served to differentiate it from measles. According to Morrow (Drug Eruptions, New York, 1887), it becomes more pronounced after meals and the ingestion of alcohol, and sometimes, too, after the discontinuance of the drug producing it. It can be readily distinguished by these characteristics, as well as by the absence of the symptoms characteristic of measles. Copaiba and cubebs have been known to often give rise to scarlatiniform or morbilliform eruptions, in cases in which the balsamic and other preparations of these drugs have been given for the treatment of gonorrhoea and urethritis. Especially in epidemic times, these rashes are apt to be mistaken for measles. But the odour of the patient's breath and careful observance of the clinical course should confirm the diagnosis without difficulty. The following differential points should also be borne in mind in dealing with such cases: Copaiba and cubeb eruptions appear in the form of bright-red spots, about the size of a sixpence or smaller, the macular elements being separated by normal skin, but occasionally coalescing to form irregular patches of a considerable size. The spots disappear on pressure as in measles, but they are, nevertheless, not elevated above the surrounding skin as in the latter disease. The lesions exhibit a marked tendency to appear round the joints of the extremities, in this respect, therefore, presenting an important difference from measles. In very exceptional instances the spots appear upon the face - a point to be particularly noted in cases of mistake in diagnosis. Finally, Koplik's spots are wanting, and the general course of the affection differs from that of measles.

ANTITOXIC SERA.

The injection of antitoxic serum for the cure of diphtheria may give rise to an eruption simulating that of measles: the lesion is sometimes morbilliform, or more often urticarial or exudative erythema-like in character. Antitoxin eruptions may make their appearance within from three days to as many weeks after the injection of the remedy - usually, however, in eight to fourteen days. The temperature may rise, and pain and swelling in the joints be observed. Nonetheless, the constitutional symptoms are usually so dissimilar that the mere knowledge that such rashes sometimes follow the use of these substances should be sufficient to insure safety from a diagnostic standpoint - the more so when it is remembered that neither characteristic catarrhal symptoms nor Koplik's spots are present. The same, of course, applies equally truly to the eruptions induced by the administration of antistreptococcus and antitetanic sera.

ECZEMA.

Eczeema is at times mistaken for the rash of measles - especially when occurring, as it sometimes does, in epidemic form and accompanied by ophthalmia. But it can be differentiated from measles by the dissimilarity in the constitutional and other symptoms, and by the fact that the eruption is attended by scabbing and crusting from an early stage of its course.

CHICKEN-POX.

Measles with large miliary vesicles may create a suspicion of chicken-pox; and the latter, if the single vesicles are unusually small and interspersed with profuse well-developed roseolae, may be mistaken for measles. Still, all doubt should be dispelled by the history of the case, its general course, and the absence of Koplik's spots.

TYPHOID FEVER.

The observance of the case for a few days should serve to distinguish the roseola of typhoid fever from the characteristic exanthem of measles.

CHOLERA.

This affection has a known geographical distribution and well-known severe abdominal symptoms.

FLEA-BITES.

In the case of children of delicate and sensitive skin, an eruption similar to that of measles may be produced by the bites of fleas, mosquitoes, and bugs. But here there will be obvious indications as to the cause thereof, as well as an absence of the characteristic general and local symptoms of measles.

THRUSH.

The frequent association of anorexia, bodily discomfort and general irritability, with perhaps an anomalous rash might lead to an aphthous stomatitis being mistaken for the exanthem of measles. But the aphthous spots are larger, speedily ulcerate, and of an appearance like wash-leather.

MORBILLI SINE MORBILLIS.

In the absence of an epidemic or typical cases, the variety of measles without eruption might escape attention; and the diagnosis of measles of this kind can only

be made with certainty at the time of an epidemic or when infection can be traced to another case - failing which the prodromal symptoms and the condition of the mucous membranes, the presence of Koplik's spots, and a possible abortive rash about the face and neck should suffice to establish a correct diagnosis in every instance.

PYÆMIA.

It is occasionally observed that pyogenic microorganisms give rise to an eruption bearing a great resemblance to the exanthem of measles; but the real nature of the disease will be apparent from the history of the case and the general and local symptoms.

MEASLES IN THE NEGRO.

It is sometimes very difficult to establish a diagnosis of measles in the negro and other dark-skinned and coloured races. In such persons the rash appears in the form of irregularly indented and coppery blotches, and gives rise to a marbled appearance. In the case of the negro the disease is distinguished by the minute vesicles, like lichen papules or miliary vesicles, or by papules appreciable to the touch, - which last-mentioned fact, together with the occurrence of lesions on the mucous membranes and the cutaneous desquamation and the general constitutional symptoms, must be relied upon for the recognition of the disease.

P R O G N O S I S .

It is generally believed by the laity that measles is a favourable disease, and one of little or no importance and seldom or never dangerous to the life of the afflicted child - a strange belief when it is considered that the disease carries off its victims by the thousand each year, even more than scarlatina owing, of course, not to a greater malignancy but to a wider distribution. In general, however, the prognosis of measles is not unfavourable, though it varies with the epidemic and with the individual, and is especially influenced by the presence or absence of complications. The average mortality from the disease has been placed by some at 3 per cent., but there have been series of cases with a mortality of over 30 per cent. - viz., in the siege of Paris when a death-rate of 36.7 per cent. was reported by Colin. The younger the patient the graver the prognosis. This applies particularly to children, for adults are often very severely attacked. This has been exemplified, for instance, in the American Civil War, the Brazilio-Paraguayan War, the Franco-Prussian War, and among savage nations. In such cases, however, we have another important element influencing the prognosis - viz., the effect of want, exposure, crowding, and other elements of imperfect hygiene, combined with lack of nursing, and often with the existence of previously debilitated health. Such conditions, too, account for the high rate of mortality often seen in foundling hospitals and in homes, hospitals, and other institutions for children. It is not only that the hygiene is not always perfect, but that the previous debilitated condition of the children of this class, which existed before they entered the institutions, has rendered them less able than otherwise to resist the effect of the disease from which they suffer. The prognosis is rendered much more unfavourable by the combination of measles with any other previously existing disease - e.g., rickets, scarlet fever, tuberculosis, whooping-cough, dyspepsia, and the like. In fact, the development of any complication adds greatly to the gravity of the affection, as it is to the complications that the mortality is almost entirely due. Broncho-pneumonia is probably the complication which kills most children, but many cases are destroyed by atelectasis, croupous pneumonia, and diarrhoea. Furthermore, it is an unfortunate fact that, even after the patient has apparently recovered entirely, the danger is not over; for the sequels of the disease - notably tuberculosis in one or other of its forms - weaken the constitution of the patient and may eventually culminate in his death.

AGE.

The age of the patient is a factor of great importance in determining the amount of danger attendant upon an attack of measles. Apart from the fact that healthy and very young infants (up to the age of six months) are attacked very mildly, if at all, it may be

taken as established that measles becomes most dangerous only for young or very young children; that its danger decreases rapidly as years roll on, and in the late years of childhood is already at a minimum; and, finally, that in old persons - who, however, are rarely attacked, owing to their comparative lack of susceptibility - the disease is again dangerous. Thus, Schütz states that he noticed a high mortality amongst children from six to eight years. In the Paris garrison - ages 18 to 30 - deaths from measles were very frequent in 1838, 1839, 1848, 1849, 1855, and 1860 - due, according to Laveran, to the influence of vitiated hospital air. So also, according to Schiefferdecker, there dies from measles in London from 1856-66 - in the first year of life, 3,368; in the second, 7,606; in the third, 4,261; in the fourth, 2,247; in the fifth, 1,184; from 0 to five years, 18,666; from five to ten years, 1,076; from ten to fifteen years, 84; and above fifteen years, 111, making a total of 19,937. Likewise at Königsberg, in six years, - in the first year of life, 88; in the second and third, 157; from the fourth to the tenth, 115; from the tenth to the twentieth, 2; and of older persons, none at all. According to Passow, the absolute mortality from measles in Berlin in 1863-67 increased up to the second year of life, at which point it reached its maximum: 24 per cent. of all the deaths were in the first year, and 31 per cent. in the second. From the third year onwards it diminished - at first rapidly, then slowly, up to the thirtieth year: not constantly, however, since in the eighth and tenth years there was a slight increase, while from the twentieth to the twenty-fifth year no death were reported. From the thirtieth to the thirty-fifth year the mortality again increased slightly; above thirty-five years there died only one person, aged sixty-two. According to Ranke, there died in Munich - in 1859-68 - 70 children under one year out of 195, 119 at the age of from one to five years, 11 persons above fifteen years out of 185 ill; the mortality of the first five years was, therefore, 24.5 per cent. In Würzburg it was, according to Voit - in 1842-71 - for the same years of life about 23 per cent.: there died, of 88 patients under one year, 21 or 23.8 per cent.; of 367 from one to five years 15, or 4 per cent.; of 289 from five to fifteen years 3, or 1 per cent. In the Vienna Children's Hospital there died, according to Monti (1864-67), of 372 cases of measles the enormous number of 98, of which 6 (out of 16 patients) were between six months and one year of age; 70 from one to five years (out of 173 patients, namely, 35 patients with 21 deaths in the second year; 52 with 26 deaths in the third year; 47 with 13 deaths in the fourth year; and 39 with 10 deaths in the fifth year); 22 from five to eleven years (of 183 patients there were 43 from five to six years, with nine deaths; 38 between six and seven, with six deaths; 33 between seven and eight, with 4 deaths; and 32 between eight and nine, with 3 deaths); of persons above this age no one died. According to Geissler, there died in 1861 at Meerane, out of 1,754 patients, 63; out of 13 under six months, no one; out of 99 from one and a half to one year, 2; out of 221 from one

to two years, 19; out of 264 from two to three years, 26; out of 226 between three and four years, 7; out of 204 from four to five years, 6; 1 each out of 187, 151, 144, of six, seven, and eight years respectively of 227 older children - up to fourteen years - no one died. At Frankfort (1860-61), according to Speiss, the mortality equalled for the first year 8 out of 45 cases, or 18 per cent.; for the second, 15 out of 156 cases, or 10 per cent.; for the third, 9 out of 204 cases, or 4.4 per cent.; for the fourth, 3 out of 186, or 1.6 per cent.; so also for the fifth (4 out of 243); for the fifth to the tenth, 0.7 per cent. (7 out of 954). According to Kellner, there died at Frankfort, in 1858, 43 children of measles: 8 in the first, 18 in the second, 5 in the third, 4 each in the fourth and fifth, 1 in the sixth and seventh, 2 in the eighth year, and above eight years of age no one. The influence of measles upon the mortality of different ages is strikingly illustrated by the epidemic in the Faroe Islands, as recorded by Panum and to which some reference has already been made. During the first nine months of 1846 far more people died than was usual; and of these, in the first year of life, nearly 3 times more; between one and twenty years the normal proportion; in the third decade 1.4 times more; in the fourth to the eighth decade 2.4 times; 2.6 times, 4.5 times, 3.9 times, 2 times more; between 80 and 100 years 1.5 times more. The chief portion of this excess was due to measles, which is therefore more dangerous the older the patients are; the decrease in the mortality in the oldest decades was due to the fact that only 65 years had elapsed since the last epidemic, and the oldest persons were therefore for the most part no longer liable to attacks of measles, and could not, of course, succumb to the effects thereof. The following table is taken from Panum's report of the epidemic in question:

Average Annual Mortality at the Faroe Islands.		Mortality during the Epidemic of Measles during the Early Months of the Year 1846.	
Age-Divisions.	Mortality of different Age-Divisions.	Mortality of different Age-Divisions.	Ratio of Mortality during the Epidemic to Average Mortality (the latter = 1).
Under 1 year	10.9	30.0	1 : 2.8
1 - 10 years	6.6	0.6	1 : 1.0
10-20 "	0.5	0.4	1 : 0.8
20-30 "	0.55	0.75	1 : 1.4
30-40 "	0.85	2.1	1 : 2.4
40-50 "	1.1	2.8	1 : 2.6
50-60 "	1.0	4.5	1 : 4.5
60-70 "	2.0	7.8	1 : 3.9
60-70 "	6.0	13 .1	1 : 2.5
70-80 "	16.9	26.1	1 : 1.5
80-100 "			

Panum's figures for the epidemic of measles, which occurred in Iceland in 1864, are noteworthy in that they are somewhat at variance with the above: for whilst the

death-rate is high for the first year of life and for adults over 20 years of age, the Iceland epidemic was particularly fatal to children from 1 to 3 years old. Still further, a large number of cases also occurred among the adults in the Iceland epidemic of 1882, varying at different parts of the island. The reason for this high mortality at the most vigorous period of life is not easy to explain. The unfavourable conditions of existence in the Faroe Islands afford no solution of the problem: for we have it on Panum's authority that they were inhabited by a hardy and long-lived race; and 350 out of every 1000 deaths occurred in individuals over 70 years of age, whereas in Denmark only 150 out of 1000 were at this period of life. In Iceland, again, the total mortality was so high that the population had decreased rather than increased in the course of several centuries (and that in spite of the remarkable prolificity of the women), due doubtless in great part to a large infant mortality during the first year of life. In Denmark, moreover, the age of 38 is reached by 569 out of every 1000, while in Iceland the same number live only to the age of 14. According to Schleisner's observation, the figures for Iceland, for ordinary years (1844 and 1845), the total number of deaths, 1365, was apportioned, with respect to age (showing that once the susceptibility of early infancy is past the Icelanders exhibit vital resistance to a marked degree) thus: Up to 1 year, 557 or 40.8 per cent.; from 1 to 2 years, 139 or 10.2 per cent.; from 20 to 50 years, 283 or 20.7 per cent.; and from 50 to 100 years, 386 or 28.3 per cent. According to Holt (*Diseases of Infancy and Childhood*, 1899, p. 911), the mortality of measles in children at all ages is from 4 to 6 per cent.; while under two years of age it may be 20 per cent. or more. Dawson Williams (*loc. cit.*) tells us that, in the forty years from 1848 to 1887, there were in England and Wales 367,602 deaths from measles, and that of this number 335,874 occurred in children under five years of age, leaving only 31,728 cases amongst the other ages thereafter. He points out that, whilst measles is common enough before five years, there is a great decrease in its mortality after the age of two, as will be seen from the following data:

Age.	Sex.	Number of Deaths per 1000.
Under 1 year..	Male	3.01
" 1 "	.. Female	2.51
1 to 2 years ..	Male	5.81
1 to 2 "	.. Female	5.46
2 to 3 "	.. Male	2.88
2 to 3 "	.. Female	2.93
3 to 4 "	.. Male	1.60
3 to 4 "	.. Female	1.68
4 to 5 "	.. Male	0.93
4 to 5 "	.. Female	0.96

The study of an entire epidemic in a locality affords the best means of determining the susceptibility to measles and the mortality thereof at different ages, as will be apparent from some such table as the following, which is based upon the figures published by Theodore Thomson (Quoted by Williams:- *loc. cit.*):

Measles.

Age.	Population.	Attacks.	Deaths.	Death-Rate Per cent.
0-1 year	1155	166	16	6.9
1-2 years	947	233	46	23.6
2-3 "	1028	354	36	17.5
3-4 "	1000	324	16	8.0
4-5 "	951	324	5	2.6
5-10 "	4530	560	6	0.7
10 years and upwards	25,968	39	0	0.0
At all ages	35,606	1031	125	1.7

From this tabulation it will be seen that under one year of age children are less susceptible than later, and that their mortality is greater during the next two years. In general, we may take it that during the first six months of infancy the mortality is comparatively low, that it then rises at attain the maximum during the second year, and falls again after the fifth year of the child's existence, as will be seen from the following figures taken from J. W. Tripe's report:

Mortality for Measles in England from 1868-72.

In 1000 Fatal Cases the Age of the Patients was respectively:

0 - 1	1 - 2	2 - 3	3 - 4	4 - 5	5-15	15-25	25-45	45-65	Over 65
200	376	190	101	53	72	3	4	1	0

INSTITUTIONAL EPIDEMICS.

It is generally believed that measles is much more fatal when occurring in children's homes, nurseries, asylums, hospitals, and other institutions than in private houses. Under the former circumstances its mortality is sometimes alarming; and for the reason that such patients come there for treatment debilitated in body and of bad family and personal history. Little wonder, then, that the institutional death-rate is at times frightful! Holt (loc. cit.), for instance, says that amongst the 143 cases in the New York Nursery and Children's Hospital the mortality was 35 per cent, during the epidemics which there occurred in 1892 and 1895. Gauneton (La Rougeole à l'Hospice des Enfants Assistés, Paris, 1892) gives a table for one of the Parisian institutions, showing the appalling mortality of 50 per cent. during five years:

Year.	Hospice des Enfants Assistés. Cases.	Deaths.	Percentage.
1882	280	128	45.0
1883	268	128	47.0
1884	328	187	57.0
1885	370	147	46.0
1886	329	138	42.0
Total in 5 years.	1575	728	46.22

According to him, there were no deaths from ten to twenty years - from 1887-91 - from 0-6 months, 23.68

per cent.; from 6 to 12 months, 55.77 per cent.; from 1 to 2 years, 53.94 per cent.; from 2 to 3 years, 27.73 per cent.; from 3 to 4 years, 13.66 per cent.; from 4 to 5 years, 6.20 per cent. Again, the death-rate reach the large figure of 40.15 per cent. for the seven-year period of 1882-1888, during which, in the Hospital for Sick Children, Paris, 2585 cases of measles were treated. The mortality, however, was lower, namely, 25.02 per cent., in the Trousseau Hospital from 1882-1886 - 907 cases in all being admitted suffering from measles; and in 1890-1894 the death-rate was somewhat higher, namely 28 per cent., amongst 2248 measles patients.

SEX.

It is difficult to arrive at a conclusion regarding the influence of sex upon the prognosis of measles; the writer is of the opinion that it may be disregarded as unimportant, as at one time the number of deaths among boys appears to exceed those amongst girls, whereas at another the contrary obtains.

PREVIOUS HEALTH OF THE PATIENT.

It very naturally follows from what we know regarding the systemic effects of measles that an attack of that malady occurring in the debilitated will influence the prognosis for evil; and the more so should the dyscrasia in question be that of tuberculosis, which when latent is apt to be rejuvenated, and so rapidly destroy the patient on the supervention of the measles attack. This, however, will vary somewhat according to the seat of the tuberculous process: thus, if in the lymphatic glands, it would be less unfavourable than if located in the lungs or other vital parts. Measles usually aggravates chronic catarrhal ailments, especially those of the middle and internal ear; and, short of actual fatality, the function of the affected part may be destroyed for ever. The greatest danger doubtless exists from pulmonary complications, and of these capillary bronchitis and broncho-pneumonia are by far the most dangerous; indeed, it is estimated that no less than one-third of all children attacked by the latter during measles perish from its effects. Laryngeal affections are well known to contribute to the risk of fatality, especially if a diphtheritic lesion be present. An attack of measles in the rachitic, strumous, or anaemic is always a serious event; and the greatest care should be taken of such children at epidemic times to obviate the risk. The presence of hydrocephalus, and other acute or chronic maladies, would also detract from the chance of the morbillous patient's recovery.

CHARACTER OF THE EPIDEMIC.

