days, and the morning remissions are not marked. The maximum temperature is usually reached by the fifth day, when the temperature may reach 105°, 106°, or 107°. In mild cases it seldom rises above 103°. After reaching its maximum the temperature generally continues with slight morning remissions until the twelfth or fourteenth day, when the crisis occurs, during which the temperature may fall below normal within twelve or twenty-four hours. Preceding a fatal termination, there is usually a rapid rise in the fever to 108° or even 109°.

The heart may early show signs of weakness. The first sound becomes feeble and almost inaudible, and a systolic murmur at the apex is not infrequent. Hypostatic congestion of the lungs occurs in all severe cases.

The brain symptoms are usually more pronounced than in typhoid, and the delirium is more constant.

The urine in typhus shows the usual febrile increase of urea and uric acid. The chlorides diminish or disappear. Albumen is present in a large proportion of the cases, but nephritis seldom occurs.

Variations in the course of the disease are naturally common. There are malignant cases which rapidly prove fatal within two or three days; the so-called *typhus siderans*. On the other hand, during epidemics there are extremely mild cases in which the fever is slight, the delirium absent, and convalescence is established by the tenth day.

Complications and Sequelæ.—Broncho-pneumonia is perhaps the most common complication. It may pass on to gangrene. In certain epidemics gangrene of the toes, the hands, or the nose, and in children noma or cancrum oris, have occurred. Meningitis is rare. Paralyses, which are probably due to the post-febrile neuritis, are not very uncommon. Septic processes, such as parotitis and abscesses in the subcutaneous tissues and in the joints, are occasionally met. Nephritis is rare. Hæmatemesis may occur.

Prognosis.—The mortality ranges in different epidemics from 12 to 20 per cent. It is very slight in the young. Children, who are quite as frequently attacked as adults, rarely die. After middle age the mortality is high, in some epidemics 50 per cent. Death usually occurs toward the close of the second week and is due to the toxæmia. In the third week it is more commonly due to pneumonia.

Diagnosis.—During an epidemic there is rarely any doubt, for the disease presents distinctive general characters. Isolated cases may be very difficult to distinguish from typhoid fever. While in typical instances the eruption in the two affections is very different, yet taken alone it may be deceptive, since in typhoid fever a roseolous rash may be abundant and there is occasionally a subcuticular mottling and even petechiæ. The difference in the onset, particularly in the temperature, is marked; but cases in which it is important to make an accurate diagnosis are not usually seen until the fourth or fifth day. The suddenness of the onset, the greater frequency of the chill, and the early prostration are the distinctive features in typhus. The brain symptoms too are earlier. It is easy to put down on paper elaborate differential distinctions, which are practically useless at the bedside, particularly when the disease is not prevailing as an epidemic. In sporadic cases the diagnosis is sometimes extremely difficult. I have seen Murchison himself in doubt, and more than once I have known a diagnosis to be deferred until the *sectio cadaveris*. Severe cerebro-spinal fever may closely simulate typhus at the outset, but the diagnosis is usually clear within a few days. Malignant variola also has certain features in common with severe typhus, but the greater extent of the hæmorrhages and the bleeding from the mucous membranes make the diagnosis clear within a short time. The rash at first resembles that of measles, but in this disease the eruption is brighter red in color, often crescentic or irregular in arrangement, and appears first in the face.

The frequency with which other diseases are mistaken for typhus is shown by the fact that during and following the epidemic of 1881 in New York one hundred and eight cases were wrongly diagnosed—one eighth of the entire number—and sent to the Riverside Hospital (F. W. Chapin).

Treatment.—Practically the general management of the disease is like that of typhoid fever. Hydrotherapy should be thoroughly and systematically employed. Judging from the good results which we have obtained by this method in typhoid cases with nervous symptoms much may be expected from it. Certain authorities have spoken against it, but it should be given a more extended trial. Medicinal antipyretics are less suitable than in typhoid, as the tendency to heart-weakness is often more pronounced. As a rule the patients require from the outset a supporting treatment; water should be freely given, and alcohol in suitable doses according to the condition of the pulse.

The bowels may be kept open by mild aperients. The so-called specific medication, by sulphocarbolates, the sulphides, carbolic acid, etc., is not commended by those who have had the largest experience. The special nervous symptoms and the pulmonary symptoms should be dealt with as in typhoid fever. In epidemics, when the conditions of the climate are suitable, the cases are best treated in tents in the open air.

III. RELAPSING FEVER (*Febris recurrens*).

Definition.—A specific infectious disease caused by the spirochæte (spirillum) of Obermeier, characterised by definite febrile paroxysms which usually last six days and are followed by a remission of about the same length of time, then by a second paroxysm, which may be repeated three or even four times, whence the name relapsing fever.

