ILLUSTRATION NO. 1.

AN EARLY INTRA- VASCULAR TUBERC.

There is a central necrotic patch running through the centre of the patch there is a small capillary vessel, in which the embolism has lodged. Around the necrotic patch there is a zone of mononuclear cells.

The change has occurred in the centre of the marrow.
ILLUSTRATION No. 2.

A CHANGE IN THE DEVELOPMENT OF AN INTRA-VASCULAR TUBERCLE.

The central necrotic patch is being invaded by the surrounding mononuclear. It is interesting to note that the invasion is occurring in the first instance along the planes between individual fat cells.
ILLUSTRATION NO. 3.

AN EMBOLIC OR INTRA-VASCULAR TUBERCLE.

In the centre of the field, there is a patch of tissue necrosis; around this central patch there is a dense collection of Round Cells; they are beginning to invade the central area, and they are passing onwards along the planes of the former fat cells.

X 300 diams.
ILLUSTRATION NO. 4.

THE DEVELOPMENT OF AN INTRA- VASCULAR TUBERCLE.

There is a central area of Epithelioid Cells, and a surrounding zone of Round Cells.

X 200 diams.
ILLUSTRATION NO. 5.

EPITHELIOD CELLS LYING FREE IN THE MARROW SUBSTANCE.

It will be noticed that in places the epithelioid cells are directly derived from the endothelial cells of the capillaries, and they may be seen actually passing through the vessel wall.

X 400 diams.
ILLUSTRATION No. 8.

THE EARLY DEVELOPMENT OF THE TUBERCLE IN THE MARROW.

The illustration is intended to shew the vascular changes in the development of a follicle. The vessel wall is blurred and indistinct: adhering to the wall there are several endothelial cells: others have passed into the lumen or without: the lumen is partly occupied by structureless debris.

By some authorities it has been denied that this is a vessel. They look upon it as an early developing giant cell.
ILLUSTRATION No. 7.

VASCULAR CHANGES IN THE DEVELOPMENT OF THE PERIVASCULAR TUBERCLE.

The endothelial cells lining the vessel have become swollen and detached. Some have passed into the lumen and some have passed through the wall into the surrounding tissues. The actual wall of the vessel is swollen and structureless. To the left of the vessel there is accumulation of round cells beginning to collect around the focus.

X 400 diams.
VASCULAR CHANGES IN THE DEVELOPMENT OF
ILLUSTRATION NO. 8.

THE INTRA-VASCULAR CHANGES
OF A PERI-VASCULAR
TUBERCLE.

The Endothelial Cells of the vessel have
become loosened; they have passed into the lumen
and to the exterior; some of them are beginning to
form Giant Cells.

X 200 diams.
ILLUSTRATION No. 9.

A PERI-VASCULAR TUBERCLE.

Surrounding a blood vessel there are apparently two epitheliod follicles - actually it is the same one which has extended all round the wall of the vessel. The blood vessel is still patent.
ILLUSTRATION NO. 10.

A PERI-VASCULAR TUBERCLE
DEVELOPING IN THE MARROW.

The vessel may be seen lying alongside
the follicle; a Giant Cell is developing in the
interior of the follicle.

X 130 diam.
ILLUSTRATION No. 11.

A RETICULATED TUBERCLE DEVELOPING IN THE MARROW.

In the area of its development it has produced an entire absorption of the true bone tissue.

X 30 diams.
ILLUSTRATION NO. 12.

EMBOLUS IN BLOOD VESSEL.

Occupying the lumen of one of the vessels of the marrow there is the object shown in the illustration; it is impossible to say what its exact nature is, but quite possibly it is a portion of tuberculous débris; the endothelium lining the vessel is becoming detached.

X 300 diams.
ILLUSTRATION No. 13.

A DEVELOPING MARROW FOLLICLE: SHewing
THE DEVELOPMENT OF GIANT CELLS AND A
COMMENCING SURROUNDING FIBROSIS.

The follicle has originally developed as a peri-
vascular one: in its interior the epithelioid cells
are forming giant cells, while in the periphery the
epithelioid cells are becoming fibro-blasts.
ILLUSTRATION NO. 14.

A MARROW FOLLICLE SHOWING THE DEVELOPMENT OF A CENTRAL GIANT CELL:
It has been formed by cohesion of a number of Epithelioid Cells.
ILLUSTRATION NO. 15.

CASEATING TUBERCLE.

The section is one through a mass of caseating tubercle; the vessels stand out in definition; they are blocked with caseous débris, and in this way the dissemination of disease may be explained.