The severity of the prevailing epidemic undoubtedly has much to do with the mortality of measles - some epidemics at times being extremely mild and possessed of a very low death-rate, whereas others have just the very opposite characteristics, a large part of the appalling mortality being due to such serious complications as broncho-pneumonia. For long the etiology of the exceedingly malignant nature of some of the epidemics of the past was sought for in vain - theories being then vaunted which are now no longer tenable, such as

climatic influences, geographical location, "virgin soil," and the like. Even the unsuitable dietetic and hygienic and therapeutic procedures of the past, already noted, do not quite explain the differences in mortality reported by one and the same observer during different epidemics, or from the same district at different times. Universally applicable rules cannot be laid down; and even the rare exceptions, about to be noted, must be left for the most part for the future to explain. There are many interesting examples extant in the literature. Thus, at Lippe in Hungary, an epidemic prevailed, in 1856, of such a malignant character that over 50 per cent. of the cases died, mostly after a normal prodromal stage, through complications which occurred after the fifth day, while in 1863 only 3 per cent. succumbed. The epidemic at Winschoten, beginning in the month of May of 1865, occasioned, Tresling says, a mortality of 4.83 per cent., while that of the middle of September of 1871 caused only a death-rate of 2.1 per cent. According to Karajan, the mortality of the epidemics of 1862 in Lower Austria, which occurred during the presumably unfavourable cool months, reached only 2.29 per cent., while that which occurred in the summer months of 1863 in the same district attained 6.29 per cent. If from this summer epidemics should prove more fatal, yet in other places precisely the reverse has obtained. Thus, according to Voit, there died in the Children's Clinic at Würzburg, within thirty years during the winter months, 12.7 per cent. of the measles cases; in spring, 11.5 per cent.; in summer, only 2.5 per cent.; and in autumn, 0.4 per cent. Passow informs us, however, that of all the fatal cases of measles in Berlin, from 1863 to 1867, there took place in winter 41.4 per cent.; in spring, 11.9 per cent.; in summer, 13.5 per cent.; and in autumn, 33.4 per cent.—the autumn being therefore essentially more unfavourable than in Würzburg. In the year 1885, in Sunderland (County of Durham) an epidemic of great severity broke out, which Harris (Lancet, April 30, 1887, p. 970) says was the most malignant in that borough: for out of 1316 cases 384 died, that is to say, over 29 per cent.; during the decade immediately preceding, the average number of deaths from measles annually had been 46, this being regarded as low. In 1887, an unusually malignant epidemic broke out in Liverpool and district, the mortality being 15 per cent.: in contrast to which was the 1875 Canary Islands epidemic with only 8 deaths 1123 cases. The extreme virulence of epidemics amongst savages has already been referred to, the disease at one time among the North American Indians working havoc everywhere, the cause thereof being put down to atmospheric inclemencies. The 30 per cent. mortality of measles, on the introduction of that disease to the Fiji Islands in 1874, is quoted in favour of the "virgin-soil" hypothesis. The epidemiology of Iceland, moreover, furnishes a striking illustration of the ravages of a measles when its susceptibility as a whole has not been lessened by frequent outbreaks of the disease. According to Hagenbach (Jahr. f. Kinderh., N.S., Vol. ix., p. 57), pandemics occurred there in 1664, 1694, and 1846: in 1868-69, however, the outbreak was confined to a small part of the island. On

May 23, 1882, the infection was carried there from Copenhagen and swept over the whole island, lasting until the September of that year; and as no effort was made to prevent its spread, the destruction which it was capable of working can well be imagined. Thus, the total death-rate from all causes for 1882 was 32.59, whereas in the four preceding years it had varied between 15.00 and 18.00. The number of deaths in 1882 exceeded the births by almost a thousand; and so great was the commercial effect of the epidemic that important industries were brought to a standstill for weeks together. The disease did not even spare infants under six months, as is usual; and it was particularly fatal to pregnant and puerperal women. In the six medical districts, with populations of about 5,500 each, the total mortality from all causes for the year was 408 (about 7.5 per cent.); the total mortality from measles 250 (about 4.5 per cent.), of which latter 12 were still-births, 47 were less than one month of age, 68 between one and twelve months, and 16 were women who had lately been confined. Indeed, so serious was the state of affairs that the medical officers seriously considered the advisability of making measles an endemic disease, in order to save the country in future from such pandemics. The malignancy in question, moreover, could not have been due, as has been suggested, to the coldness of the northern climate, when we take into consideration the epidemic of the (hot) Fiji Islands occasioned by infection from Sydney, which destroyed a fourth of the population. The severity of the epidemics of measles, however, does not vary so much as in the case of scarlet fever. Undoubtedly the carelessness of many mothers, in allowing the disease to run its course untreated, and the general view taken as to its supposed benignity, are responsible in great part for its sometimes high mortality. Thus, according to Ranke (Jahr. f. Kinderh., N.S. Vo. ii., 1869, p. 36), the average mortality at Munich for four epidemics was 1.7 per cent.; the separate epidemics, 0.7 per cent.; twice 1.5 per cent.; and once 2.7 per cent.: total number of cases 1907. At Stuttgart, according to Köstlin (Arch. Vereins f. Wissen. Heilk., 1866, Vol. ii., p. 342), from 1852-1865, 300 cases of measles were treated by the medical officers of the city charities, in which the facilities for recovery were unfavourable. In spite of the latter, however, only 7 died - the death-rate being therefore the extremely low one of 1.8 per cent. The epidemics at the following four places may be taken as representing those of medium severity: Thus, at Heidelberg, according to Embden (loc. cit.), in 1888, there were 461 cases of measles at the Policlinic and the Children's Hospital, with 31 deaths, or 6.7 per cent. At the Policlinic of Kiel, in 1860, according to Bartels (loc. cit., p. 66), 573 cases with 21 deaths, or 3.8 per cent. At Griefswald, in 1861, according to Krabler (loc. cit., p. 119), 311 cases with 21, or 6.8 per cent. At Würzburg, in 1883, according to Brier (loc. cit., p. 11), 1896 cases with 153 deaths.

LOCATION.

Schiefferdecker (E infl. d. Acut. Haut. auf d. Kdrstbl., 1870) long ago drew attention to the variation of measles at different places; affirming that in London,

out of 1000 deaths, according to statistics extending over eleven years, 27.0 deaths were due to that affection; in Frankfurt-on-the-Main, during twelve years, 12.0; in Königsberg, in twelve years, 6.6; in Stuttgart, in fifteen years, 6.3; in Geneva (Canton), in thirteen years, 6.6; in Munich, in seven years, 5.8; in Berlin, in eighteen years, 3.8 cases. Probably in some places the difference in mortality may depend partly upon the presence or absence of severe epidemics of measles during the years concerned; but this cause, nevertheless, fails to explain the very noticeable difference between the two great cities, London and Berlin, in which it may be presumed that measles is more or less endemic. The cause must therefore be sought in local conditions, which either increase the mortality from measles in London, or that from other causes in Berlin: the former is probably the most important cause of the marked difference in question. According to Whitley (Change of Type in Epidemic Disease, Milroy Lectures, Brit. Med. Jour., 1893, Vol. i., p. 451), the interval between epidemics is generally about two years, sometimes six months more or six months less; and it is due to the seasonal curve showing two maxima, and an epidemic wave of longer period, recurring at intervals of ten years, when a very high mortality is reached; thirdly, to the fact that in populous places a series of epidemics may gradually raise the mortality of measles to a rate double or triple that of the ordinary seasonal maxima. The highest mortality of the disease is well known to be found in cities, asylums, and nurseries; and, according to Williams (loc. cit.), the affection appears to be quite unaffected by improvements in sanitation. In proof of this may be cited the Local Government Board's report for England and Wales (Thompson:—Twenty-fourth Annual Report of the Local Government Board, with Supplement, v., 1894-95), showing an increasing mortality since the decade ending 1880, while the principal zymotic diseases which were directly dependent upon sanitation decreased. The mortality amongst cases treated in private practice we have seen to be considerably less than observed in hospitals, owing perhaps to the greater vital resistance of the former and their coming under treatment sooner. Thus, according to Fürbringer (Berl. klin. Woch., 1891, S. 103), the death-rate in cases treated at the Policlinic was 6.7 per cent., while amongst those treated in private practice it was only 2.6 per cent. In the Nursery and Child's Hospital of New York City, according to Adriance (loc. cit.), the number of cases of measles observed was 96, with a mortality slightly over 15 per cent., whilst others in private practice have been known to boast of never having a patient succumb to the disease. This strikingly contrasts with the experience in many public institutions. Thus, to cite further examples, Henoch (Berl. klin. Woch., 1891, p. 103) mentions that of the 294 cases of measles treated in the Charité Hospital from April, 1888 to October 1, 1890, 89 died, or 30.3 per cent. Fürbringer (loc. cit.), again, reports that, at Friedrichshain from 1886-1890, there were 453 cases with 103 deaths, or 22.6 per cent.; and also that from 1886-1887, the number of cases there

being 181 with 55 deaths, the mortality was as great as 30.4 per cent. Both Henoch and Fürbringer, however, explain that almost all who succumbed were in a miserable condition, and were either rachitic or suffering from various atrophic conditions or severe complications when brought to the hospital. On the other hand, cases properly treated at home do not show such an alarming mortality, even in the cities; and, as a rule, a not unfavourable prognosis may be given in the country.

SEASON AND CLIMATE.

Although the death-rate of measles is markedly increased by the occurrence of inflammation of the lungs, it is not always the case that this complication is more common and its mortality higher in the cold and inclement seasons of the year: at least this is only what can be inferred from a mass of varied statistics. Gregory holds that "season would appear to have less influence on the mortality of measles than might have been anticipated", in proof of which he gives the following table:

Deaths from Measles in England and Wales by Quarterly Periods.

Quarterly Periods.	1837	1838	1839	1840
Jan., Feb., & March	2022	2074	2836
April, May, June	1512	3204	2641
July, Aug., & Sept.	2362	1037	2767	1739
Oct., Nov., Dec.	<u>2392</u>	<u>1943</u>	<u>2892</u>	<u>2110</u>
	<u>4754</u>	<u>6514</u>	<u>10,937</u>	<u>9326</u>

Karajan tells us that measles in 1862 occurred in lower Austria during the cooler months of the year, but had a death-rate then of only 2.29 per cent.; whereas the mortality reached 6.29 per cent. in the same place the following summer. Passow returns the deaths from measles in Berlin from 1863 to 1867 thus:

Season.	Percentage Mortality.
Spring	11.9
Summer	13.3
Autumn	33.4
Winter	41.4

The late winter and the early spring months are said to be the most fatal seasons for measles in the United States. The official returns for New York City (from 1830-1844 with 2104 deaths from measles) are to the following effect:

Season.	Deaths.
January, February, March	610
April, May, June	574
July, August, September	536
October, November, December	384

From this it will be seen that there were fewest deaths from the disease in the last three months of the year, and the most in the first three. Furthermore, the months of February, March, April, and May, 1900, show the greatest number of deaths in the United States (United States Census Report, 1900):

Comparative Proportion of Deaths in Each Month Per 1000 Deaths in the United States for the Year 1900.

January	95.0
February	150.1
March	176.0
April	146.8

Comparative Proportion of Deaths in Each
Month Per 1000 Deaths in the United
States for the Year 1900. (Continuation.)

May	130.3
June	66.4
July	48.5
August	43.6
September	34.7
October	25.5
November	34.6
December	48.5

There are many who believe that climate is not without influence upon the death-rate of measles. Gregory says that "in hot countries measles is not viewed with alarm, evidently from the absence of thoracic complications". Nevertheless, he entirely loses sight of the danger arising from gastro-intestinal accidents in such localities. On the Amazon river, in 1749-50, according to d'Alves, there died 30,000 Indians; a similar mortality occurred in British North America, according to Meyer-Ahrens; at Madagascar 5,000 cases died in one month in 1806; in the American Army, according to Woodward, out of 21,676 cases over 2.5 per cent. died, merely from the fever, without reckoning the numerous complications; the mortality assumed alarming proportions during the epidemic, we have seen, at the Faroe Islands; also, according to Meyer-Ahrens, during that of Iceland in 1846. There succumbed upon an Indian immigrant ship, according to Roux, out of 43 cases of measles 11; in the restricted accommodation of the Stockholm Children's Hospital, of 131 cases 36 per cent. died; under favourable hospital conditions, according to Laveran, 40 died out of 125 soldiers who had contracted measles, but who were at the same time not yet recovered from the debilitation of a recent campaign.

GENERAL MORTALITY.

The mortality of measles varies in different localities: for, as would be expected, it is greater in large cities, where there are larger numbers of overcrowded poor persons than in the country. Even in large cities there will be noticed a considerable variation in the mortality. In the subjoined table, based upon the official returns, and extending over a period of thirty-three years, the higher death-rate of the city of London is apparent, the figures representing the number of deaths per million of the population:

	England.		London.	
	Male.	Female.	Male.	Female.
Under 1 year of age	3022	2530	3571	2897
From 1-2 years of age	6086	5825	8630	8050
" 2-3 "	3178	3255	4683	4757
" 3-4 "	1730	1851	2594	2620
" 4-5 "	980	1028	1358	1446
" 5-10 "	255	278	301	316
" 10-20 "	29	38	24	32
" 35-40 "	3	5	2	3

The years comprised in the above table were 1838-1842 and 1847-1874, the average mortality for one year being in England 457 males and 422 females; and in London 620

males and 522 females. It is now generally recognised that the death-rate from measles has steadily declined with improvements in sanitation and so forth. This will be evident from the Local Government Board's returns from which the following data are taken:

Year -	1851-60.	1861-70.	1871-80.	1881-90
Annual Mortality per One Thousand Persons living at Ages under Five Years	2.8	3.0	2.57	3.13

Even in former years, when measles was considered as now a trivial ailment, the mortality under favourable conditions was usually comparatively slight, at least perhaps the most benign of the acute fevers. For instance, Faber affirms that there died in the epidemic of 1827-28 at Schorndorf only 1.8 per cent. of 2,100 cases. According to Geissler, from 1835-1869 at Meerane, only 2.1 per cent. of all the deaths amongst children were from measles, the severe epidemic of 1861 causing only a mortality of 3.5 per cent.; according to Ranke, in four epidemics at Munich, the mortality varied from 0.7 to 2.7 per cent.; in the Children's Clinic at Würzburg there died, according to Voit, out of 851 cases of measles from 1842-1871, 39 or 4.5 per cent.; in Stuttgart, according to Kistlin, from 1852-1865, 1.8 per cent.; the epidemic at Frankfort in 1858 occasioned, according to the same observer, a mortality of 2.4 per cent. Occasionally an epidemic is marked by special malignancy, owing to the occurrence of severe complications, which same markedly augment the number of deaths. Thus, there died at the Children's Hospital in Würzburg, in the epidemic of 1863, 10.5 per cent.; in the Grand Duchy of Baden, according to Meier, from 1818-24, 5.4 per cent.; in an epidemic at Sydney, according to Carroll, 6 per cent.; at Leith, according to Brown, 9.7 per cent.; in the district of Zolkien in 1840, according to Seidl, out of 1,1519 cases, 196 or almost 13 per cent.; at Magold, according to Schütz, nearly 10 per cent.; at Altdorf, according to Kapff, 10 out of 95 cases; at Herresberg, according to Fricker, 1 out of 11; and, according to other reports from Würzburg, in the years 1836-37, out of 317 cases, 47, out of 312 cases 22, out of 266 cases 24, and so on with other instances similarly.

FAVOURABLE INDICATIONS.

The prognosis is favourable when the initial temperature is moderate, except perhaps during the evening exacerbations; when the pulse does not exceed 120 beats in the minute, the temperature being below 100. or 103.F.; and when both temperature and pulse begin to fall as soon as the rash is fully out, thereafter declining slowly. In addition to the above, the skin of the patient should be moist; there should be no disproportion between the amount of the fever and the degree of muscular debility; the breathing, even if quickened, should yet be deep and should give rise to no particular pain; the cough should be slight and loose, subsiding as soon as the rash is in full bloom and disappears. This,

again, should be of the normal colour and duration, and appear at the fourth day and progress gradually all over the body. Finally, complications should be absent, the catarrhal symptoms moderate, and the patient not too far advanced in life.

UNFAVOURABLE INDICATIONS.

It is not a good sign when the initial temperature rises above 103.F., or if it remains so or increases before the full bloom of the exanthem. After the fading of the rash a high temperature can only be viewed with alarm, as indicative in most instances some sort of pulmonary complication. Furthermore, the eruption should not be late in coming out, free from confluence and unusual profusity, and neither scanty or pale or livid. A very unfavourable indication is a high pyrexia with a poorly-developed eruption. The haemorrhagic form of the disease is certainly also very grave, the more so if bleedings from the mucous membranes be observed. A dangerous cardiac weakness would be indicated by the sudden recession of the rash; and the presence of serious complications would be suggested by convulsions, nervous disturbances, severe diarrhoea, persistent hoarseness with dyspnoea, and a continued hyperpyrexia.

T R E A T M E N T.

PROPHYLAXIS.

The fact that measles is contagious before any symptoms appear renders prophylaxis almost impossible. Once the disease has broken out in a family or institution, it is seldom that its spread can be controlled. Nevertheless, the effort should always be made, as proper hygienic and sanitary measures can accomplish much good. The various public health measures may conveniently be considered under the following headings:

ISOLATION.

The restriction of the propagation of measles is obviously necessary from the view of public safety; and measures of isolation, as now practised almost everywhere, have well justified the trouble and expense entailed, leading in many instances to the disease being for a longer or shorter period entirely stamped out of the districts in question. The greatest obstacle to the procedure seems to be the powerful indifference on the part of the parents, who seem to regard measles as something that their children must have sooner or later. Hence the great mortality even now encountered and the frequency of the various complications from time to time reported. The fact of its infectivity during the prodromal stage, when usually neither parents nor physicians have the power to recognise the developing attack, contributes largely to its propagation, especially in epidemic form. There are many valuable recommendations that have been published from time to time by health officers and others for the information of the laity; and it is believed that the effects thereof have been most salutary. Indeed, the more the laity are enlightened as regards this pest of infancy the better. In time the hope is justified that the co-operation of the public with sanitary authorities and medical practitioners will in due course lead to the disease being shorn of much of its malignancy. Medical men should let no opportunity pass of impressing upon the lay mind that measles is contagious; that it is dangerous to life; that it is one of the most frequent causes of deafness; and that as such it is a constant menace to the public health. In testimony of this we have Quain's statement (Dict. of Med., 1883) that the annual mortality from measles is 5 per every 10,000 inhabitants; as well as the fact that the deaths in 1889 from measles - 14,732 - in England and Wales was 5 per thousand in excess of those from both diphtheria and scarlatina - respectively 5,368 and 6,698. In Glasgow, according to Russell (Handbill issued by Order of the Glasgow Health Committee, 1897), the deaths from measles in that city from 1891-96 were three times as many as those caused by scarlatina, four times as many as enteric fever, and in excess of all infectious diseases, with the sole exception of whooping-cough. The parents

should be reminded, moreover, that measles is one of the most dangerous diseases to which a child under five years can be exposed; that it is especially dangerous during teething, or in the second year of life, death often resulting from pneumonia; and that the longer the child can be protected from measles the less likely will he be to become deaf or die from the disease. Furthermore, it is necessary to point out that delicate or strumous children are by measles often lead into consumption, and that it is absolutely untrue that having measles or other children's diseases when young predisposes to, or assures better health in after years, as is commonly believed. As bearing upon this subject the suggestions of Theodore Thompson (Twenty-fourth Report of the Local Government Board, 1894-95: Supplement containing the Report of the Medical Officer, p. 135) to the following effect: The sources from which information may be obtained as regards the occurrence of measles are fourfold, namely: (1) The adoption of compulsory notification by the medical attendant and householder. Efforts must be made to insure systematic notification by the householders, as by distribution through the medium of schools of handbills, impressing upon the householders their duty, as well as their liability if they fail to notify. (2) Careful inquiry, in every instance, to trace where possible the sources of infection, supplemented by house-to-house visitation in the immediate neighbourhood when necessary. (3) Notification by school authorities of any known or suspected cases of measles of which they have information, and also of the names and addresses of absentees from school. This should be made obligatory in municipal schools, and efforts should be made to enlist the co-operation of the masters or mistresses of private schools and the teachers in Sunday-schools. The information needs to be given systematically, that is to say, during inter-epidemic periods, as well as when epidemics prevail. Sanitary authorities in receipt of information derived from school authorities should, it need hardly be said, regard knowledge of cases in this way reported to them as possible clues to the detection of other and unknown cases. (4) Information, general and particular, from persons and organizations rendering assistance - medical or eleemosynary - to the poor, from the clergy, and from church organizations generally. The measures whereby extension of measles within the invaded dwellings may be limited are, according to our author, fourfold also, namely: (1) Every household known by the sanitary authority to be invaded should be visited by an officer of the health department for the purpose of ascertaining what steps have been taken towards attainment of proper isolation of the sick person, and of advising, when necessary, further efforts in the direction of safeguarding other inmates of the dwelling. In addition to verbal instructions on this subject, printed forms containing similar advice may with advantage be left with the householder. During the infectious period the patient, if not removed to a hospital, for infectious diseases, should be kept apart from other members of the family, in a suitable room and in charge

of an attendant who should have no personal communication with the other inmates of the house; and precautions of cleanliness and disinfection should be taken. (2)

Frequent visits should be made to the household by officers of the sanitary authority, with a view to seeing that the precautions against spread of infection are not relaxed so long as there is danger of the disease being communicated to others. Such visits should serve also to aid in the early detection of cases in the same family. For not less than fourteen days after disinfection of the invaded dwelling, members of the household should be kept under observation, and they should be instructed to communicate with the medical officer of health on the appearance of any suspicious symptoms. (3)

When it is found impossible, owing to inadequate house accommodation or other reasons, to isolate the sick person properly, it is most desirable that the patient, if the state of his health permit, be at once removed to a suitable hospital. (4) After the recovery of the patient or after his removal to a hospital, the room or rooms that have been occupied by him, as well as all articles that have been infected, should be properly disinfected. Thompson also gives seven methods, by means of which extension of measles throughout the invaded district may be checked:

(1) The notification by the health department of the occurrence of measles to school authorities. (2) The exclusion from school for a prescribed period, or pending the production of a medical certificate of all members of invaded households; children known to have been in personal communication with houses in which measles is known to have broken out; and children of households not yet invaded, but in close relation with the houses already invaded. (3) Closure of elementary schools. To be **effective**, this must include all private schools for young children, as well as all Sunday-schools. If it cannot be made universal, it is not worth attempting. To close the day-schools and leave the Sunday-schools open may be expected to have the effect of spreading the epidemic over a longer period of time, but without producing any such diminution in the total number of cases as would compensate the community for the **great** inconvenience caused by the closure of the elementary schools. Closure of the schools, if resorted to, should not be adopted whilst there is reasonable prospect of effectually controlling measles; not, on the other hand, should it be postponed until prospect of benefit from the measure has well nigh disappeared. (4) Precautions with reference to library books. The librarians of public libraries should be systematically informed by the sanitary authorities of the names and addresses of all persons known to be suffering from measles, with a view to not supplying books to any member of an invaded household until further informed by the said authority that this may be done with safety. (5) Prohibition of those **residing** in invaded households from carrying on their occupations, when such a step appears necessary. (6) Instruction of the public of the gravity of measles, especially amongst infants and

"Avoid the special contagium of the disease. Do not let a child go near a case of measles: this is especially important to be observed by guardians of children between one and two years of age. Do not permit any person or thing, or a dog, cat, or other animal, to come direct from a case of measles to a child. Unless your services are needed, keep away from the disease yourself. If you do visit a case, bathe yourself and change and disinfect your clothing before you go where there is a child. Do not permit a child to ride in a hack or other closed carriage in which there has been a person sick with measles, except the carriage has since been thoroughly disinfected. Do not permit a child to wear or handle clothing worn by a person during sickness or convalescence from measles. Beware of any person who has a cough or sore throat; do not permit a child to kiss or take the breath of such a person, nor to drink from the same cup, blow the same whistle, or put his pencil or pen in the mouth" (Handbill issued by the Michigan State Board of Health, Feb., 1900).