Etiology.—This disease, which has also the names "famine fever" and "seven-day fever," has been known since the early part of the

eighteenth century, and has from time to time extensively prevailed in Europe and in Ireland. It is common in India, where the conditions for its development seem always to be present. The subject has been specially studied by Vandyke Carter, of Bombay. It was first seen in this country in 1844, when cases were admitted to the Philadelphia Hospital, which are described by Meredith Clymer in his work on fevers. Flint saw cases in 1850–'51. In 1869 it prevailed extensively in epidemic form in New York and Philadelphia; since then it has not appeared.

The special conditions under which it develops are very similar to those of typhus fever. Overcrowding and deficient food are the conditions which seem to promote the rapid spread of the virus. Neither age, sex, nor season seems to have any special influence. It is a contagious disease and may be communicated from person to person, but is not so contagious as typhus. Murchison thinks it may be transported by fomites. One attack does not confer immunity from subsequent attacks. In 1873 Obermeier described an organism in the blood which is now recognised as the specific agent. This spirillum, or more correctly spirochæte, is from three to six times the length of the diameter of a red blood-corpuscle, and forms a narrow spiral filament which is readily seen moving among the red corpuscles during a paroxysm. They are present in the blood only during the fever. Shortly before the crisis and in the intervals they are not found, though small glistening bodies, which are stated to be their spores, appear in the blood. The disease has been produced in human beings by inoculation of the blood during the paroxysm. It has also been produced in monkeys. Nothing is yet known with reference to the life history of the spirochæte.

Morbid Anatomy.—There are no characteristic anatomical appearances in relapsing fever. If death takes place during the paroxysm the spleen is large and soft, and the liver, kidneys and heart show cloudy swelling. There may be infarcts in the kidneys and spleen. The bone marrow has been found in a condition of hyperplasia. Ecchymoses are not uncommon.

Symptoms.—*Incubation* appears to be short, and in some instances the attack develops promptly after exposure; more frequently, however, from five to seven days elapse.

The *invasion* is abrupt, with chill, fever, and intense pain in the back and limbs. In young persons there may be nausea, vomiting, and convulsions. The temperature rises rapidly and may reach 104° on the evening of the first day. Sweats are common. The pulse is rapid, ranging from 110 to 130. There may be delirium if the fever is high. Swelling of the spleen can be detected early. Jaundice is common in some epidemics. The gastric symptoms may be severe. There are seldom intestinal symptoms. Cough may be present. Occasionally herpes is noted, and there may be miliary vesicles and petechiæ. During the paroxysm the blood invariably shows the spirochæte. After persisting with severity or even

with an increasing intensity for five or six days the crisis occurs. In the course of a few hours, accompanied by profuse sweating, sometimes by diarrhœa, the temperature falls to normal or even subnormal, and the period of apyrexia begins.

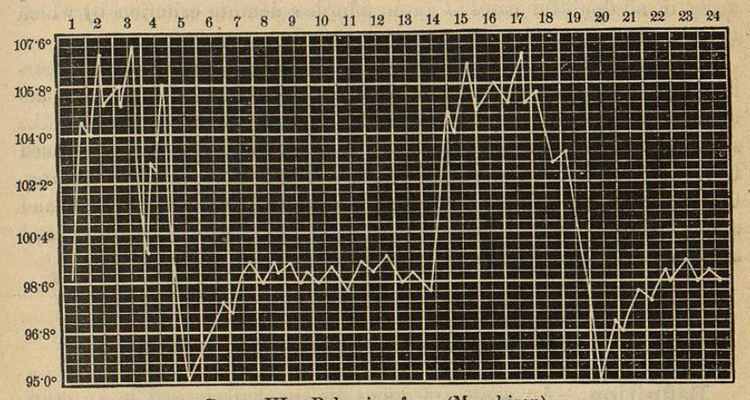

CHART VI.—Relapsing fever (Murchison).

The crisis may occur as early as the third day, or it may be delayed to the tenth; it usually comes, however, about the end of the first week. In delicate and elderly persons there may be collapse. The convalescence is rapid, and in a few days the patient is up and about. Then in a week, usually on the fourteenth day, he again has a rigor, or a series of chills; the fever returns and the attack is repeated. A second crisis occurs from the twentieth to the twenty-third day, and again the patient recovers rapidly. As a rule the relapse is shorter than the original attack. A second and a third may occur, and there are instances on record of even a fourth and a fifth. In epidemics there are cases terminating by crisis on the seventh or eighth day without the occurrence of relapse. In protracted cases the convalescence is very tedious, as the patient is much exhausted.

Relapsing fever is not a very fatal disease. Murchison states that the mortality is about 4 per cent. In the enfeebled and old, death may occur at the height of the original attack.