X 90 diams.
ILLUSTRATION No. 16.

EARLY CYST FORMATION WITH TUBERCLE FOLLICLE.

A single follicle is developing in the marrow: the epitheliod cells in the interior are being disintegrated leaving an open space which eventually develops into an actual cyst. The cells at the periphery are tending to become consolidated into what one may term the cyst wall.

x 100 diams.
ILLUSTRATION NO. 17.

A TUBERCULOUS FOLLICLE
DEVELOPING IN THE MARROW.

The Epitheliod Cells are forming Giant Cells, and in one Giant Cell an area of calcification is forming.

X 200 diams.
ILLUSTRATION NO. 18.

THE CELLULAR REACTION OF THE MARROW IN TUBERCLE.

In the early stages of tuberculous infections the marrow undergoes a cellular reaction; there is an increase at first of the polymorphonuclear and later of the mononuclear cells.

X60 diams.
ILLUSTRATION NO. 19.

CELLULAR REACTION OF THE MARROW IN TUBERCLE.

The section is one which shows the line of junction between the cellular reaction and the early fibrous reaction.

X 45 diams.
ILLUSTRATION No. 20.

CELLULAR CHANGES IN THE FORMATION OF FIBROUS MARROW.

The illustration shews a progressive series of changes from the connective tissue cell (A) through elongated cells (B & C) into myxomatous cells (D & E), these later become connected with fibro blasts (F & G); the approximation of the fibro blasts forms fibrous marrow (H).
ILLUSTRATION No. 21.

EARLY CHANGES IN THE DEVELOPMENT OF FIBROUS MARROW.

In the intervals between the fat cells a simple fibro-myxomatous tissue is developing: the fat cells are being separated and replaced by the new and more embryonic tissue.

X 60 diams.
ILLUSTRATION No. 22.

FURTHER CHANGES IN THE DEVELOPMENT OF FIBROUS MARROW.

The fibro-myxomatous tissue between the fat cells has become quite considerable in amount. In places the fat cells have become entirely replaced but here and there single specimens are visible. The new tissue is becoming more fibrous in character.

X 75 diams.
ILLUSTRATION NO. 23.

FIBROUS MARROW — SHEWING ITS DEVELOPMENT FROM THE PERI-VASCULAR TISSUES.

The marrow has been almost entirely replaced by fibro-myxomatous tissue — here and there fat cells are visible. Much of the young fibrous tissue is arranged in concentric whorls around blood vessels: indication of its development from the peri-vascular tissues.

X 150 diams.
ILLUSTRATION No. 24.

DENSE FIBROUS MARROW.

The entire marrow space has become converted into dense fibrous tissue. The bone lamellae are undergoing a fibrous metaplasia and absorption: the whole process is a protective one against the action of the tubercle bacillus.

X 60 diams.
ILLUSTRATION NO. 25.

HEALTHY BONE MARROW.

This is a section of the Bone Marrow, before it has undergone any reaction change to the tubercle.

X 33 diams.
ILLUSTRATION NO. 26.

FATTY MARROW.

This is a stage in the reaction of the marrow to infection by tubercle; by a proliferation of the tissue between the fat cells and around the blood vessels fibrous marrow is developed.

X 38 diams.
ILLUSTRATION NO. 27.

FIBROUS MARROW.

In the spaces between the Bone Lamellae the marrow has become converted into young connective tissue; the process is a defensive one against the spread of the Tubercle.

X 38 diams.
ILLUSTRATION No. 28.

ABSORPTION OF BONE BY MEANS OF OSTEOCLASTS.

Lying alongside the lamellae there are a number of large multinucleated cells (osteoclasts): they are producing local absorption of the bone and the resulting depressions are spoken of as Howslip's Lacunae. As a result the outline of the bone has acquired an irregular "eaten out" appearance. When the bone has been absorbed the space becomes occupied by new fibro cellular tissue.

X 200 diams.
ILLUSTRATION NO. 29.

ABSORPTION OF BONE BY OSTEOCLASTS.

The section is one of an early Encysted Tubercle; lying in the granulation tissue there is a spicule of Bone undergoing absorption.

X 160 diams.
ILLUSTRATION No. 30.

FIBROUS METAPLASIA OF THE BONE LAMELLAE.

In the centre of the field there is the outline of lamellae: in part the lamella is being rapidly destroyed: the portion of the lamella to the right has become converted or reverted into fibrous tissue. The ghost of its outline is still visible. The process is occasionally a stage in the development of fibrous marrow. X 150 diams.
ILLUSTRATION No. 31.