NOTIFICATION.

In view of the fact that measles carries off more children than scarlatina or diphtheria, the desirability of making measles a notifiable disease is apparent. That it is not compulsorily notifiable under the Infectious Diseases Notification Act is a matter of regret; and the option which the sanitary authorities have of making it locally so should always be exercised. The great drag upon the rates for notification fees acts as the one and only deterrent; so also, perhaps, the fact of the measure having been put to a lengthy test in Edinburgh and failed to effect its purpose. Indeed, Sir H. Littlejohn himself, in one of his annual reports, advised its discontinuance. One advantage, however, derived lay in the fact of its leading indirectly to the discovery of scarlatina cases resembling measles. If notification is to be of value at all, the householder's duty should be enforced, as innumerable cases of measles are not seen by medical men at all. Certain epidemics also might be prevented, as suggested, if it were possible to compel notification only in the inter-epidemic periods, and to isolate at the same time all suspected or certain cases. The great value in aborting an epidemic lies in the fact that it gives children time to pass ages at which most attacks and the greatest mortality occur. The principal difficulty is due to the early communicability of the disease: for as soon as the first symptoms thereof are manifest, the infection is sure to lay hold on all susceptible and exposed persons, and then isolation is futile. Dawson Williams cites the following case to prove that infection may occur even before the infected person is known to be ill: According to Fenton, M.O.H., Coventry, "Thirteen children attended a dancing class one afternoon, including 3 of my own and 2 of a friend, who had just arrived in the district, and who had been exposed to infection of measles before arriving. These 2 children came to my house and spent the evening in my presence. There was nothing to attract my attention to their condition, and, indeed, so well were they

young children. (7) Temporary addition to the sanitary staff during times of epidemic prevalence of measles for the purpose of effecting necessary inquiries, visits, disinfection, etc. Some years ago the Health Committee of the City of Glasgow issued a handbill, entitled "Hints about the Prevention of Measles"; and as it contains many useful hints, it may here with advantage be quoted: "The Committee of Health of Glasgow hope that parents and others will read this paper carefully, and adopt the instructions which it contains, and any others given by the medical attendant having the same in view. Measles is a dangerous disease, one of the most dangerous with which a child under five years can be attacked. It is especially apt to be fatal to teething children. It tends to kill by producing inflammation of the lungs. It prepares the way for consumption. It tends to maim by producing inflammations of the ears and eyes. In Glasgow, measles has caused three deaths for every one which has been caused by scarlet fever. Only one infectious disease has been more destructive of life, viz., whooping-cough. Measles has carried off more than four times as many persons as enteric fever. It is therefore a great mistake to look upon measles as a trifling disease. The older a child is the less likely it is to catch measles; and, if it does, the less likely is it to die. If every child could be protected from measles until it had passed its fifth year, the mortality from measles would be enormously decreased. It is therefore a great mistake - because, as a rule, children sooner or later have measles - to say 'the sooner the better', and to take no means to protect them, or even deliberately to expose them to infection. It is wrong for mothers with children in arms to go into houses where measles exists. Every child with measles ought at once to be put to bed and kept warm. The mildest cases may be made serious by a chill. Measles is for this reason most dangerous in winter and spring. A case of measles continues infectious for at least three weeks after the appearance of the rash. During that time separation from the healthy ought to be secured either by removal of the sick to hospital or by isolation at home. Isolation means not merely a separate room for the sick, but the withdrawal of apparently healthy children of the same family from school (day and Sunday), and the exclusion of strange children from the house. The isolation is, as far as possible, from other children belonging to the same family, more necessary in the case of measles than of any other infectious disease, because of this peculiarity; for days before the rash comes out, the child is highly infectious. School teachers especially ought to be familiar with the appearance of children in this stage of measles. The eyes are watery, glistening, and sensitive to light; there is a ringing cough, sneezing, and running from the nose, with a flushed face: in short, all the signs of a bad 'cold in the head'. No child showing these symptoms ought to be allowed to go to school. Any child observed at school with these symptoms ought to be sent home at once. Such children are to be looked for more particularly in the Infant Department." Again, the following handbill, entitled "How to Avoid and Prevent Measles", may also be quoted verbatim:

that they had walked six miles in the morning, had danced in the afternoon, and walked home about one mile at night. Next day they both sickened and developed measles. Of the remaining 11 children 2 were presumably immune, having previously suffered from measles, but the whole of the 9 developed measles during the following fourteen days".

SANITARY INSPECTION.

From what we know of the manifestations of the disease, it is advisable that any district in which it occurs should be submitted to proper inspection, and for the purpose of ascertaining the extent of the disease; discovering unsuspected cases; disclosing persons who have been subject to infection and preventing their conveying the contagion; warning parents and guardians as to the prevalence and distribution of the disease; and prohibiting healthy children from an infected house attending school. This inspection will, of course, be carried out by the sanitary inspector during the usual course of his statutory duties: a special staff, however, might be appointed should occasion arise. In general, the duties of the medical officer of Health are formulated; in the case of measles they should comprise the prompt investigation of the disease when either suspected or notified; ordering of the prompt and thorough isolation of those sick or infected with measles, so long as there is danger of their communicating the disease to other persons; seeing that no persons suffers from lack of nurses or supplies; giving public notice of infected places by placard on the premises if necessary; notifying teachers or superintendents of schools concerning families in which there are cases of measles; disinfecting rooms, clothing, and premises, as well as all articles likely to be disinfected, before allowing them to be used by other persons than those in isolation; keeping his sanitary authority constantly advised respecting every outbreak of measles. These rules should, when necessary and lawful, be enforced in their observance by penalty; and, in the absence of regulations by the sanitary authority conflicting therewith, orders by the Medical Officer of health in the performance of these duties should have the force of regulations by sanitary authority itself.

SCHOOL-CLOSURE.

It is obvious that closure of the schools is only of service in the early stages of the epidemic. It should be only advised after taking into consideration the locality affected, the effect of the closure of the schools on the information that will be forthcoming regarding the outbreak, and the opportunities for intercourse apart from the school. As a last resort, and one likely to be of far-reaching utility, it may be arranged by the medical officer that there be a mutual exchange of information regarding the children absent from school through illness; that the school children be excluded from infected houses; that teachers will give warning of any cases of "cold" which they notice amongst their scholars; and that information be given when the epidemic is observed to be at an end. It may here be noted that the model by-laws of the French government contain provisos equally drastic, and thorough in detail,

for dealing with epidemics in primary schools (Annal. d'Hyg. Publ., Sept. 1, 1893); and they prescribe that every child attacked by fever be sent away from school or, if a boarder, to the hospital, and upon the advice of the inspecting medical officer, the brothers and sisters of the child - and even all the children of the same house - are to be kept away from school. The family to which the child belongs must receive a notice as to the precautions to be adopted against possible infection of other children, and as to the necessity of not sending the child back until it has bathed or washed with soap several times, and until its clothes have undergone either disinfection or complete washing in boiling water. Children who have been ill must not return to school without a medical certificate, and until a period of time has elapsed since the beginning of the fever equal to that prescribed by the instructions of the Academy of Medicine of Paris. Children attacked by measles must be forbidden to return to school for sixteen days; and their books and copy-books, toys, and other objects which may have become contaminated must be destroyed by burning. The class-rooms must be disinfected; and when several cases occur within a few days, in spite of all precautions, either the schools must be closed or exclusion of children under a certain age must be insisted upon. If necessary, a notice containing information as to the epidemic which has required the exclusion can be sent to each family. With regard to the disinfection of class-rooms, the instructions are: Wash the class-room walls and floor with an antiseptic; disinfect by atomization all maps, etc., hung on walls; and disinfect by washing tables, seats, and furniture generally - completely destroying by fire the desks of patients, books, toys, and so forth.

DISINFECTION.

It is very seldom that measles is conveyed by infected articles or individuals, as the germs of the disease appear to have very little vital resistance outside of the human body: still, the possibility of the propagation of the affection in this way must always be remembered. Therefore, efficient disinfection should invariably be attempted by the most suitable means available. At the outset, forthwith should be burned or disinfected all secretions from the nose, eyes, and mouth after removal of the same by convenient pledgets of cotton-wool. The patient's urine and faeces should be buried at least thirty-five to forty yards away from the dwelling - failing which, they may be flushed down the sewer from the closet, the basin of the latter being immediately disinfected thereafter. There are very many efficient disinfectants available almost everywhere. For the W.C., chamber utensils, etc., chloride of lime is both non-poisonous, inexpensive, and thoroughly reliable; and one pound of it will make three gallons of germicidal liquid, a quart of which will serve the day's demands. For disinfecting sheets, clothing, etc., one gallon of this solution may be added to ten gallons of water: the fabric (if it be white) can be immersed in it for two hours or so before being carried from the room. Of the other disinfectants, specially adapted to a case of measles, permanganate of potassium and corrosive sublimate are to be

recommended. They may with advantage be combined in the proportion of one part of each to eight gallons of water. It need scarcely be pointed out that it is quite unsuitable for the disinfection of metallic vessels; and for the disinfection of sinks, drains, and sewers it is less reliable than chloride of lime. Its poisonous nature must be remembered, and the attendants put on their guard. Provided the odour be not objected to, carbolic acid may be used with confidence. Articles of clothing and bedding which come from the patient should be washed separately, and with due antiseptic precautions: on no account may they be sent to the public laundry, as it is to be feared is too often the case. The physician need not be reminded as to the measures of personal asepsis to be observed, and the risk which he runs of carrying the infection to another household - though, as stated, such risk is somewhat remote, and it is better to err on the right side in this matter. After the patient's recovery, he should be thoroughly bathed and clad afresh before being brought into an uninfected apartment. The sick-room and its contents must be thoroughly disinfected by formaldehyde, sulphur dioxide, or one or other of the rigid measures required in infectious diseases and described in the various manuals on hygiene and sanitation. Patients who have died from the disease should have their bodies wrapped in a sheet immersed in a 5 per cent. solution of carbolic acid, or a 1 : 1000 solution of corrosive sublimate. When cremation is not allowed, the body should be surrounded with quick-lime and buried six feet below the surface of the cemetery. As few persons as possible - and only those who have already had measles - should be allowed to attend the funeral. The books borrowed from the public library before return should be efficiently disinfected. Unbound books should be submitted to the action of steam. Bound ones should be "stoved" in a formaldehyde chamber in which there is a partial vacuum. In houses where there is no special apparatus, a few drops of formalin should be sprinkled on every page of the book. With its pages open it should - for twenty-four hours and in a warm room - be exposed, in an air-tight box, chest, or drawer, to an excess of formalin.

MANAGEMENT OF THE DISEASE.

In mild cases of measles very little treatment is required, and in any event it must be purely symptomatic: for in its ordinary form the course of the malady cannot be aborted. Provided there are no complications and the fever and constitutional and other disturbances are kept in check, recovery will ensue in due time. One has therefore little to do more than, as a rule, to watch the progress of the disease, to oppose injurious influences, and to place the patient under those circumstances in which interference with the normal development is as far as possible obviated. All this is accomplished if the patient be ordered to take to his bed, to have his diet properly regulated, his thirst quenched with water, etc., his apartment ventilated and kept at a temperature of about 65.°F., and a due supply of light secured. There should, of course, be no draughts. At the same time it is

absolutely necessary that there should be an abundance of fresh air, previously warmed if possible. The child should be covered only as warmly ~~and~~ is comfortable to it. Far too often the bed is heaped with too much clothing. About the close of the third day a warm bath should be given, as it tends to relieve the fever, to quiet the nervous system, and to aid in the satisfactory development of the eruption. At all times water must be used in a manner to ensure cleanliness. There is no need in shunning water in the way that is sometimes done. Ablution, performed properly, never need do harm. The same remark applied to the changing of the bedclothes and the garments of the child, which popular prejudice causes to be too much neglected. Liquid or semi-liquid diet is to be recommended, but it is not necessary in the case of older children with undisturbed digestion to use an absolute milk diet. In cases of gastric irritability predigested or other special food may be needed. As already stated, water may be given in any reasonable quantity to assuage the severe thirst. Infants may be given water without fail, to prevent their overloading their stomachs with milk. Cool, slightly acidulated drinks may be given older patients, or alkaline or carbonated waters; or, in case the skin is dry and the kidneys not acting freely, hot drinks. In order to avoid the photophobia, it is necessary to keep the room darkened, or the patient's eyes shielded with a screen or turned away from the light. It may here be noted that Chatinère (Presse Méd., April, 28, 1900) claims to have used red light in measles with good effect, and reports his having aborted the attack in nine instances - the recovery being complete in three to five days after the appearance of the first symptoms of the disease. Inoculation has also been tried by various clinicians, mainly for immunization against the disease. Thus, Thompson (loc. cit.), after inoculating nine children previously uninfected, with fresh serum from a patient suffering from measles, observed a rubeoloid eruption of three days' duration about the point of inoculation: in four of the children referred to the immunity thus conferred was regarded as complete. Weisbecker inoculated children with the blood-serum of measles patients, but with negative result; and on nine occasions Hubert and Blumenthal, by means of a similar procedure, cut short the disease. These experiments, however, having been incomplete and inconclusive, serum-therapy in measles may be regarded as futile. Alcohol is seldom needed in ordinary measles, and should be withheld unless specially indicated. As a substitute for alcohol, one ounce of glycerine may be combined with eight ounces of water, and half a teaspoonful of citric and tartaric acid added and given daily: of this both Semmola and Dujardin-Beaumetz (Rev. des Mal. de l'Enfance, Aug., 1888). There are certain measures which should be instituted for the prevention of complications from the catarrhal inflammation of the nose, mouth, and conjunctiva. The mouth should be washed several times a day with a solution of boracic acid, to which a little glycerine and a few drops of oil of wintergreen may be added, or some

antiseptic wash may be substituted. In this way it is possible in most instances to prevent the occurrence of stomatitis which usually threatens all cases. Williams is a firm believer in the method, as "it has been shown that the microbes associated with bronchopneumonia are present in the mouth in more than half the cases of measles". The nasal cavity should be sprayed with some mild antiseptic solution frequently during the day; and some authorities believe in using the steam atomizer on that part, as well as the mouth and throat. Siredex, for instance, claims to have had excellent results from the method in his institution, where previously 46 per cent. of his cases were complicated, but now only 13 per cent. The parts of the body, already mentioned as specially liable to gangrene (genitals, etc.) must be kept scrupulously clean and aseptic. During the entire course of the illness, the toilet of the skin must be properly supervised, and the eruptions commonly observed about the mouth cured by suitable antiseptic ointments. The vesicles or pustules on the body should be kept in aseptic condition, especially by means of a saturated solution of boracic acid - the fine powder remaining imbedded in the skin and destroying the offensive and infective emanations thereof. Itching - always annoying and often the cause of impetigo from the scratching which it occasions - may be kept within bounds by the application of carbolyzed vaseline or oil of eucalyptus. During the stage of desquamation, the child should receive one or two warm baths, and be put to bed at once; so also during convalescence, remembering always that a chill is very apt to be contracted unawares after the illness, so that it would be a wise thing to terminate each bath with a cold douche. Indeed, various hydrotherapeutic measures have from time to time been recommended for the control of the pyrexia of this disease, though, as a rule, the temperature requires little attention to keep it within reasonable bounds. For the purpose in question cold may be employed in the form of douches, baths, and spongings. Tepid baths, cold packs, and spongings, of the many methods hitherto recommended, are those most usually employed. The disadvantage, however, attached to sponging must be remembered, and lies in the irritation of the skin which the procedure entails. The special recommendation attached to hydrotherapy is in the respects that (1) it usually affords the patient relief more speedily and safely than any other antipyretic measure; (2) that it shortens convalescence by permitting the patient to return to the open-air activity sooner than otherwise possible; and (3) that it favours cleanliness of the body - an important precaution in the prevention of certain complications: again, whilst it is indispensable to combat by means of cold a dangerously high fever, it is no less desirable to control in time a temperature which tends repeatedly to exceed definite limitations. Amongst the special indications for hydrotherapy there are three of great importance: Sudden pyrexia with cerebral symptoms; pyrexia with bronchitis; and the relief of the inevitable discomfort of ordinary attacks. Experience proves that the best method is to

give, for about two minutes, a douche of cold water (59.F.) - the water - when cerebral complications are present - being particularly directed to the head and neck. Failing the alleviation of the cerebral symptoms and the reduction of the temperature by this means, hot douches alternating with cold ones may be tried - friction being made all the while and the procedure repeated as often as called for by the exigencies of the case. Due precautions must, of course, be taken to guard the child against the risk of heart failure, both during and after the bath, the temperature being taken per rectum if required after the bath, and a tablespoonful of wine administered at the same time. The efficiency of hydrotherapy is strikingly demonstrated in malignant cases, in which it is often of service after all other methods have failed. When necessary, ice-bags may be applied to the scalp or neck, and often affords more prompt relief than the foregoing. Should compresses be used, it is important to note that they should be frequently changed. Excellent results have been described with cold baths in the ataxo-dynamic forms of measles by Juel-Renoy and Duponchel (La Trib. Méd., May 15, 1890); while Dieulafoy (La Méd. Mod., June 26, 1890) reports instances of cold baths, to the number of four, giving speedy relief in cases where the disease was rapidly assuming a malignant form. Baths, according to Fodor (Bl. f. klin. Hydrother., July, 1891), should be given every hour, when the temperature rises above 102.2.F.: one only, however, is recommended to be given during the night. In the second class of cases (pyrexia with bronchitis), hydrotherapy is specially indicated for the reasons that: (1) the higher the temperature in these cases the more rapid and shallow the respirations; (2) the consequent diminution in the expansion of the lungs; (3) the tendency to atelectasis and consequent destruction of portions of the pulmonary tissue; and (4) the danger of poisoning by carbonic acid gas, and of insufficient oxidation of the blood. Hydrotherapy affords striking relief also in those cases in which the bronchitis is severe from the very invasion of measles, where, of course, the existing pyrexia will be aggravated by the outbreak of the eruption; capillary bronchitis, too, almost invariably manifests speedy response to hydrotherapeutic measures properly supervised. Cases of a mild character, coming under the third division, have the febrile discomforts satisfactorily relieved by the cold baths, which may be given as often as desired during the day, and perhaps twice at eventide: the temperature of the bath need not exceed 82.F., nor the immersion in the same a quarter of an hour. It is perhaps as well to mention here that the older writers on measles considered the degree of development of the exanthem of vital importance; and numerous, indeed, are the directions in some of their works for promoting it. Even in the year 1897, one finds Larrabee (Pediatrics, Oct. 1, 1897) recommending for the speedy development of the rash the administration of the iodides with diaphoretics, or the application of

hot packs smeared with mustard; and Paulet (New York Med. Jour., June 5, 1897), the painting of cocaine upon the skin as an unfailing developer. As tardiness or mildness of the eruption are usually without direct prognostic significance, such procedure as the above may be looked upon as entirely supererogatory. Very little is required in ordinary cases with further regard to the medicinal treatment. The cough is often distressing, and demands sedative mixtures. Small, frequently repeated doses of a combination of opium and ipecacuanha with sweet spirits of nitre or citrate of potash, on account of the fever, answers very well. As the disease advances and the cough grows looser, expectorants may be substituted. Some bromide salt, combined with other drugs, is also an excellent remedy for cough. As already stated, the pyrexia ordinarily needs no special treatment, even when it reaches as high as 104.F., provided this elevation occurs at the height of the eruption, is not continuous, and is unattended with threatening symptoms. The effect of the fever, rather than its degree, constitutes the indication for treatment. In ordinary cases the use of nitre or citrate of potash, as mentioned above, is sufficient. When, however, this does not succeed, and the fever is accompanied by tossing, delirium, grinding of the teeth, twitching of the muscles, or, on the other hand, by stupor and unconsciousness, more active measures are needed. The efficacy of hydrotherapy has already been referred to; and it is as well to remember that we are fortunate in possessing in drugs of the antipyretic class a very valuable means of attaining the end in a less disagreeable way. It is, after all, upon the threatening nervous symptoms that we wish to act in most cases. The literature of the disease contains many cases illustrative of the powerful and favourable action which drugs of this class exert upon nervous symptoms. Delirium may be stopped and impending convulsions aborted by small doses of antipyrine, phenacetine, antifebrine, benzanilide, and similar remedies, sufficient in amount to produce slight reduction of temperature, but not sufficient to cause any excessive fall with coldness of the skin or profuse perspiration. Such an effect is not needed, and is not desirable. The bromides in full doses favourably influence the nervous symptoms. It is important that the condition of the bowels should also receive due attention. Constipation is sometimes present and must be relieved. This must be done carefully, in view of the tendency of patients with measles have to the development of diarrhoea. Enemata are to be preferred, and, if they are not sufficient, mild laxatives - such as castor-oil and small doses of calomel and rhubarb - may be given. Should there be slight diarrhoea, medication is hardly necessary. Bismuth - with or without opium - may be required if more severe diarrhoea exists. Treatment is not called for often in cases of vomiting. Allowing the stomach to rest for a time is often the best of measures, and after this attending carefully to the character of the food. If it does not avail, some of the various remedies commonly used to control it may be employed. The

irritation of the eyes is best treated by diminishing the amount of light in the room. A lotion of boracic acid used frequently is often a relief. The application of a little vaseline to the edges of the lids will prevent their adhering during sleep. The spraying of the nose with tepid alkaline solutions is grateful to the patient. Failure of the strength in bad cases of measles is to be combated by the use of stimulants, sinapisms, hot mustard foot-baths, with digitalis, quinine, and other remedies. The recession of the rash may be treated by warm baths, although it is to be borne in mind that this symptom properly indicates the development of some complication, which must be sought for and appropriately treated, if course, by the usual remedies.