Complications are not frequent. In some epidemics nephritis and hæmaturia have occurred. Pneumonia appears to be frequent and may interrupt the typical course of the disease. The acute enlargement of the spleen may end in rupture, and the hæmorrhage from the stomach which has been met with occasionally is probably associated with this enlargement. Post-febrile paralyses may occur. Ophthalmia has followed certain epidemics, and may prove a very tedious and serious complication. Jaundice has already been mentioned. In pregnant women abortion usually takes place.

Diagnosis.—The onset and general symptoms may not at first be distinctive. At the beginning of an epidemic the cases are usually regarded as anomalous typhoid; but once the typical course is followed in a case the diagnosis is clear. The blood examination, which should be made in all doubtful cases of fever, affords a definite criterion by which the diagnosis can readily be made.

Treatment.—The paroxysm can neither be cut short nor its recurrence prevented. It might be thought that quinine, with its powerful action, would certainly meet the indications, but it does not seem to have the slightest influence. The disease must be treated like any other continued fever by careful nursing, a regular diet, and ordinary hygienic measures. Of special symptoms, pains in the back and in the limbs and joints demand opium. In enfeebled persons the collapse at the crisis may be serious, and stimulants with ammonia and digitalis should be given freely.

IV. SMALL-POX (*Variola*).

Definition.—An acute infectious disease characterised by an eruption which passes through the stages of papule, vesicle, pustule and crust. The mucous membranes in contact with the air may also be affected. Severe cases may be complicated with cutaneous and visceral hæmorrhages.

Etiology.—It has not yet been determined in what country small-pox originated. The disease is said to have existed in China many centuries before Christ. The *pesta magna* described by Galen (and of which Marcus Aurelius died) is believed to be small-pox. In the sixth century it prevailed, and subsequently, at the time of the Crusades, became widespread. It was brought to America by the Spaniards early in the sixteenth century. The first accurate account was given by Rhazes, an Arabian physician who lived in the ninth century, and whose admirable description is available in Greenhill's translation for the Sydenham Society. In the seventeenth century a thorough study of the disease was made by the illustrious Sydenham, who still remains one of the most trustworthy authorities on the subject.

Special events in the history of the disease are the introduction of inoculation into Europe, by Lady Mary Wortley Montagu, in 1718, and the discovery of vaccination by Jenner, in 1798.

Small-pox is one of the most virulent of contagious diseases, and persons exposed, if unprotected by vaccination, are almost invariably attacked. There are instances on record of persons insusceptible to the disease. It is said that Diemerbrock, a celebrated Utrecht professor in the seventeenth century, was not only himself exempt, but likewise many members of his family. One of the nurses in the small-pox department of the Montreal General Hospital stated that she had never been successfully vaccinated,

and she certainly had no mark. Such instances, however, of natural immunity are very rare.

Age.—Small-pox is common at all ages, but is particularly fatal to young children; thus, in the Montreal epidemic of 1885, 86 per cent of the deaths were of children under ten years of age. The *fœtus in utero* may be attacked, but only if the mother herself is the subject of the disease. The child may be born with the rash out or with the scars. More commonly the fœtus is not affected, and children born in a small-pox hospital, if vaccinated immediately, may escape the disease; usually, however, they die early.

Sex.—Males and females are equally affected.

Race.—Among aboriginal races small-pox is terribly fatal. When the disease was first introduced into America the Mexicans died by thousands, and the North American Indians have also been frequently decimated by this plague. It is stated that the negro is especially susceptible.

The Contagium develops in the system of the small-pox patient and is reproduced in the pustules. It exists in the secretions and excretions, and in the exhalations from the lungs and the skin. The dried scales constitute by far the most important element, and as a dust-like powder are distributed everywhere in the room during convalescence, becoming attached to clothing and various articles of furniture. The disease is probably contagious from a very early stage, though I think it has not yet been determined whether the contagion is active before the eruption develops. The poison is of unusual tenacity and clings to infected localities. It is conveyed by persons who have been in contact with the sick and by fomites. During epidemics it is no doubt widely spread in street-cars and public conveyances. It must not be forgotten that an unprotected person may contract a very virulent form of the disease from the mild varioloid.

The disease smoulders here and there in different localities, and when conditions are favorable becomes epidemic. Perhaps the most remarkable instance in modern times of the rapid extension of the disease occurred in Montreal in 1885. Small-pox had been prevalent in that city between 1870 and 1875, when it died out, in part owing to the exhaustion of suitable material and in part owing to the introduction of animal vaccination. The health reports show that the city was free from the disease until 1885. During these years vaccination, to which many of the French Canadians are opposed, was much neglected, so that a large unprotected population grew up in the city. On February 28th a Pullman-car conductor, who had travelled from Chicago, where the disease had been slightly prevalent, was admitted into the Hôtel-Dieu, the civic small-pox hospital being at the time closed. Isolation was not carried out, and on the 1st of April a servant in the hospital died of small-pox. Following her decease, with a negligence absolutely criminal, the authorities of the hospital dismissed all patients presenting no symptoms of contagion, who could go home. The