OSTEOBLASTS AT WORK.

Lying along the Bone lamellae there are seen to be enormous numbers of Osteoblasts: they are busily depositing new Bone. The intervening marrow is distinctly fibrous in character.

X200 diams.
ILLUSTRATION NO. 31A.

SCLEROSIS
AROUND A TUBERCULOUS FOLLICLE.

To the right of the field there is a single Tuberculous Follicle; around it the Bone is sclerosed.

X 28 diams.
ILLUSTRATION NO. 32.

THE STRUCTURE OF PERIOSTEUM.

Section of thickened Periosteum, showing its differentiation into two zones, an inner Cellular Zone and an outer or Fibrous Zone. The Periosteum is situated between the muscle and the underlying Bone.

X 35 diams.
ILLUSTRATION No. 33.

FIRST STAGE IN THE DEPOSIT OF NEW PERIOSTEAL BONE.

To the right of the illustration there are a number of muscle films: lying deeper there is the periosteum, the two layers of which are well seen. The cellular or osteogenetic layer is considerably thickened. In the centre of the field there is the shell of cortical bone: its outer surface is irregular and corroded, and upon it there is beginning to be deposited a thin layer of new bone. Between the old and the new bone there is a clear cut line of demarcation. To the left of the illustration there is the bone marrow.

X 200 diams.
The overlying muscle has been removed. The periosteum is enormously thickened. The cortical bone has the characteristic worm-eaten appearance and upon it there is a thin layer of new bone. A further deposit of bone is occurring in the form of a series of spine-like projections - the position of the spines is determined by the arrangement of interspinous vessels.

X 200 diams.
ILLUSTRATION No. 35.

THIRD STAGE IN THE DEPOSIT OF NEW PERIOSTEAL BONE.

The spine-like projections of new bone have increased in size and, their extremities joining, arches are formed. In the spaces between the arches there are blood vessels. Series after series of arches are deposited in this manner until a very considerable thickness may be attained.

X 200 diams.
ILLUSTRATION NO. 36.

FINAL STAGE IN THE DEVELOPMENT OF SUB-PERIOSTEAL BONE.

Note its porous arched appearance and the presence of blood vessels in each intervening space.

X 75 diams.
New Periosteal Bone.

Secondary to the irritation of a tuberculous osteomyelitis, the periosteum has deposited a quantity of porous new bone. Note its spongy radiating appearance, and the vascularity of the inter-lamellar spaces. In the new periosteal bone there are several follicles of tubercle developing.

X 5 diams.
ILLUSTRATION NO. 38.

NEW SUB-PERIOSTEAL BONE.

Note the characteristic porous appearance of the Bone; the overlying Periosteum is active. One of the Periosteal vessels is shown entering the Bone.

X 43 diams.
ILLUSTRATION NO. 39.

NEW SUB-PERIOSTEAL BONE.

The actual periosteum stands out as a thick black line; it is engaged in actively depositing the underlying bone.

X 33 diams.
ILLUSTRATION NO. 40.

NEW SUB-PERIOSTEAL BONE.

The Bone is the site of a central infiltrating tubercle; around the outline of the old shaft there is a perfect ring of porous new sub-periosteal Bone.

X 5 diams.
ILLUSTRATION No. 41.

TUBERCULOUS ENDARTERITIS OBLITERANS.

The inner coat is thickened by the deposit of a quantity of new connective tissue. The elastic lamina is practically intact. There is some thickening of the peri-vascular tissues. Note the absence of the round cell infiltration which distinguishes the syphilitis endarteritis.

X 150 diams.
ILLUSTRATION No. 42.

TUBERCULOUS ENDARTERITIS OBLITERANS.

The thickening has gone on to entire obliteration of the vessel lumen - the remains of the elastic lamina may be noticed. The surrounding marrow has undergone a marked fibrous change. 

X 250 diams.
A PRE-TUBERCULOUS CHANGE IN A METATARSAL BONE FOLLOWING TUBERCULOUS ENDARTERITIS OF THE NUTRIENT VESSELS.

The section is one of a series through an entire metatarsal bone. The distal portion of the bone is shewn: the proximal portion was infected with tubercle and the lower limit of the diseased tissue is visible. The nutrient vessel may be seen to be in a condition of endarteritis obliterans. The portion of the marrow which is supplied by the nutrient vessel has undergone a series of degenerative changes resulting in its conversion into fibrous tissue. The portions of bone supplied by the articular and periosteal vessels remain healthy. The degenerative change in the marrow renders it liable to infection by tubercle.

X 5 diams.