TREATMENT OF COMPLICATIONS.

GENERAL CONSIDERATIONS.

Although measles usually runs a normal course and terminates without the occurrence of any serious complication, there is always the chance of bronchitis or broncho-pneumonia carrying off the patient. In order to prevent this, rules have been formulated by various writers, of which those of Hutinel (*The Broncho-Pulmonary Complications of Measles, Presse Méd., Vol. v., No. 38, 1897*) as a good as any: they are to the following effect - (1) Children suffering from broncho-pneumonia should be isolated, and should not be near children having simple measles. (2) Not only developed cases, but those that show bronchitis, or those that have been exposed to the contagion, may be said to be threatened with broncho-pneumonia. (3) Children should not be grouped: neither those in full eruption, nor those in the stage of incubation. (4) The child should be kept in a condition of cleanliness most extreme. If the skin is not in satisfactory condition, is excoriated, eczematous, or simply dirty, the child should be given a sublimate bath without hesitation, using 1 : 5000 solution, and be made thoroughly clean. (5) Sores, crusts, ulcers, impetiginous patches or eczematous surfaces should be antiseptically dressed with surgical minuteness. (6) There are normally micro-organisms in the mouth, the pharynx, the nasal fossae, etc., which are capable of becoming virulent and provoking broncho-pneumonia. One should take care of the mucous membranes covering the regions not less carefully than the external tegument. (7) Nasal lavage is more often harmful than useful. It is liable, he holds, to irritate the delicate epithelium, and often leads to otitis media. Boracic acid, in vaseline or in tepid water, may be gently applied. At the Hôspice des Enfants Assistés of Paris there appear to be still more stringent regulations in force against measles. They may here be summarized to specially illustrate the ways in which a hospital, or any other large building with spacious rooms, may be used as a place in which to treat measles, and, still further, to show how much can be done, even under unfavourable conditions, to prevent complications (especially diphtheria and broncho-pneumonia), and thus to diminish the mortality of the disease. Thus, the case-mortality from measles at the above-mentioned hospital had been for many years very high: from 1869-72, 48.72 per cent.; in 1878, 42.64 per cent.; and from 1882-85, 44 per cent. On the other hand, however, in the Parisian Children's Hospital the death-rate averaged only 26.6

per cent. - thereby demonstrating that the high death-rate at the Hospice could not be due to the severity of the epidemic type. Investigation proved that the high death-rate was in great part due to diphtheria and broncho-pneumonia: for during the six years prior to 1891, of the total number of cases of measles 14.39 per cent. died from diphtheria, 23.75 per cent. from broncho-pneumonia. By adoption of the precautions about to be described, in conjunction with more efficient sanitary and therapeutic procedure, the death-rate was reduced from 40 per cent. or more to 20 per cent. Under the heading of General Precautions, we may note that the children were to be made lean, and were kept very warm by swathings of thick cotton under the nightgown. All the attendants - of which there were about one to every four children - and residents were required to wear clean Holland overalls; the visiting physician wore a long white apron, over this a Holland coat, and an extra Holland coat which he was to change in each ward. The use of antiseptics was general and very thorough. All children newly admitted into the Hospice were cleansed before being sent into the schools. All heads the least suspicious were done up in gauze bandages; and all children suffering from impetigo or rashes of the slightest description were treated in a like manner. All cases of discharge from the eyes, nose, or ears were bandaged or plugged with wool. Under the heading of Special Precautions, all cases of broncho-pneumonia were to be isolated in "boxes". These were spaces partitioned off by glazing, about eight feet in height and open at the top of the ward. Each contained a door and a window of the ward. There were two beds in each, with their heads about two feet from the wall. These were not kept entirely for cases of broncho-pneumonia, but were mainly used for them because that: (1) disease was considered very infectious, and (2) isolation was thought to diminish the severity of the attack. There was also a systematic application of antiseptic precautions, as regards the mouths of the patients and the drinking vessels used by them. At the Hôpital des Enfants Malades of Paris, an additional precaution was used in such infectious cases. Thus, at meal-times a mackintosh sheet was spread on the bed, and an oblong galvanized wire basket with a tall handle was placed thereon. This basket contained a basin for the patient's food, and had small divisions at the sides for the condiments, etc. It was carried straight to the kitchen after meals, and plunged at once into water at the boiling point. We have already discussed a variety of preventive measures, and may here specially note that the complications of measles must be treated in the same way as if they occurred independently of that affection.

NERVOUS SYMPTOMS.

The convulsions and other nervous symptoms occurring with the high temperature can usually be allayed by cold applications to the head and nape of the neck; those common to the invasion of measles in children, and of a minor character, call for no special treatment. If

preferred, and as recommended by Guinon (Bl. f. Klin. Hydr-
 other., July, 1891), cold baths may be used - the water
 being gradually cooled; or the water may be poured from
 a distance above on the shorn scalp. Stimulants (camphor,
 alcohol, etc.) are usually strongly indicated in these
 cases; and when the patient is severely affected and the
 face markedly congested, a few leeches to the mastoid
 process will likewise occasion marked alleviation of
 the urgent symptoms, that is, in the case of children
 old enough and sufficiently strong to stand the loss
 of blood which the procedure entails. Antipyrine - in
 full doses, according to age, in the afternoon - of all
 internal medicaments is most likely to prove satisfact-
 ory. In cases showing high fever, prostration, and debil-
 ity the drug, being unsafe, should be replaced by the -
 less efficient - sulphate of quinine (one to two grains
 three times a day for each year of life), or the tannate
 of that remedy (in double or treble the dose of the
 sulphate) if diarrhoea be present and obstinate.

SKIN.

The toilet of the skin, by way of prevention of
 complications therein and the control of itching, has
 already been described.

ULCERATIVE STOMATITIS.

Ulcerative stomatitis and pharyngitis usually
 respond to antiseptic sprays and mouth-washes, or to a
 paint composed of glycerine and borax, eucalyptus, thymol,
 menthol, and the like medicaments. Should the stomatitis
 progress to ulceration of an obstinate character, a 10
 per cent. solution of silver nitrate will be called for,
 failing which more drastic treatment with chromic acid
 or the actual cautery will be required. The incessant
 cough consequent upon pharyngeal irritation can usually
 be relieved by a cocaine spray of moderate strength.

CANCERUM ORIS.

This very serious complication requires that the
 patient be placed under an anaesthetic at once, and the
 part cauterized thoroughly with fuming nitric acid and
 the mass curetted from the mucous lining of the cheek.
 If this fail, the whole of the affected area must be exc-
 ised, and the part repaired at a later date by a plastic
 operation: otherwise the patient will surely die, and in
 any case there must be free stimulation from the first.

CORYZA.

When troublesome this symptom can be allayed by the
 irrigation of the nares with a saline solution at
 frequent intervals.

EPISTAXIS.

At the onset of the invasion of the disease a
 slight amount of bleeding at the nose is rather salut-
 ary than otherwise; but, if intractable, it can usually be
 arrested by hot water douching, failing which the nares
 should be injected with strong astringents - sulphate
 of zinc, ferric perchloride, adrenaline, etc. - and then
 plugged with antiseptic wool, the latter to be frequently
 changed to prevent infection of the ear or pharynx.

CONJUNCTIVITIS.

The light in the sick-room must be kept subdued
 if this affection be troublesome. In addition to this

there will be required the energetic application of cold, and also frequent cleansing of the parts, and at a later stage somewhat astringent compresses and collyria, together with antiseptic precautions throughout. Boracic acid solution usually makes the best application, but special ophthalmic indications must be met as they arise.

LARYNGITIS.

In the vast majority of the cases of measles laryngitis is present. Cold compresses to the neck will usually be sufficient in mild cases, aided by the use of the foot-bath. If the affection be severe, frequent hot fomentations should be applied over the region of the larynx, due care being always taken to avoid blistering, the production of redness alone being advisable. Steam and antiseptic sprays are also of service, and creosote and other antiseptics may with advantage be added in certain cases. When severe congestion is present, a few leeches may be applied to the supra-sternal region. For the relief of dyspnoea or membranous formations, tracheotomy or intubation may be necessary; and O'Dwyer's recommendation of Dover's powder to relieve the laryngeal spasm of catarrhal and diphtheritic cases may be expected to contribute greatly to the comfort of the patient. The suffocative form due to laryngeal stenosis can sometimes be relieved by vigorous counter-irritation, failing which the inhalation of oxygen is indicated forthwith. For this complication von Jürgensen recommends a hypodermic injection of the hydrochlorate of apomorphine to induce vomiting. It should not be forgotten, however, that the stenosis may be due to the presence of a false membrane caused by the streptococcus or diphtheria bacillus. If the latter, antitoxin must be administered and the usual treatment for diphtheria instituted.

OTITIS MEDIA.

No case of measles should have the ears neglected in any particular, owing to the frequency of complications in connection therewith and the risk of permanent deafness. The aim and object of the treatment should be the alleviation of the existing pain, restoration of the normal atmospheric pressure in the middle ear, removal of the secretion from the nose and pharynx and external auditory meatus, and due attention to the indications arising on perforation of the membrana tympani. Thus, the nares may be cleansed with antiseptic swabs of sterilized cotton-wool rolled round a probe and dipped in peroxide of hydrogen, boracic acid, or other mild germicide of a lukewarmness; after which an ointment of eucalyptus (5 minims) in vaseline (1 ounce) may be applied with a camel's-hair brush. The Politzer bag may only be used once a day upon older children, in whom also clearing of the nostrils by blowing alone can be expected. To relieve the pain, cocaine (2 per cent.) may be dropped into the ear, that is, should external hot applications fail to afford relief. Accumulations of pus in the tympanic cavity must be promptly liberated by incision of the drum in the lower segment, the child's head being held by an assistant in a suitable reflected light; following which the aural cavity must be washed out

thrice daily with warm water and hydrogen peroxide, incision of the drum being repeated should the opening close up in the meantime. It is particularly important that the drum be not allowed to rupture spontaneously, or permanent deafness may result: this must be anticipated by incision when bulging is observed. Extension of the process to the mastoid will call for the usual surgical operation.

NEPHRITIS.

Though a rare complication in measles, its possibility must not be overlooked. The urine should therefore be examined every day, and the usual treatment for the condition instituted as soon as the fact of renal involvement is observed.

BRONCHITIS AND BRONCHO-PNEUMONIA.

Capillary bronchitis is of all the complications of measles the one most to be feared; and it is therefore of the utmost urgency that the physician and nurses be continually on the alert to detect the first signs of the disease. The indications for treatment are threefold - viz., to insure sufficient aëration of the lungs, to support the cardiac action, and to keep the temperature as much as possible within normal limits. The first indication is met by having the sick-room properly supplied with fresh air - the patient's head and chest being supported on pillows throughout, and his position changed from time to time to aid the dislodgment of the bronchial secretion. The bowels should be relieved each day with enemata, and the general circulation promoted by mustard foot-baths (one ounce of mustard to three gallons of water). The same effect with reference to the chest should be induced by means of the mustard jacket - made by mixing one part of mustard and six parts of flour into a paste with the necessary water, the whole being applied to the thorax between two layers of flannel until a satisfactory redness be produced. To help the respiratory efforts, alternate hot and cold douches have been found of service; and so, too, the use of emetics which get rid of the mucous accumulations in the larger bronchial tubes. But they should not be given when the pulse is feeble and when there is marked prostration or stupour. According to Bartels (loc. cit.), the most ~~common~~ ^{successful} method of treating the high fever of broncho-pneumonia of measles is by means of the following procedure: Several thicknesses of cloth wrung out in cold water are laid upon flannel of sufficient thickness and width to protect the bedclothes from becoming wet; the naked patient is then placed upon these, and enveloped in them. Lively kicking and screaming ensue, giving depth and force to the previously superficial inspiration; by degrees the patient becomes more quiet, and he soon falls asleep. The cold wrappings are to be renewed every half hour, or less, until the temperature, pulse, and frequency of respiration are markedly diminished, which is usually the case in a couple of hours. The wrappings are then removed, the skin dried, the child clothed in clean and warmed garments, moderately covered up, and left to lie until a new exacerbation of pyrexia and of dyspnoea, or of the pains in the chest, renders

necessary the repetition of the wrappings; and this point, moreover, must be especially impressed upon the nurses. It is only in exceptional cases that the wrappings must be continued uninterruptedly for several days and nights, or that we are obliged to resort to the use of baths and cold douches upon the head and back. This mode of treatment may have to be repeated daily for weeks, according to the duration of the pneumonic lesion. Wrappings are usually to be preferred to the use of more energetic antipyretic methods, since the cooling of the body is more gradual, and therefore irregularities in the circulation and distribution of the blood are probably better guarded against; and they obviate, moreover, the necessity for therapeutic agents, in the majority of instances at least. Stimulants - such as hypodermic strychnine ($1/300$ gr. to a child of one year of age every three hours) - may be given; and wine has in these cases proved of marked value. Stimulants are especially indicated when the temperature either falls suddenly (e.g., at the crisis of the disease) or is already low; so, too, when the pulse shows marked irregularity, rapidity, or compressibility. To a child of one year of age from one-half to two ounces of whisky may be given diluted with eight ounces of water. Sherry or other wines, for which children often exhibit a decided liking, may be given instead if necessary. A diet, as nutritious as possible under the circumstances, will materially contribute to the success of the therapeutic measures. Many cases, according to Lomikovsky (*La Méd. Mod.*, Feb. 27, 1895), undergo a striking improvement consequent upon the administration of digitalis in full doses according to age; but when heart failure seems about to occur, nitroglycerine ($1/500$ gr. every hour for four or five doses for young children), or oxygen inhalations, are to be preferred. The desirability of isolating broncho-pneumonia cases occurring in hospitals has been already referred to above. Indeed, Holt says that "Twice in one institution have I seen regular epidemics of bronchopneumonia occur with outbreaks of measles, in some of the wards nearly every case of measles developing pneumonia".

MANAGEMENT OF CONVALESCENCE.

The convalescence of measles requires careful supervision. As the patient is recovering the diet can be increased, but confinement to bed, except in very mild cases, should continue for at least ten days from the onset of the disease, and the confinement to the sick-room for two weeks. This is with reference solely to the patient, and without regard to the question of quarantine. The first outing should be made in good weather, and the patient must be well clothed, for the mucous membranes are left in a sensitive state after the attack. Tonic treatment - including cod-liver oil - is often needed during convalescence; and, if the full measure of health does not promptly return, a change of air is an indication of no inconsiderable importance.

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-

Name Case 1.

Age 3½.

Disease

Measles, with Broncho-pneumonia, Catarrhal Conjunctivitis, Vaginitis, and Noma.

Notes

Date.	9 th	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
Day of Dis.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
Time.	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M
F																					
106°																					
105°																					
104°																					
103°																					
102°																					
101°																					
100°																					
99°																					
98°																					
97°																					

This is the case of a child of 3½ years, in whom the rash appeared on the evening of the 5th day. After this had faded, the temperature kept up, and the patient showed the typical phenomena of a rather severe type of broncho-pneumonia. She had during the period of eruption a catarrhal conjunctivitis, which now became purulent, and later caused keratitis and corneal ulceration. At this time there was a membranous condition of the conjunctiva, which resembled diphtheria so much that I caused some of the discharge and membrane to be bacteriologically examined, and with the following result: Absence of the bacillus of diphtheria, and the presence of pyogenic micro-organisms. About the 13th day, I noticed that the child had some irritation about the genitals; and on examination I found an ulcerated condition of the labia of the left side, with a foul discharge which gave me the impression of being gangrenous. I thought this was in all probability an infection from the eyes. The child was in a state of great exhaustion, and died on the 15th day of the disease.

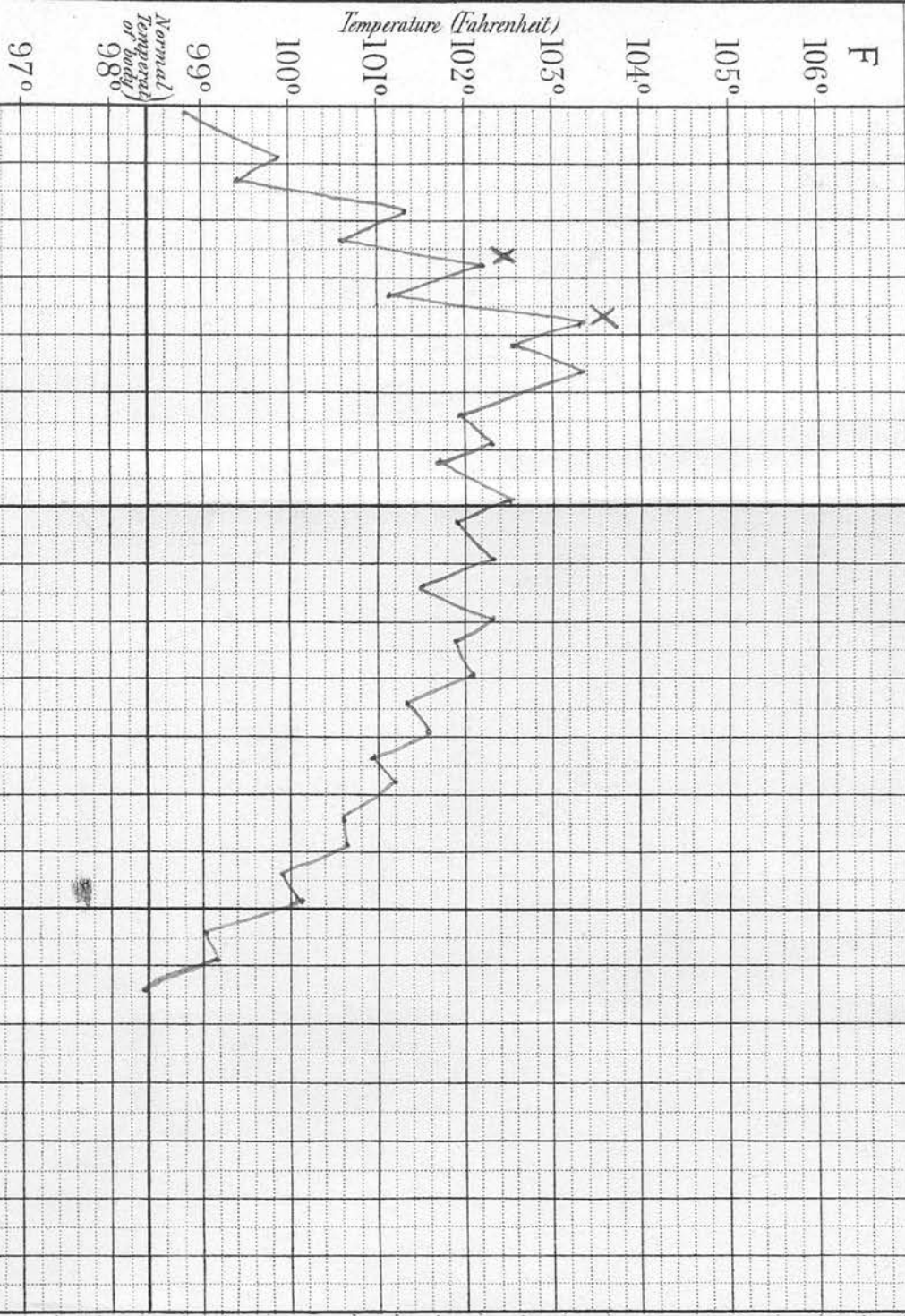
Pulse.
Resp.
Urine
Bowels

M	124	125	125	128	130	134	140	145	145	151	150	156	158	160	170	170					
E	44	44	44	44	44	44	44	44	44	44	44	44	44	44	44	44					
M																					
E																					

Name Case 3. Age 3 years. Disease Measles.

Notes

Date.	Day of Dis.	Time.
May 20	1	M
21	2	E
22	3	M
23	4	E
24	5	M
25	6	E
26	7	M
27	8	E
28	9	M
29	10	E
30	11	M
31	12	E
1	13	M
2	14	E
3	15	M
4	16	E
5	17	M
6	18	E
7	19	M
8	20	E
9	21	M



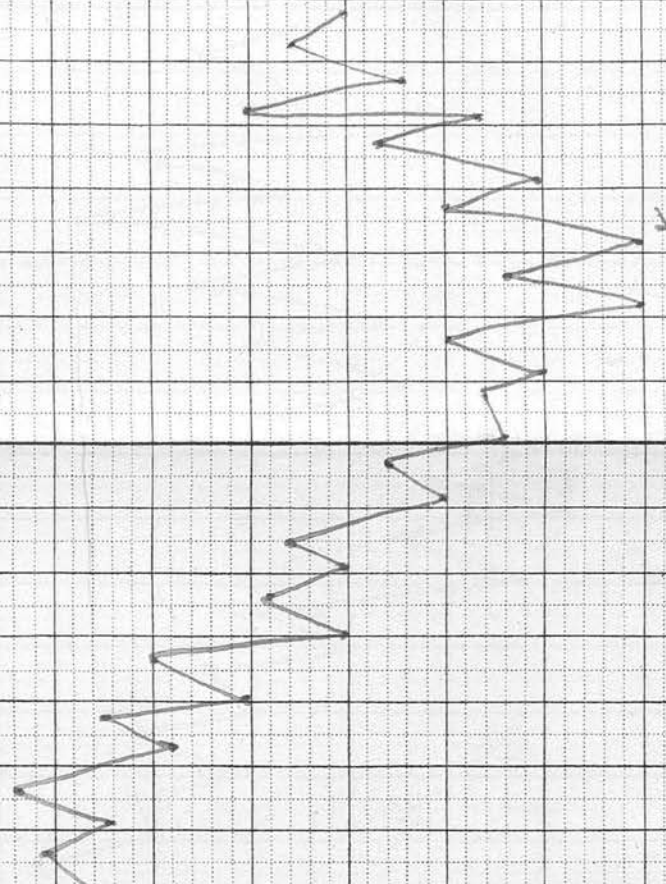
Pulse.	Resp.	Temp.
M 100	M 20	99.0
E 120	M 17.5	100.0
M 130	E 18.0	100.5
E 140	M 19.0	101.5
M 145	E 19.5	102.5
E 145	M 20.0	101.5
M 140	E 20.0	101.0
E 140	M 19.5	101.5
M 145	E 19.5	101.0
E 145	M 19.0	101.5
M 140	E 18.5	101.0
E 140	M 18.0	101.5
M 138	E 17.5	101.0
E 140	M 17.0	101.5
M 145	E 16.5	101.0
E 145	M 16.0	101.5
M 138	E 15.5	101.0
E 132	M 15.0	101.5
M 136	E 14.5	101.0
E 140	M 14.0	101.5
M 130	E 13.5	101.0
E 134	M 13.0	101.5
M 125	E 12.5	101.0
E 120	M 12.0	101.5
M 116	E 11.5	101.0
E 100	M 11.0	99.0

This chart shows the ordinary temperature curve in a case of measles. In this case the temperature kept up for some time after the rash. This was due to rather severe diarrhoea, which gave the patient in rather a weak condition for some time; but, with careful dieting, a powder of mercury and chalk followed by solution of bismuth and paregoric, and tonics during convalescence, the child made a good recovery.

Name Case 7. Age 15 years. Disease Measles with Haemorrhagic Eruption.

Notes

Date.	Temp.	Pulse.	Resp.	Trane	Bowels
6	MEM	M	M	E	E
7	MEM	M	M	E	E
8	MEM	M	M	E	E
9	MEM	M	M	E	E
10	MEM	M	M	E	E
11	MEM	M	M	E	E
12	MEM	M	M	E	E
13	MEM	M	M	E	E
14	MEM	M	M	E	E
15	MEM	M	M	E	E
16	MEM	M	M	E	E
17	MEM	M	M	E	E
18	MEM	M	M	E	E
19	MEM	M	M	E	E
20	MEM	M	M	E	E
21	MEM	M	M	E	E
22	MEM	M	M	E	E
23	MEM	M	M	E	E
24	MEM	M	M	E	E
25	MEM	M	M	E	E
26	MEM	M	M	E	E

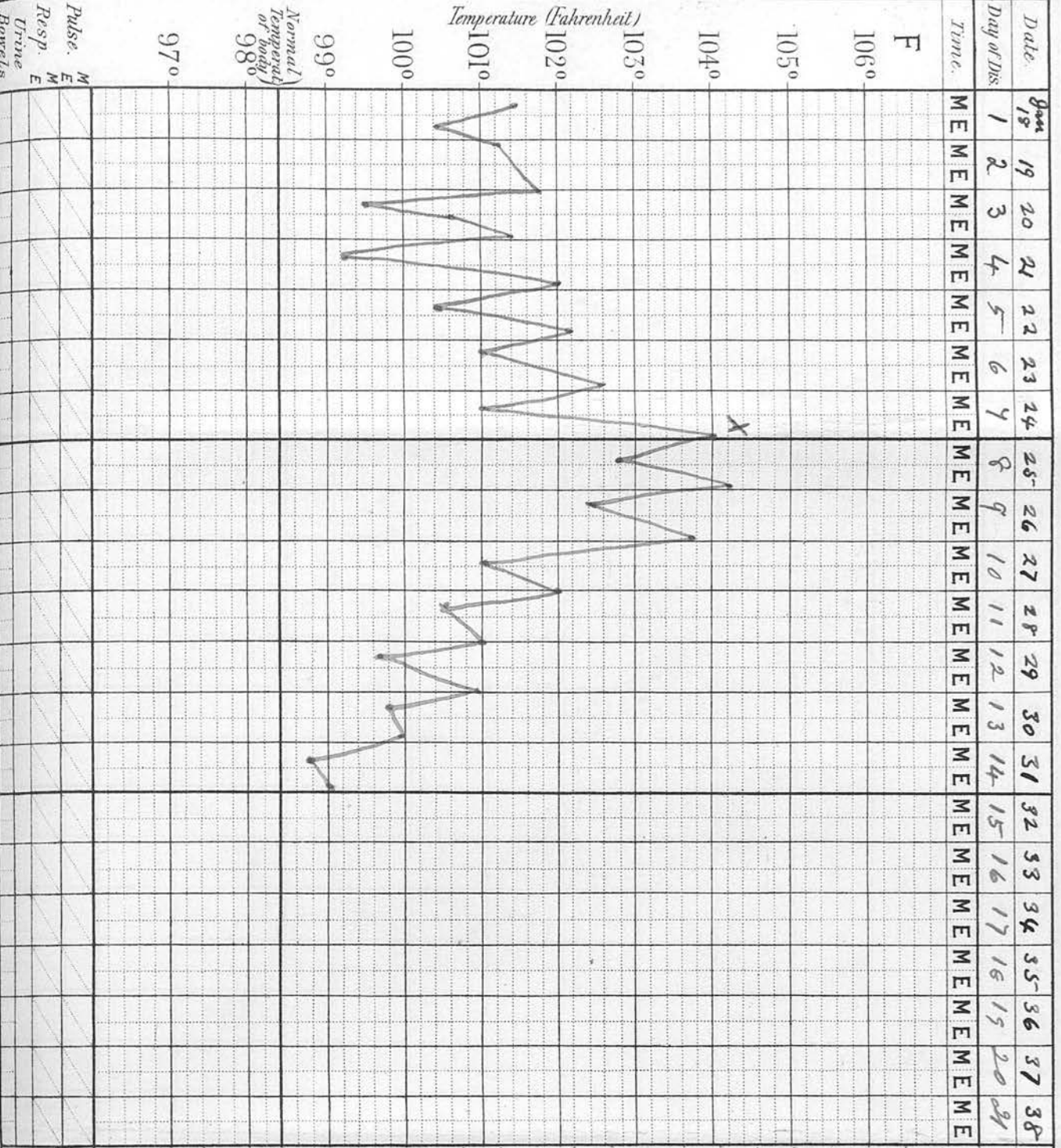


This boy of 15 suffered from measles of a fairly severe type. The eruption came out on the 4th day of the disease, small petechial spots showing themselves instead of macules. This was observed over the whole body, but more especially over the abdomen and the front of the thighs.

The temperature was high, and there was associated a good deal of bronchial catarrh.

Nevertheless, although this was an undoubted case of the so-called "black measles", the temperature was normal in a fortnight, and the recovery afterwards good.

Name Case 8. Age 8 years. Disease Measles with Prolongation of Invasion. Notes



This is the chart of a case of uncomplicated measles, the peculiarity of same being the prolongation of the stage of invasion. The patient had Koplik's spots some time before the appearance of the eruption.

Name Case 9. Age 1 year. Disease Measles.

Notes

Date	Day of Dis.	Time	F
Jan 15	1	MEM	
16	2	MEM	
17	3	MEM	
18	4	MEM	
19	5	MEM	
20	6	MEM	
21	7	MEM	
22	8	MEM	
23	9	MEM	
24	10	MEM	
25	11	MEM	
26	12	MEM	
27	13	MEM	
28	14	MEM	
29	15	MEM	
30	16	MEM	
31	17	MEM	
1	18	MEM	
2	19	MEM	
3	20	MEM	
4	21	MEM	

This is the chart of an ordinary case of measles, the only peculiarity being the high temperature during the stage of invasion, with a fall and rise again before the appearance of the eruption.

This, I think, could be partly accounted for by constipation, the child looking better and the temperature coming down after a dose of castor-oil.

Name Case 10. Age 3 years. Disease Measles with Otitis.

Notes

Date	Temp.	Pulse	Resp.	Urine	Bowels
Nov 15	106°				
16	106°				
17	105°				
18	104°				
19	105°				
20	104°				
21	103°				
22	102°				
23	101°				
24	100°				
25	99°				
26	99°				
27	99°				
28	99°				
29	99°				
30	99°				
1	99°				
2	99°				
3	99°				
4	99°				
5	99°				
6	99°				
7	99°				
8	99°				
9	99°				
10	99°				
11	99°				
12	99°				
13	99°				
14	99°				
15	99°				
16	99°				
17	99°				
18	99°				
19	99°				
20	99°				
21	99°				

This chart shows the temperature of an ordinary case of measles, the eruption appearing on the 4th day, and disappearing in the usual time; but the temperature still kept up, and the child complained of tooth-ache and was very restless: this the mother said had been the case throughout the night.

On examination of the mouth, there was nothing to be seen but a little congestion of the throat.

I thought that it might possibly be earache; and on examination of the ears, there seemed to be some tenderness all round the external auditory meatus. There was also great tenderness all round the interior of the canal - so much so, indeed, as to prevent a thorough examination.

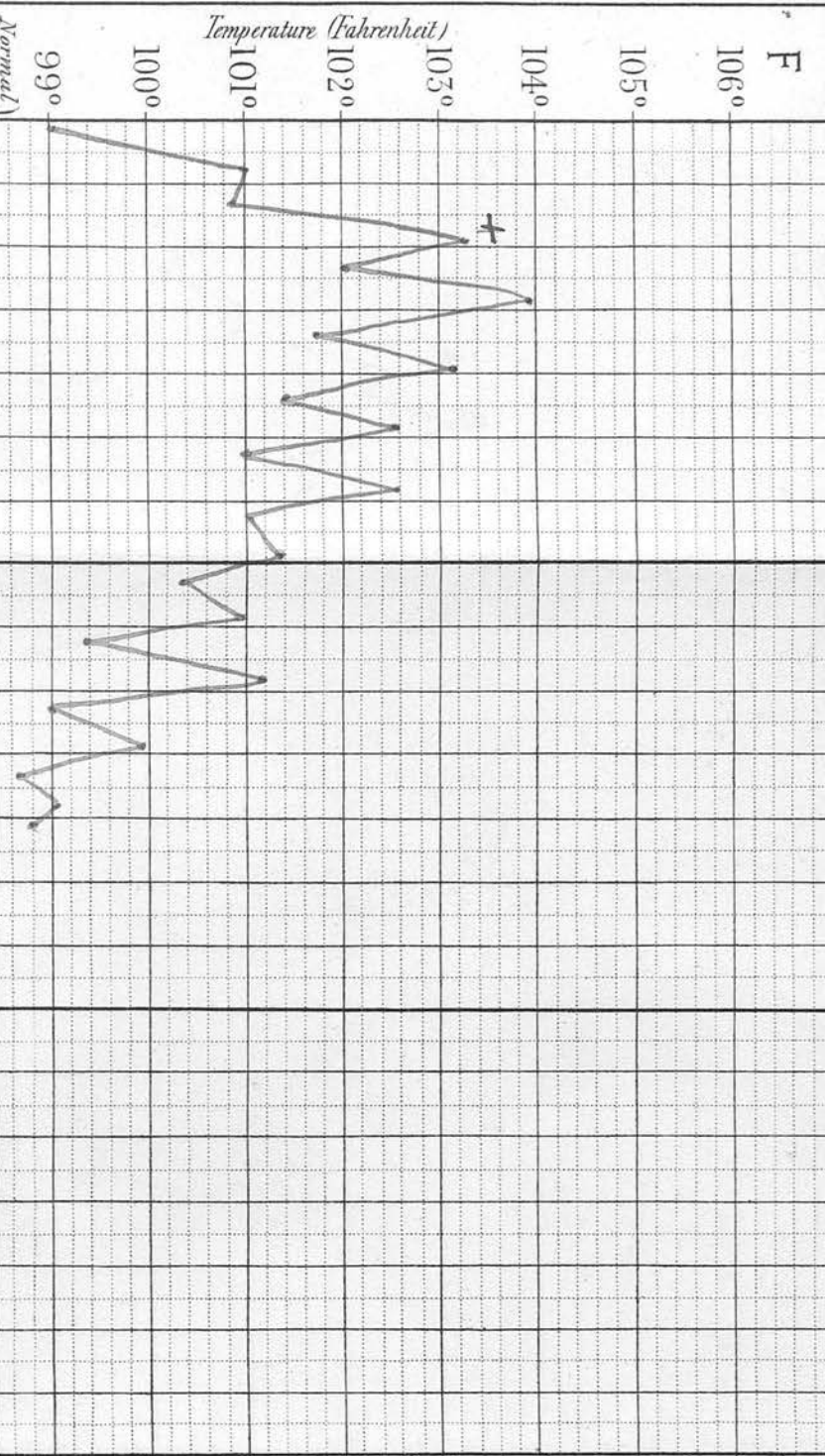
There appeared on the following day a discharge from the ear, and the child seemed much relieved thereby.

The canal was regularly syringed with boric lotion, and the child recovered in due course under tonic medicaments.

Name Case 11. Age 14 months. Disease Measles followed by Impetigo.

Notes

Date.	Day of Dis	Time.
Dec 2	1	MEM
3	2	MEM
4	3	MEM
5	4	MEM
6	5	MEM
7	6	MEM
8	7	MEM
9	8	MEM
10	9	MEM
11	10	MEM
12	11	MEM
13	12	MEM
14	13	MEM
15	14	MEM
16	15	MEM
17	16	MEM
18	17	MEM
19	18	MEM
20	19	MEM
21	20	MEM
	21	MEM



Pulse.	Temp.	Resp.	Urine	Stools
M		M		
E		M		
M		E		
E				

When called to this child, I found him to be slightly feverish, and suffering from a little cough and some bronchial catarrh.

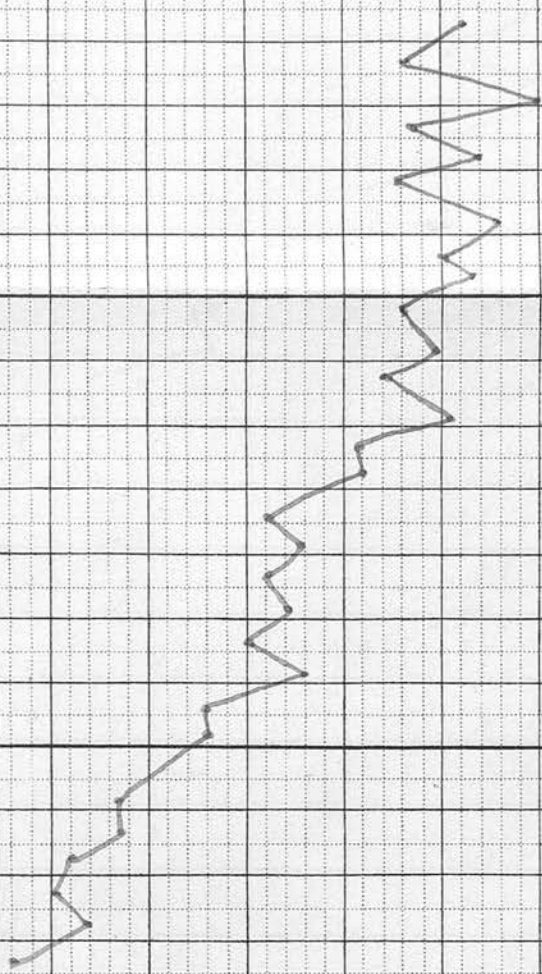
Inside the cheeks could be seen small whitish spots (Koplik's), and the characteristic exanthem appeared on the following (2nd) day of the disease.

The case progressed favourably, but was later followed by a widespread skin affection which very closely resembled impetigo.

Name Case 13. Age 2 years. Disease Measles.

Notes

Date	Day of Dis.	Time.	F
Feb 15	1	M	
16	2	M	
17	3	M	
18	4	M	
19	5	M	
20	6	M	
21	7	M	
22	8	M	
23	9	M	
24	10	M	
25	11	M	
26	12	M	
27	13	M	
28	14	M	
1	15	M	
2	16	M	
3	17	M	
4	18	M	
5	19	M	
6	20	M	
7	21	M	



When called to this case, the rash was coming out on the face and head, and the mother said that the child had not been very well for two or three days.

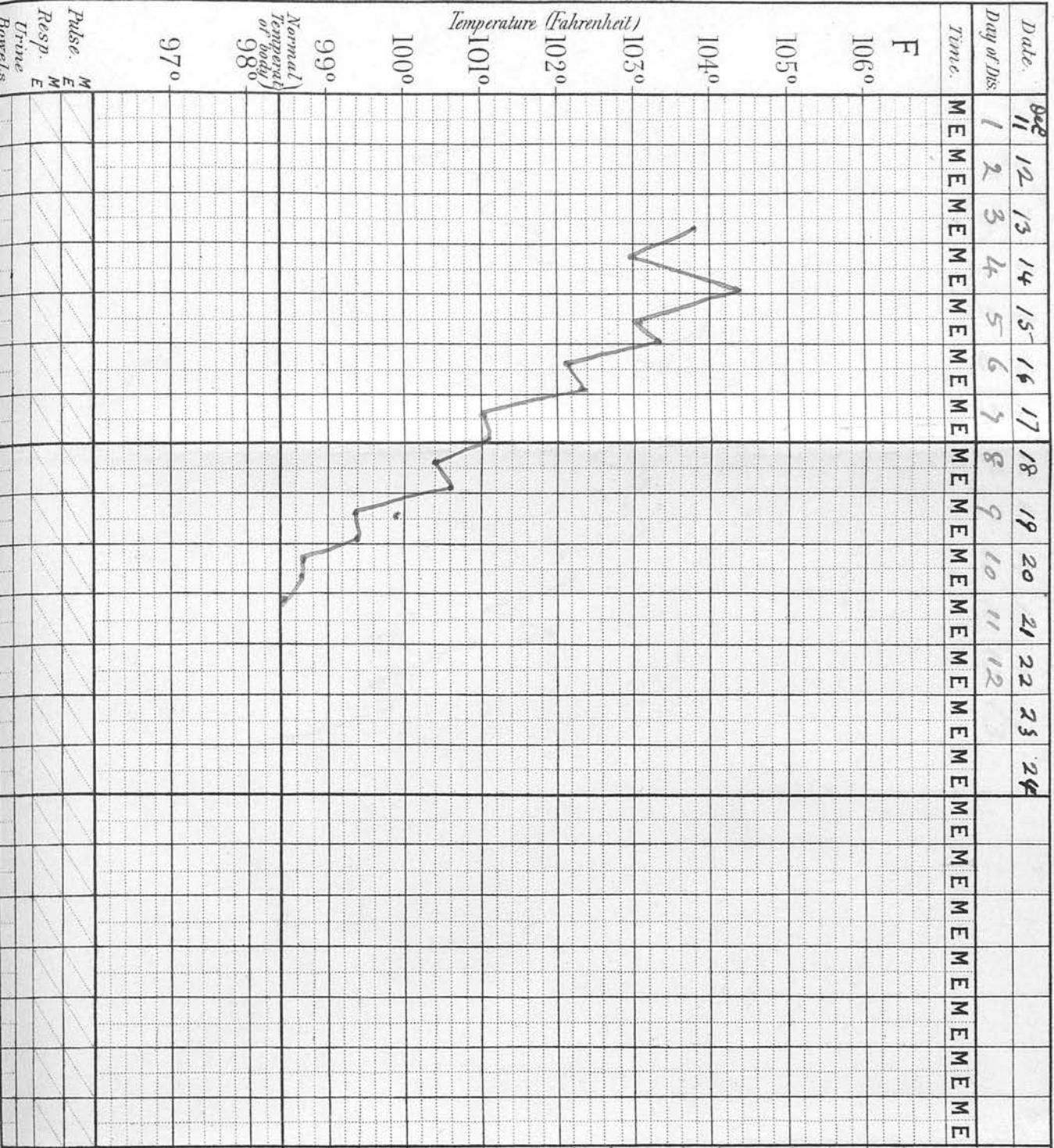
The rash on the 4th and 5th days - apparently from the beginning of the illness - was rather profuse and confluent in places, and there was a good deal of swelling of the face, giving rise to a certain amount of disfigurement of the features. The skin was very itchy, and the catarrhal symptoms were well-marked.

After the disappearance of the eruption, the temperature kept up for some time. This was certainly due to the severity of the bronchial catarrh: for after this cleared up, the patient made an excellent recovery.

Pulse. M E M E
 Resp. M E M E
 Urine
 Bowels

Name Case 14. Age 2 years. Disease Measles.

Notes



This is a chart showing a gradual fall of temperature after the appearance of a profuse rash - a phenomenon noticed when the child was first seen.
 There were no complications, and the patient made an excellent recovery in due course.

Name Case 15. Age 18 months. Disease Measles.

Notes

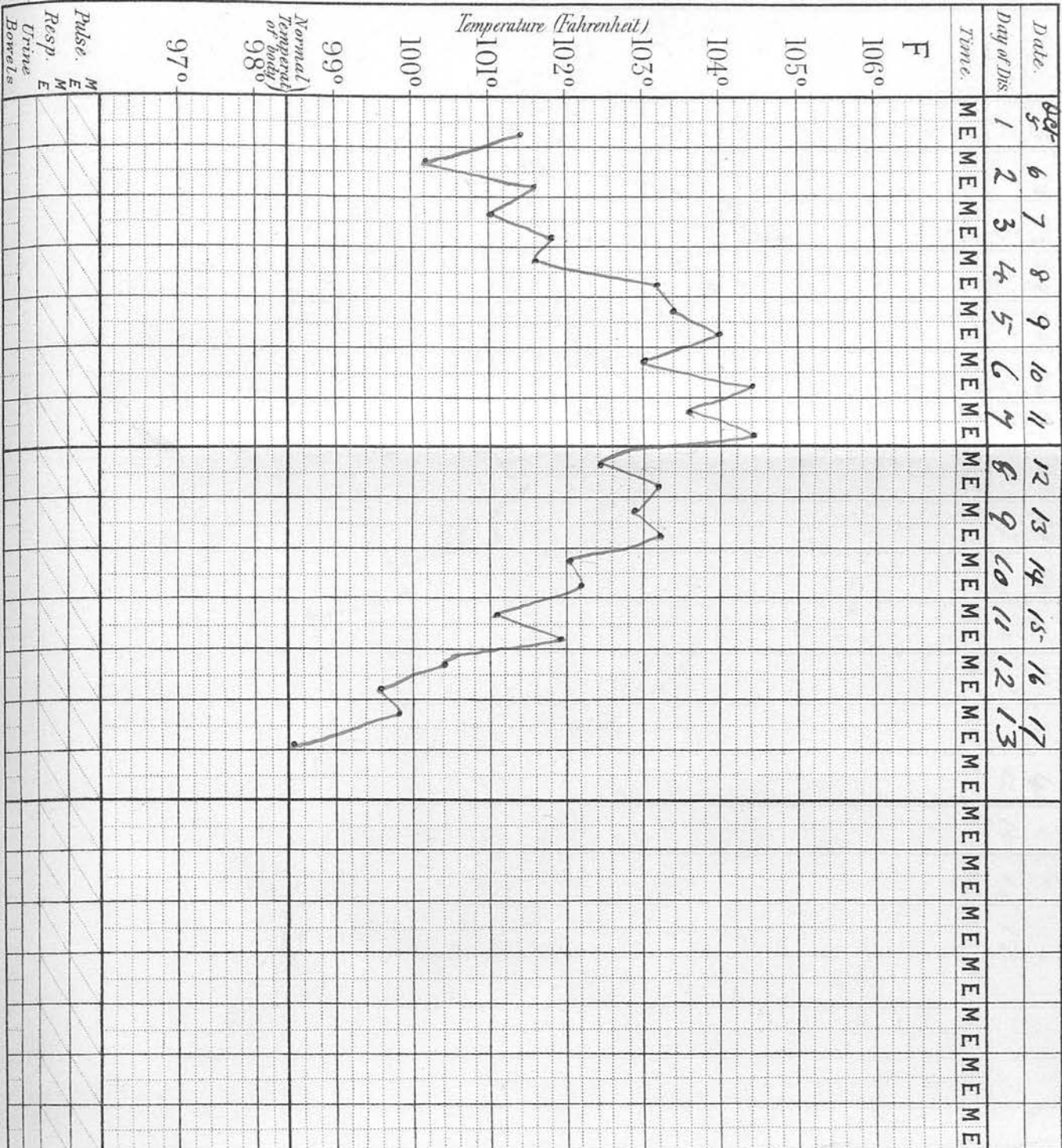
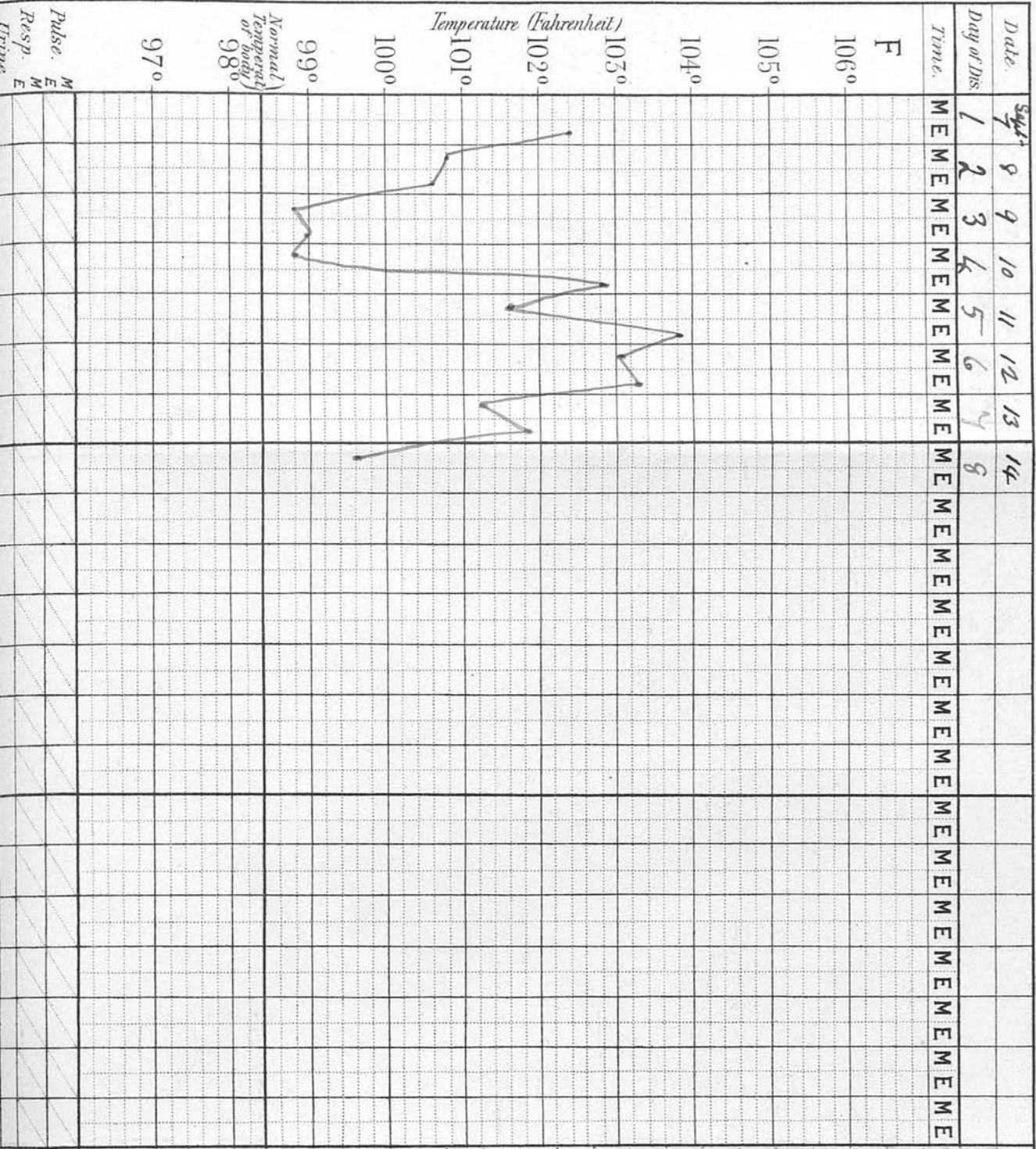


Chart showing the late appearance of the eruption, subsequent elevation of the temperature by diarrhoea and bronchial catarrh. The patient ultimately made a good recovery.

Name Case 17. Age 10 months. Disease Measles.

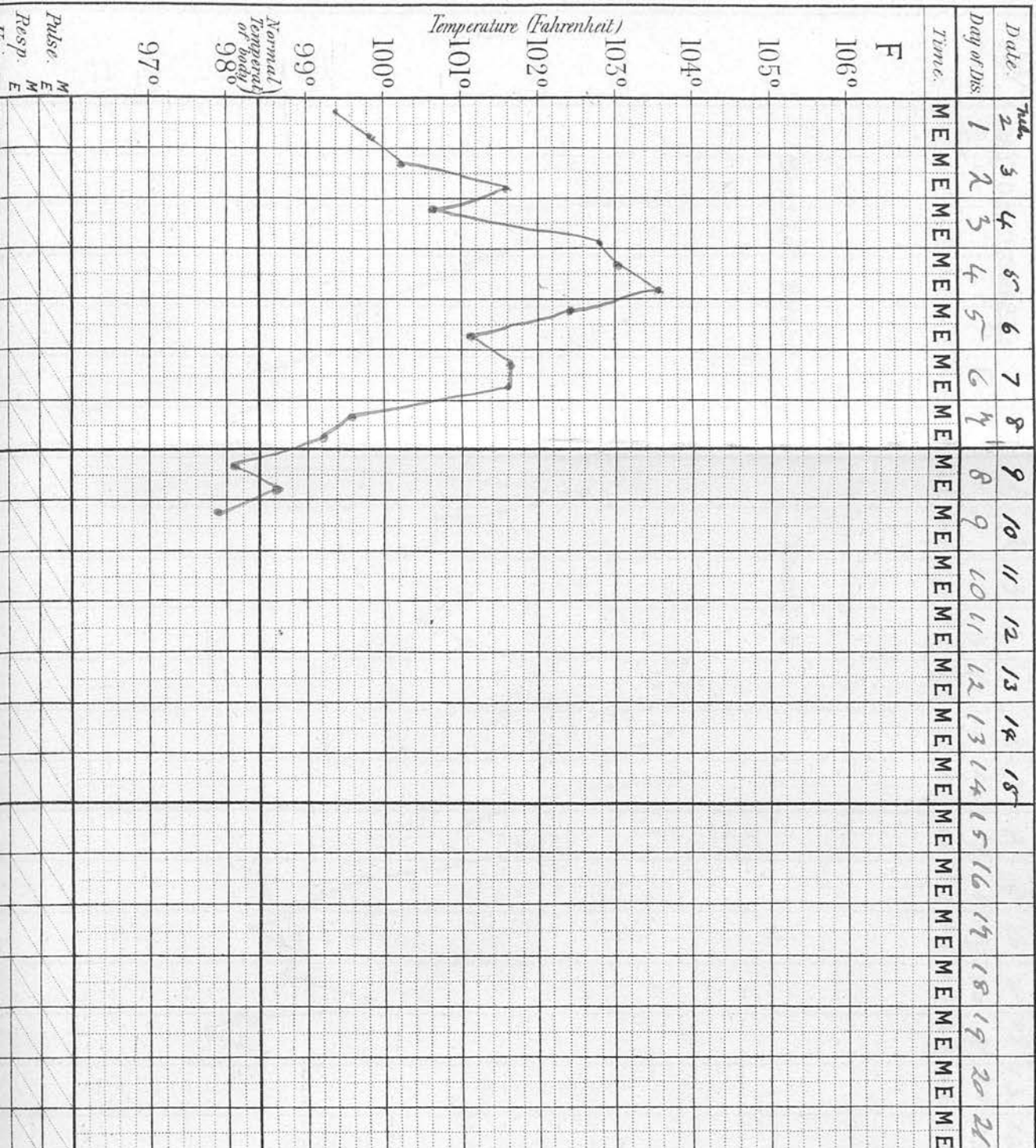
Notes



This chart shows the sudden rise of temperature at the invasion of the disease: the latter otherwise pursued a normal course.

Name Case 22. Age 3½ years. Disease Measles.

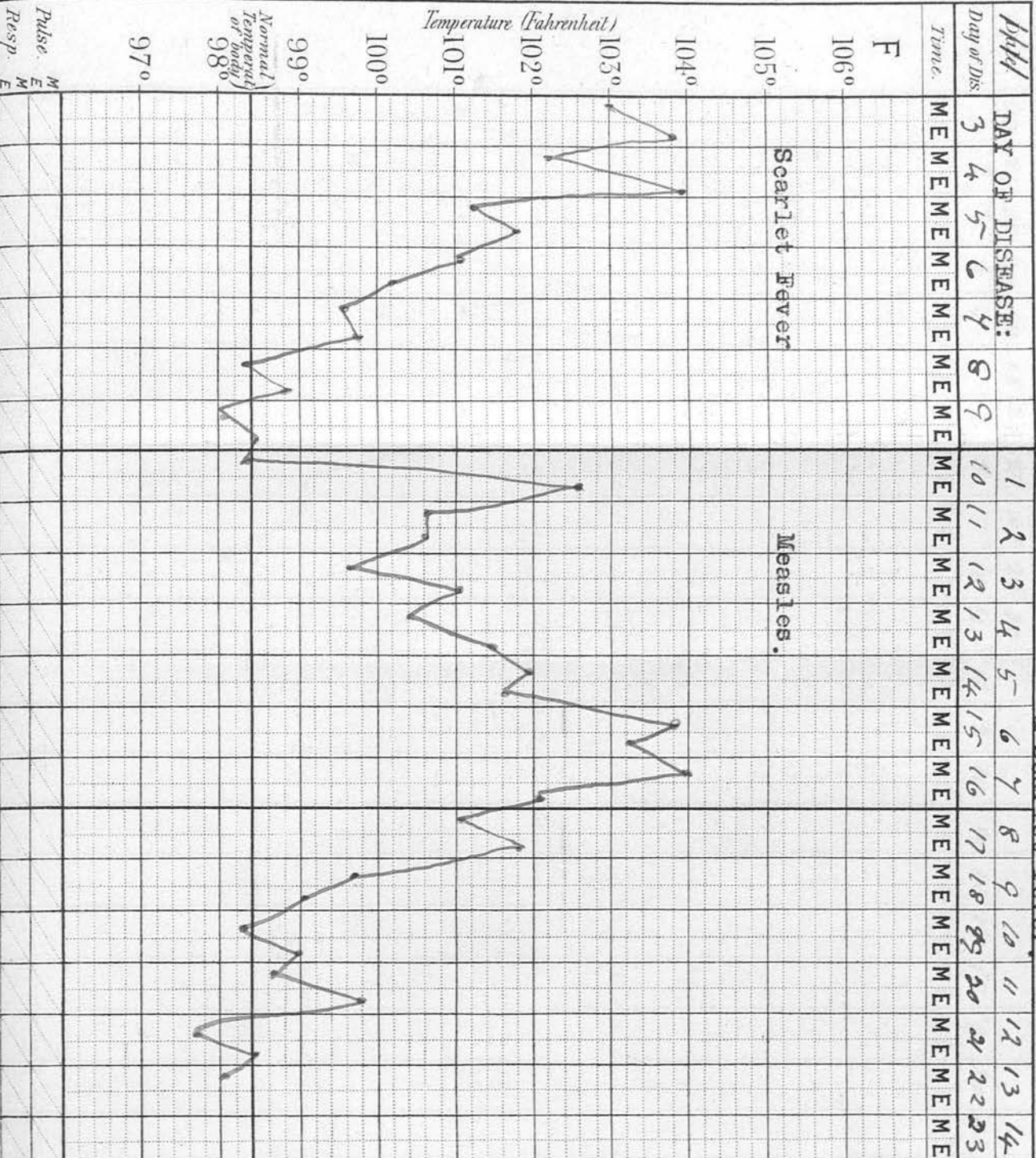
Notes



A chart of ordinary measles showing a gradual rise of temperature; eruptive or highest stage; rapid defervescence, and ultimate recovery.

Name Case 23. Age 3 years. Disease Measles, A boy.

Notes

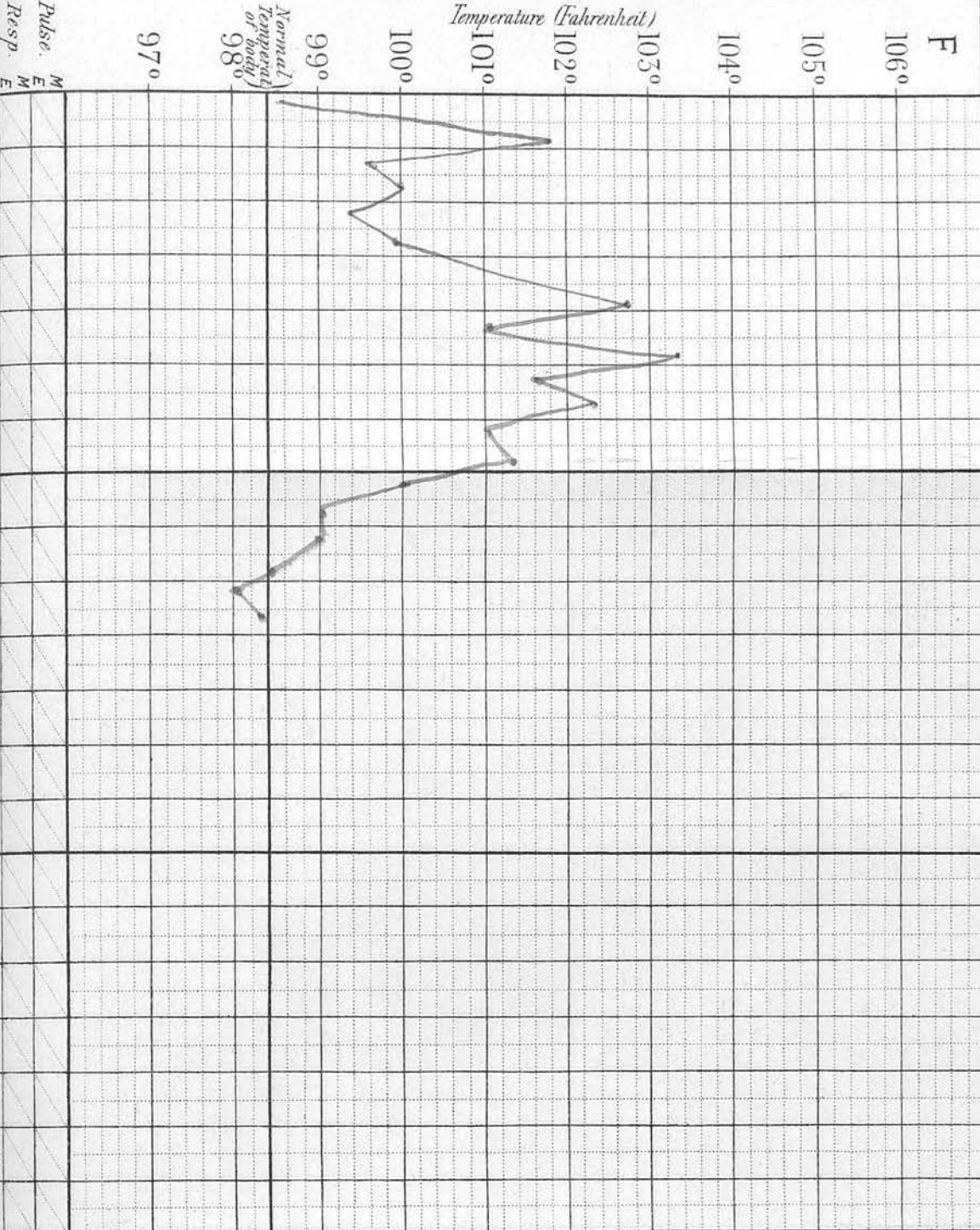


This chart shows the temperature curve of measles from the 1st day, but in this case the patient was just recovering from an attack of scarlet fever. He made a very good recovery, and there were no complications. The scarlatinal eruption was not very profuse, it came out in a patchy manner all over the body, and all the other typical symptoms of scarlatina were present. It was later proved to be so, there being well-marked desquamation.

Pulse: M E M E
 Resp: M E M E
 Temp: M E M E

Name *April* Case 24. Age 5 years. Disease Measles. Notes

Date.	Day of Dis.	Time.
20	1	M
21	2	E
22	3	M
23	4	E
24	5	M
25	6	E
26	7	M
27	8	E
28	9	M
29	10	E
30	11	M
	12	E
	13	M
	14	E
	15	M
	16	E
	17	M
	18	E
	19	M
	20	E
	21	M



This chart shows the initial rise of temperature to 102.F., followed next day by a fall to below 100 degrees. At this it remained until the stage of eruption, when it went over 103.F.; but after the disappearance of the rash it rapidly came down to normal again.

Name Case 25. Age 2½ years. Disease Measles followed by Pertussis. Notes

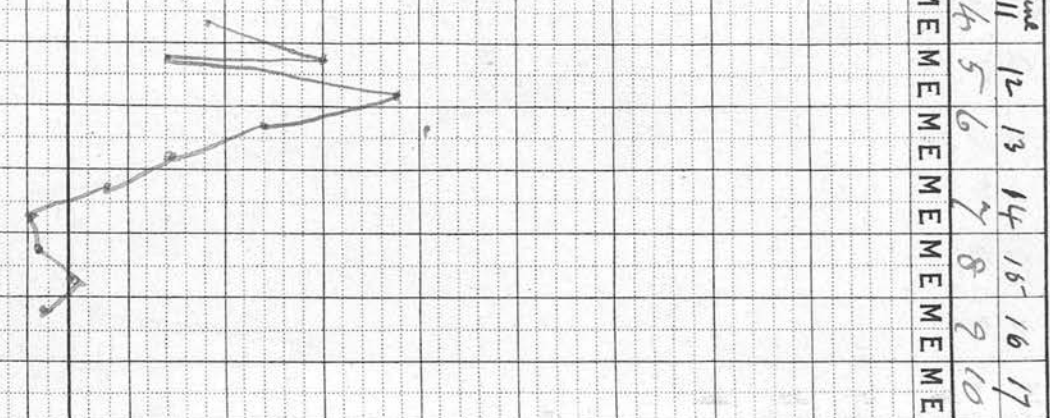
Date.	Temp.	Pulse.	Resp.	Urine
14	MEM	M	M	M
15	MEM	M	M	M
16	MEM	M	M	M
17	MEM	M	M	M
18	MEM	M	M	M
19	MEM	M	M	M
20	MEM	M	M	M
21	MEM	M	M	M
22	MEM	M	M	M
23	MEM	M	M	M
24	MEM	M	M	M
25	MEM	M	M	M
26	MEM	M	M	M
27	MEM	M	M	M
28	MEM	M	M	M
29	MEM	M	M	M
30	MEM	M	M	M
31	MEM	M	M	M
32	MEM	M	M	M
33	MEM	M	M	M
34	MEM	M	M	M
35	MEM	M	M	M
36	MEM	M	M	M
37	MEM	M	M	M
38	MEM	M	M	M
39	MEM	M	M	M
40	MEM	M	M	M
41	MEM	M	M	M
42	MEM	M	M	M
43	MEM	M	M	M
44	MEM	M	M	M
45	MEM	M	M	M
46	MEM	M	M	M
47	MEM	M	M	M
48	MEM	M	M	M
49	MEM	M	M	M
50	MEM	M	M	M
51	MEM	M	M	M
52	MEM	M	M	M
53	MEM	M	M	M
54	MEM	M	M	M
55	MEM	M	M	M
56	MEM	M	M	M
57	MEM	M	M	M
58	MEM	M	M	M
59	MEM	M	M	M
60	MEM	M	M	M
61	MEM	M	M	M
62	MEM	M	M	M
63	MEM	M	M	M
64	MEM	M	M	M
65	MEM	M	M	M
66	MEM	M	M	M
67	MEM	M	M	M
68	MEM	M	M	M
69	MEM	M	M	M
70	MEM	M	M	M
71	MEM	M	M	M
72	MEM	M	M	M
73	MEM	M	M	M
74	MEM	M	M	M
75	MEM	M	M	M
76	MEM	M	M	M
77	MEM	M	M	M
78	MEM	M	M	M
79	MEM	M	M	M
80	MEM	M	M	M
81	MEM	M	M	M
82	MEM	M	M	M
83	MEM	M	M	M
84	MEM	M	M	M
85	MEM	M	M	M
86	MEM	M	M	M
87	MEM	M	M	M
88	MEM	M	M	M
89	MEM	M	M	M
90	MEM	M	M	M
91	MEM	M	M	M
92	MEM	M	M	M
93	MEM	M	M	M
94	MEM	M	M	M
95	MEM	M	M	M
96	MEM	M	M	M
97	MEM	M	M	M

This chart shows the temperature in a case of measles followed by whooping-cough. The former cleared up rapidly; but left behind some bronchial catarrh on which pertussis soon became engendered. The patient was left weak and emaciated, as most of the paroxysms were accompanied by vomiting.

Name Case 26. Age 35 years. Disease Measles.

Notes

Date	Temp.	Pulse	Resp.	Urine
11	MEM	M	M	M
12	MEM	M	M	M
13	MEM	M	M	M
14	MEM	M	M	M
15	MEM	M	M	M
16	MEM	M	M	M
17	MEM	M	M	M
18	MEM	M	M	M
19	MEM	M	M	M
20	MEM	M	M	M
21	MEM	M	M	M
22	MEM	M	M	M
23	MEM	M	M	M
24	MEM	M	M	M

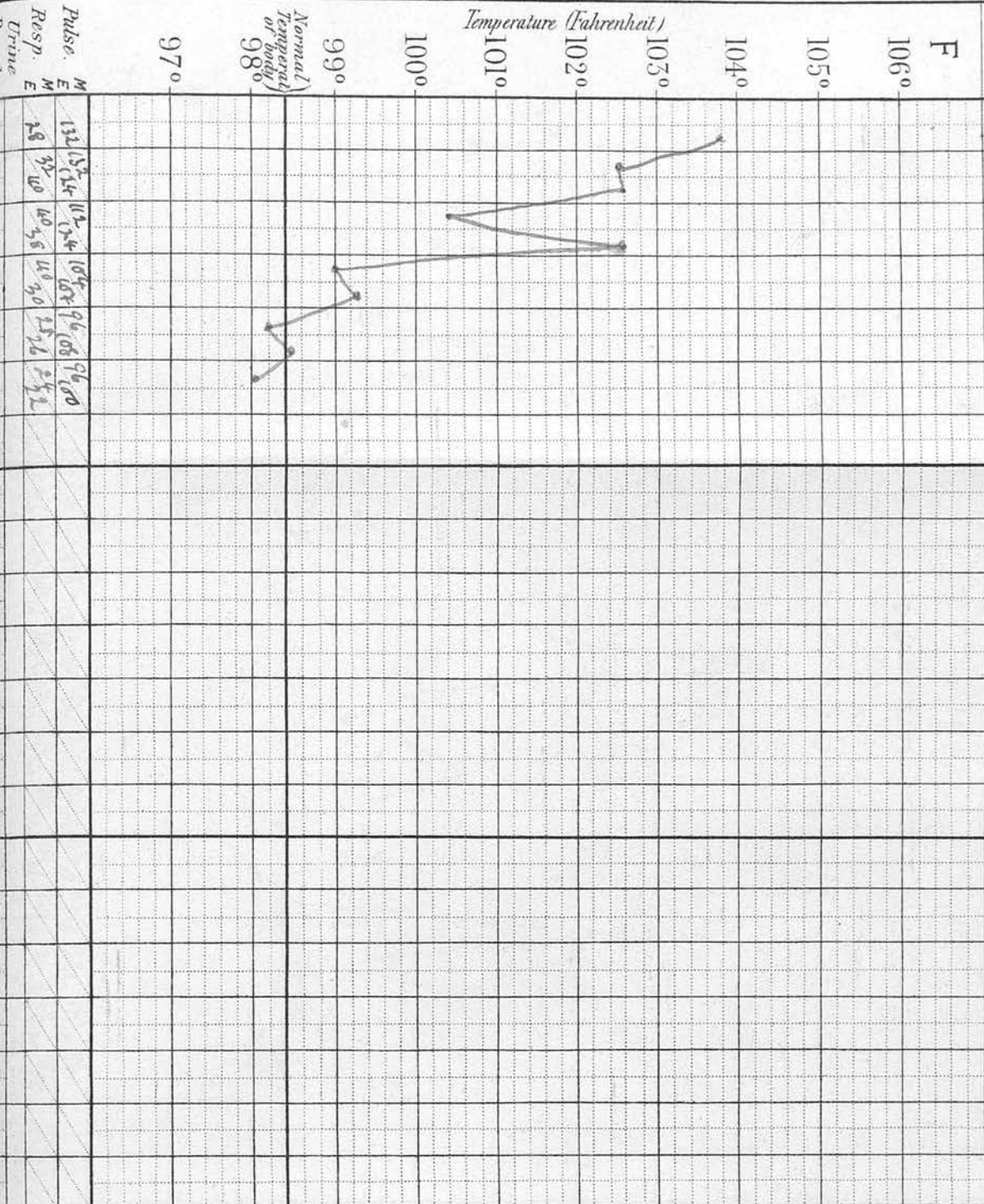


This is the chart of an ordinary case of measles in an adult of 35 years.
 The patient, a female, was ill for four days when first seen.
 The eruption soon disappeared, and she made an excellent recovery.

Name July Case 28. Age 7 years. Disease Measles.

Notes

Date	Day of Dis.	Time.
19	4	MEM
20	5	MEM
21	6	MEM
22	7	MEM
23	8	MEM
24	9	MEM
25	10	MEM
26	11	MEM
27	12	MEM
28	13	MEM
29	14	MEM
30	15	MEM
	16	MEM
	17	MEM
	18	MEM
	19	MEM
	20	MEM
	21	MEM
	22	MEM
	23	MEM
	24	MEM



This girl had been ill for four days, and when first seen showed a well-marked measly eruption all over the body.
 Although father a delicate child and suffering from a spinal curvature, she made a good recovery.

Pulse.	Resp.	Urine	Bowels
M 132	M 32		
E 154	M 40		
M 112	M 36		
E 124	M 40		
M 104	M 30		
E 96	M 25		
M 108	M 21		
E 96	M 25		
M 100	M 22		
E 100	M 22		

Name Oct Case 29. Age 2 1/2 years. Disease Measles followed by Enteritis. Notes

Date	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28
Day of Dis.	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28						
Time	MEM	MEM	MEM	MEM	MEM	MEM	MEM	MEM	MEM	MEM	MEM	MEM	MEM	MEM	MEM	MEM	MEM	MEM	MEM	MEM	MEM	MEM	MEM	MEM	MEM	MEM	MEM
F																											
Temperature (Fahrenheit)	103°	102°	101°	100°	99°																						
Normal Temperature of body	98°																										
Pulse	100	100	104	119	112	108	108	108	105	105	109	112	115	120	125	120	118	118	118	125	120	108	108	108	108	108	
Resp.	57	64	68	64	60	58	55	56	57	62	64	64	65	66	66	66	66	66	66	66	66	66	66	66	66	66	
Urine																											

This patient had been ill for some eight days, was doubtless recovering from measles when first seen, then had a temperature of 101.2.F.; and was suffering from bronchial catarrh.

The temperature still kept up, and the bowels were rather loose. The abdomen was a good deal distended and seemingly tender.

The stools had a very foul odour, and were of a brownish or grayish-green colour.

The condition lasted about three weeks. The patient received small doses of calomel and a mixture of bismuth and chalk. Afterwards there was a good, although slow, recovery.

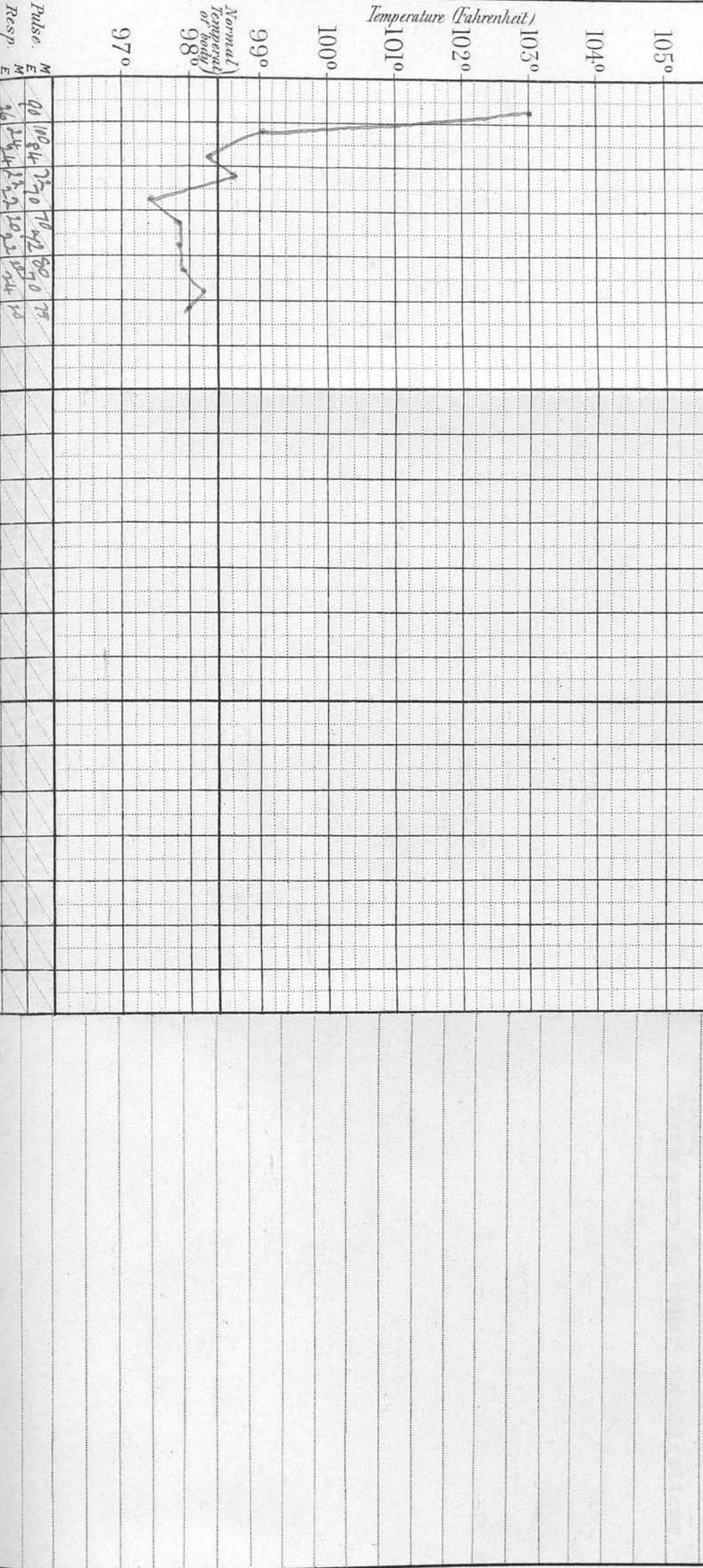
Name 641 Case 30. Age 2 years. Disease Measles followed by Broncho-pneumonia. Notes

Date	Day of Dis.	Time	F
20	1		
21	2		
22	3		
23	4		
24	5		
25	6		
26	7		
27	8		
28	9		
29	10		
30	11		
31	12		
1	13		
2	14		
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5	17		
6	18		
7	19		
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Name Sgt Case 53. Age 20 years. Disease Measles. Notes

Date	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Day of Dis	3	4	5	6	7	8	9	10						
Time	MEM	MEM	MEM	MEM	MEM	MEM	MEM	MEM	MEM	MEM	MEM	MEM	MEM	MEM

F
106°
105°
104°
103°
102°
101°
100°
99°
98°
97°



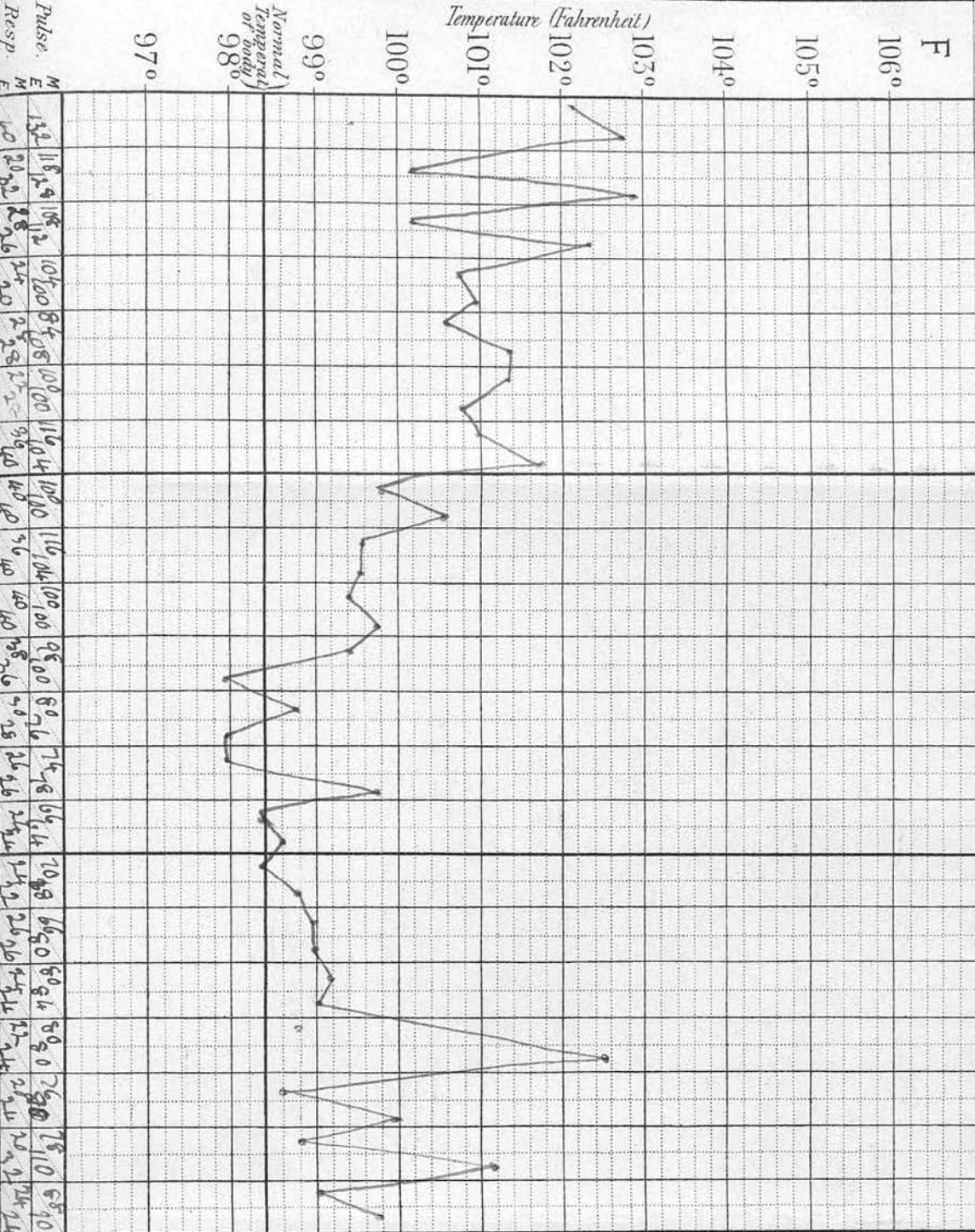
Pulse
M 90
E 84
M 75
E 70
M 70
E 62
M 80
E 70
M 75
E 70

In this case of measles in the adult there was a history of two days' previous illness. The temperature nearly touched the normal the following morning, and this was followed by a rapid recovery.

Name July Case 34. Age 9 years. Disease Measles and Scarlet Fever.

Notes

Date	Day of Dis	Tonic
1	2	3
4	5	6
7	8	9
10	11	12
13	14	15
16	17	18
19	20	21
22		



This is a chart of a case of measles followed by scarlet fever of a fairly mild type. The eruption of measles was profuse all over the body; but the later one of scarlatina, although typical of that disease, was not very profuse. There were no other complications.

Name July Case 36. Age 7 years. Disease Measles.

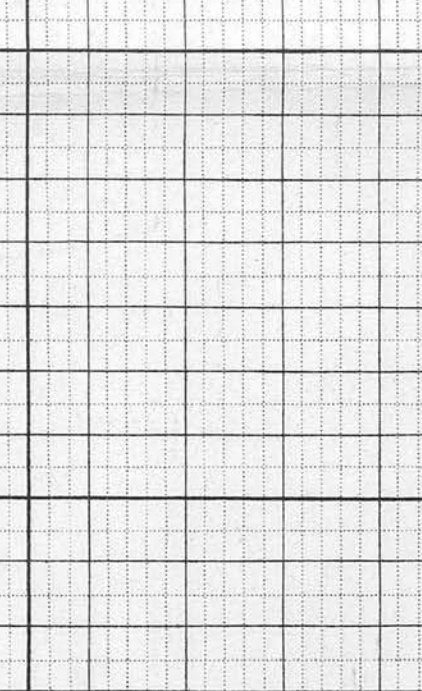
Notes

Date	Day of Dis.	Time	Temp.	Pulse.	Resp.	Trachea
12	1	MEM				
13	2	MEM				
14	3	MEM				
15	4	MEM				
16	5	MEM				
17	6	MEM				
18	7	MEM				
19	8	MEM				
20	9	MEM				
21	10	MEM				
22	11	MEM				
23	12	MEM				
24	13	MEM				
25	14	MEM				
	15	MEM				
	16	MEM				
	17	MEM				
	18	MEM				
	19	MEM				
	20	MEM				
	21	MEM				

This girl, suffering from measles, had been ill for two days when first seen. At this time she had a temperature of 100. F., showed Koplik's spots, and had the usual catarrhal symptoms of the disease.

The rash came out on the evening of the 5th day and was profuse, especially on the face and abdomen; but it soon disappeared, after which the patient rapidly recovered.

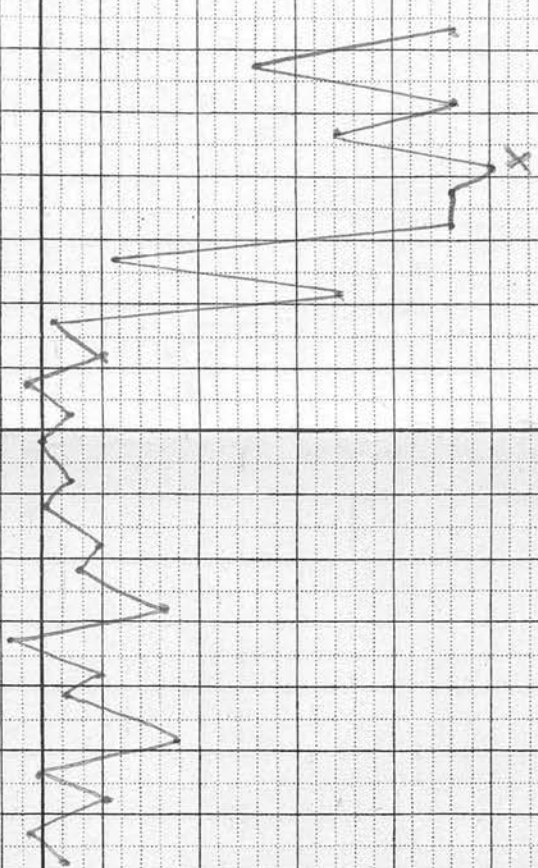
Temp. (Fahrenheit)	Day of Dis.	Time.
103°	1	M
102°	2	M
101°	3	M
100°	4	M
99°	5	M
98°	6	M
97°	7	M
	8	M
	9	M
	10	M
	11	M
	12	M
	13	M
	14	M
	15	M
	16	M
	17	M



This chart shows the temperature in a very mild case of measles. The prodromal symptoms were not at all severe, and the rash, although distinctly that of measles, was not at any time profuse nor confluent.

The child, as might be expected, made a very rapid recovery. Before I saw her, she was said to have been unwell only one day.

Date	Day of Dis	Time	F
Nov 17	1		
18	2		
19	3		
20	4		
21	5		
22	6		
23	7		
24	8		
25	9		
26	10		
27	11		
28	12		
29	13		
30	14		
Dec 1	15		
2	16		
3	17		
4	18		
5	19		
6	20		
7	21		



Pulse	Resp.	Urine
M	E	E
116	119	
120	122	
132	124	
108	102	
97	98	
97	98	
76	76	
72	72	
80	110	
72	108	
90	90	

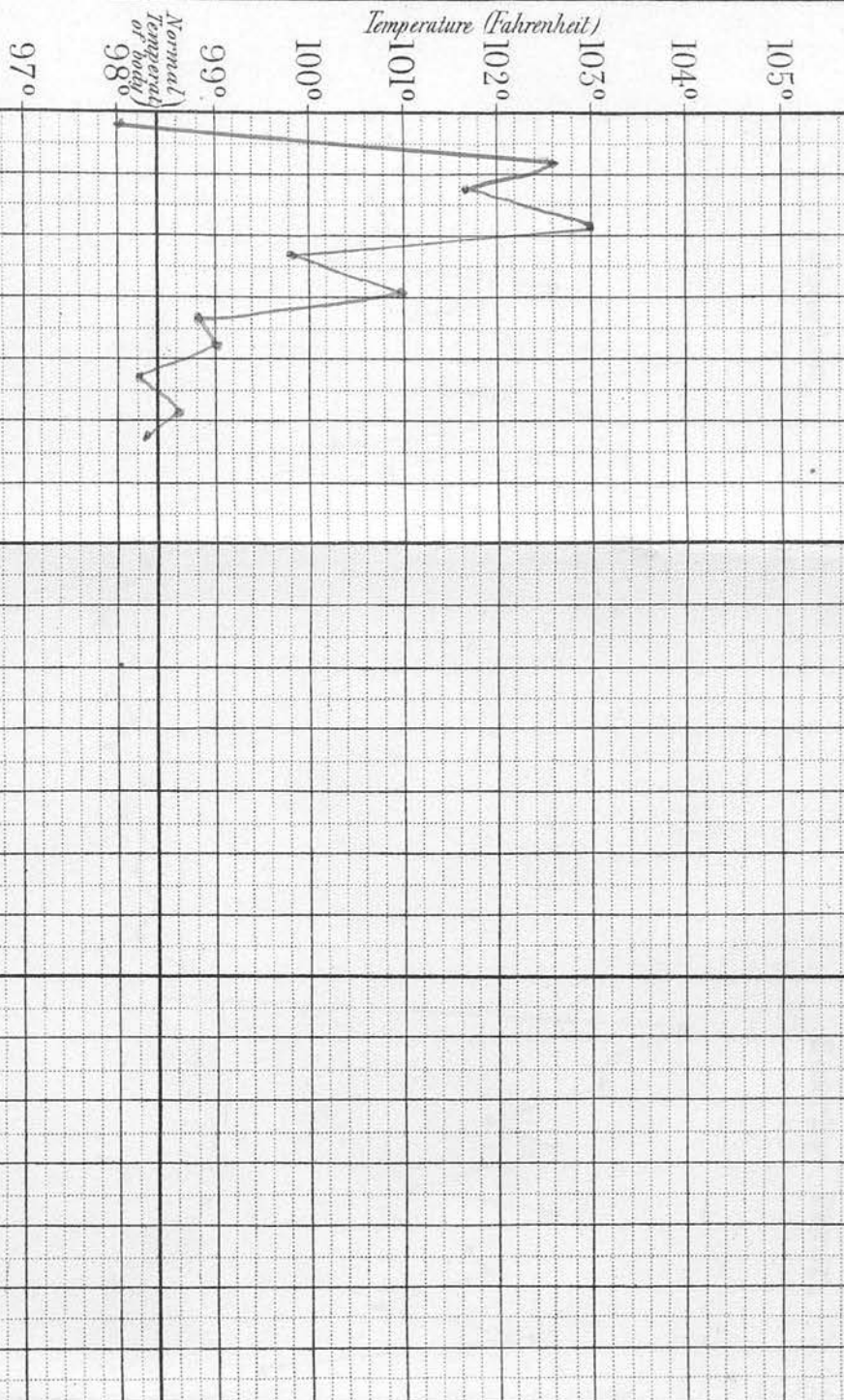
This is the chart of an ordinary case of measles, in a girl of 13, which shows a fairly high temperature from the first.

The temperature curve was only very slightly higher after than before the appearance of the rash at X. It soon reached the normal; however, but began to rise a little again from the 8th day - this being due to a bronchitic attack.

Name Case 40. Age 27 years. Disease Measles. Notes

Date.	Day of Dis.	Temp.
Aug 21	1	MEM
22	2	MEM
23	3	MEM
24	4	MEM
25	5	MEM
26	6	MEM
27	7	MEM
28	8	MEM
29	9	MEM
30	10	MEM
31	11	MEM
1 st	12	MEM
	13	MEM
	14	MEM
	15	MEM
	16	MEM
	17	MEM
	18	MEM
	19	MEM
	20	MEM
	21	MEM

This young woman had been feeling indisposed for three days previous to being seen.
 The rash made its appearance on the 4th day, and the patient made a rapid recovery.



Pulse.	Resp.	Urine
M 92	M 16	
E 92	M 16	
M 94	M 16	
E 94	M 16	
M 95	M 16	
E 95	M 16	
M 96	M 16	
E 96	M 16	
M 97	M 16	
E 97	M 16	

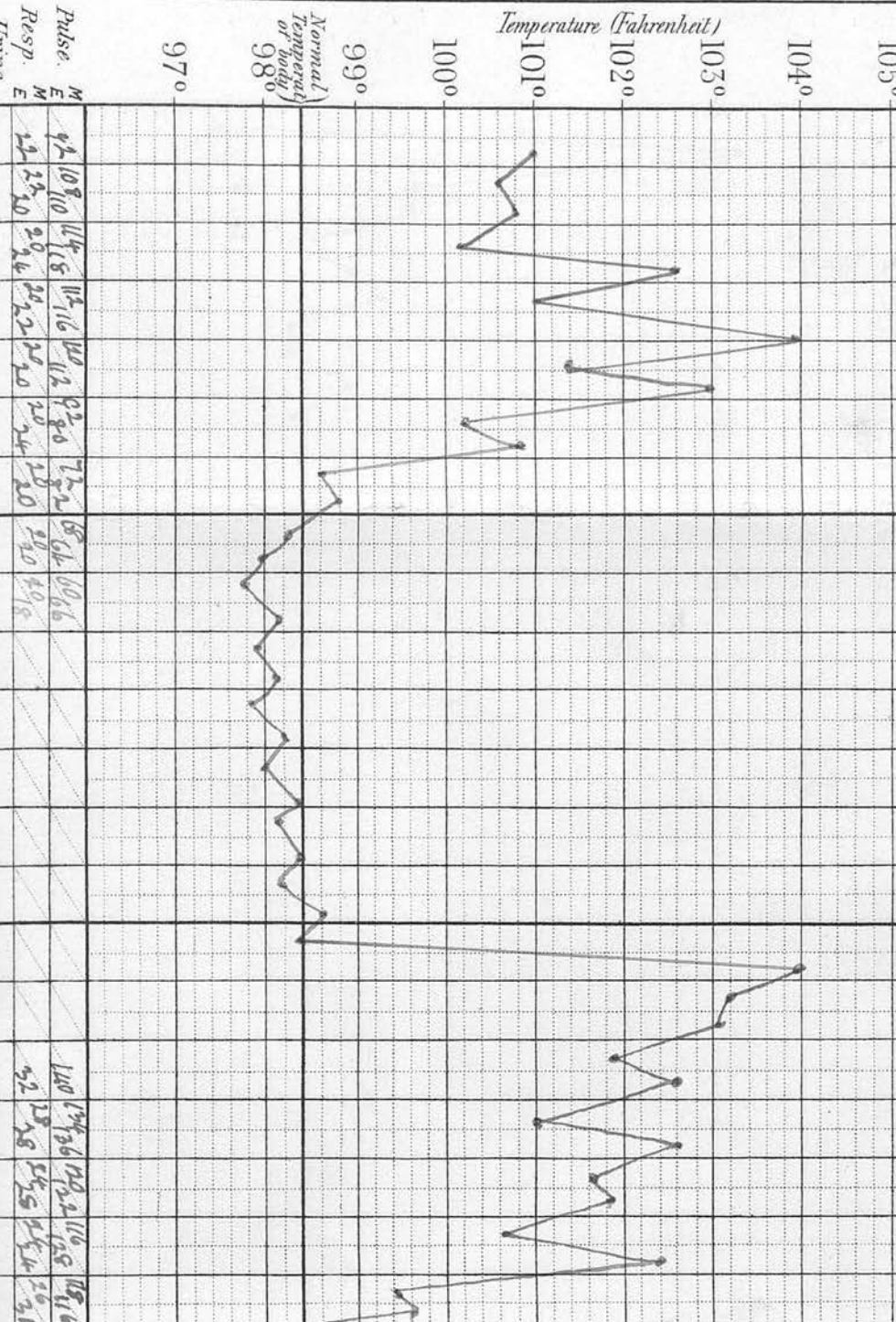
Name Case 43. Age 13 years. Disease Measles followed by Scarlet Fever.

Notes

Date	MEM	MEM	MEM	MEM	MEM	MEM	MEM	MEM	MEM	MEM	MEM	MEM	MEM	MEM	MEM	MEM	MEM	MEM	MEM	MEM	
Nov 20																					
21																					
22																					
23																					
24																					
25																					
26																					
27																					
28																					
29																					
30																					
Dec 1																					
2																					
3																					
4																					
5																					
6																					
7																					
8																					
9																					
10																					

Measles.

Scarlet Fever.

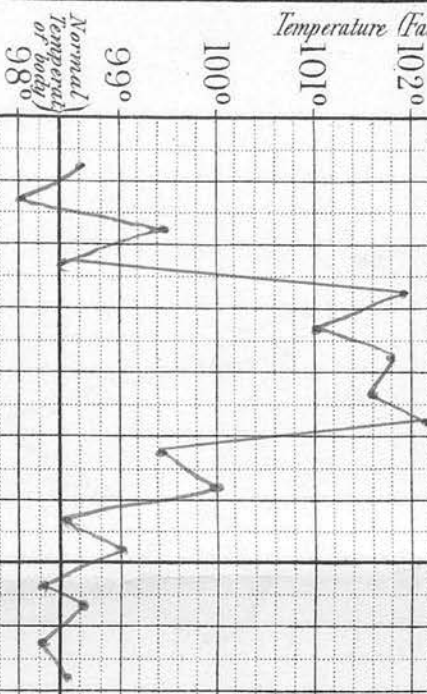


This girl of 13 years suffered from a rather severe attack of measles, the rash appearing on the evening of the 3rd day. She progressed satisfactorily after the disappearance of the eruption, and continued to do so until about the 14th day of the disease, when the temperature again began to rise, and on the following day had reached 104. F., with a quick pulse and hurried respirations. The patient was now covered with a scarlatinal rash, and she suffered from sore-throat and had the typical strawberry appearance of the tongue. Furthermore, the urine about the 4th day after the appearance of the eruption contained a slight trace of albumin, and it continued to do so for two days. I could not understand at first how this patient could possibly contract scarlatina, but it came to my knowledge afterwards that she had been visited by a friend who suffered from that affection during her illness.

Name Ann Case 44. Age 13 years. Disease Measles.

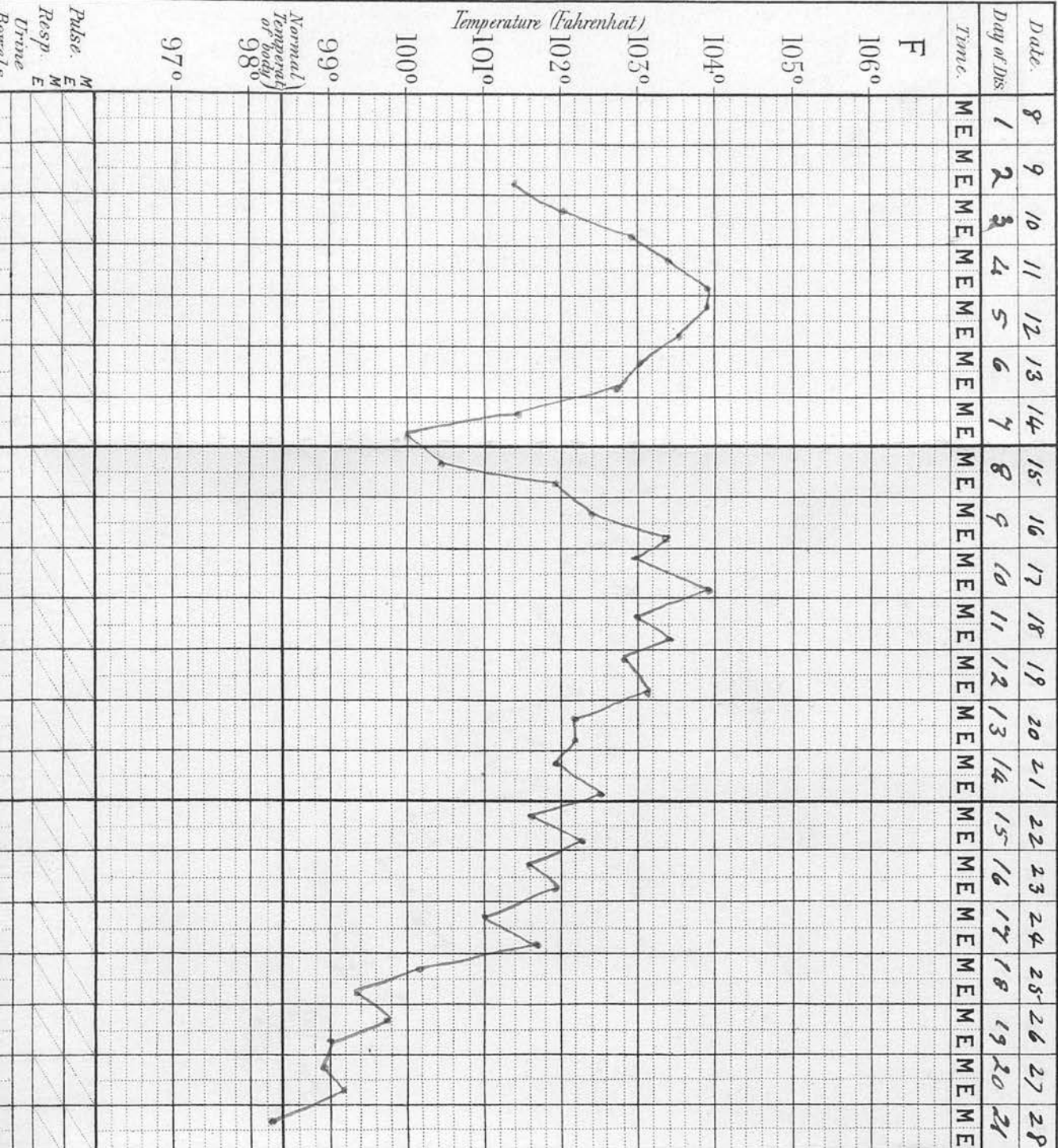
Notes

Date	Day of Dis	Temp.	Pulse	Resp.	Time
25	1	MEM	104	M	11
26	2	MEM	100	M	11
27	3	MEM	105	M	11
28	4	MEM	105	M	11
29	5	MEM	105	M	11
30	6	MEM	104	M	11
31	7	MEM	103	M	11
	8	MEM	103	M	11
	9	MEM	103	M	11
	10	MEM	103	M	11
	11	MEM	103	M	11
	12	MEM	103	M	11
	13	MEM	103	M	11
	14	MEM	103	M	11
	15	MEM	103	M	11
	16	MEM	103	M	11
	17	MEM	103	M	11
	18	MEM	103	M	11
	19	MEM	103	M	11
	20	MEM	103	M	11
	21	MEM	103	M	11



This is a chart of uncomplicated measles. The rash appeared on the 3rd day and was profuse. There were the usual catarrhal symptoms, and the patient made an excellent recovery.

Name Arnold Case 48. Age 5 years. Disease Measles with Laryngitis (probably diphtheritic)



In the case of this boy the temperature fell to 100. F.; but it rose again, and the patient had a good deal of cough which became gradually more severe, and was accompanied by difficulty of breathing and hoarseness.

The patient grew restless, and had a very gasping respiration with a certain amount of lividity.

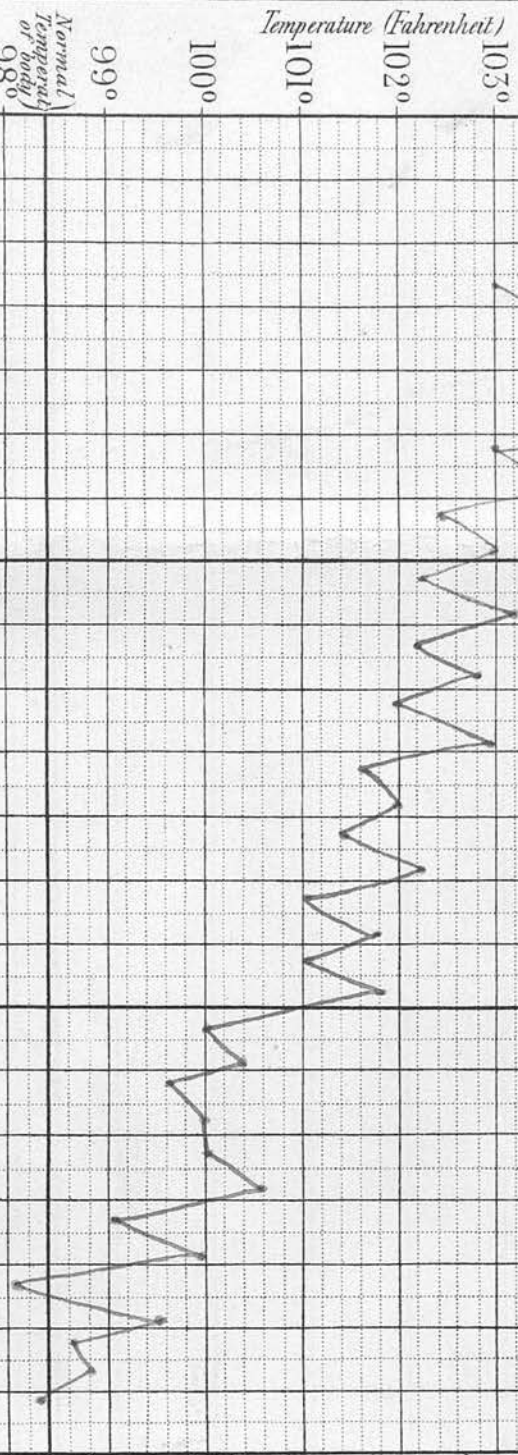
This became so serious that I thought tracheotomy ought to be performed.

I could find no membrane on the throat, but lost no time in using anti-diphtheritic serum. This was repeated on the following day, and the patient recovered in due course.

Although there were no definite signs of the suspected disease, I think that the case must have been one of membranous diphtheritic laryngitis following measles.

Name *Case 50.* Age *12 years.* Disease *Measles with Severe Bronchial Catarrh.* Notes

Date.	Day of Dis.	Temp.	Pulse.	Resp.	Urine
19	1	M	M	M	M
20	2	M	M	M	M
21	3	M	M	M	M
22	4	M	M	M	M
23	5	M	M	M	M
24	6	M	M	M	M
25	7	M	M	M	M
26	8	M	M	M	M
27	9	M	M	M	M
28	10	M	M	M	M
29	11	M	M	M	M
30	12	M	M	M	M
31	13	M	M	M	M
1	14	M	M	M	M
2	15	M	M	M	M
3	16	M	M	M	M
4	17	M	M	M	M
5	18	M	M	M	M
6	19	M	M	M	M
7	20	M	M	M	M
8	21	M	M	M	M



This boy suffered from measles of a severe type, owing to the accompanying bronchial catarrh. His temperature kept up for nearly three weeks, during which time his pulse and respiration were somewhat rapid. He also had a very severe hacking cough, which same caused a feeling of soreness behind the sternum and along the line of the attachment of the diaphragm, but which became relieved as the bronchial secretion loosened. The patient had also a poor appetite, and during the course of his illness lost flesh and weight to some extent. Nevertheless, as his surroundings were good and he received plenty of well-prepared and nourishing food and a change of air during convalescence, his recovery was more rapid than one would have expected after such a severe illness.

Name John Case 49. Age 6 years. Disease Measles. Notes

Date	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Day of Dis	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
Time	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M
F																						
106°																						
105°																						
104°																						
103°																						
102°																						
101°																						
100°																						
99°																						
Normal Temperature of body																						
98°																						
97°																						
Pulse																						
Resp.																						
Urine																						

This chart of a boy of 6 years represents an ordinary attack of measles, except for the fact that during the second week of the disease (convalescence) there appeared on the front of the legs some elevated reddish areas, which were circular in outline and painful to the touch: they very much resembled erythema nodosum.

There were no articular pains, but only a slight rise of temperature.

The lesions in question were also the cause of a burning and painful sensation in the legs. They disappeared in a few days under the exhibition of the salicylates and the local application of an evaporating and astringent lotion.